Background Soil Investigation
for

Old Fire Fighting Training Area
Naval Station Newport
Newport, Rhode Island

Northern Division
Naval Facilities Engineering Command

Contract Number N62472-90-D-1298
Contract Task Order 0218

August 2000

TETRA TECH NUS, INC.

W5200228F

BACKGROUND SOIL INVESTIGATION

FOR

OLD FIRE FIGHTING TRAINING AREA
NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION - NAVY (CLEAN) CONTRACT

Submitted to:
U.S Naval Facility Engineering Command
Northern Division, Code 18
Environmental Contracts Branch
10 Industrial Highway, Mail Stop # 82
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1.0 INTRODUCTION

At the request of the Navy, Tetra Tech NUS, Inc. (TtNUS) has completed a background soil investigation for the Old Fire Fighting Training Area (OFFTA)/Katy Field site on Coasters Harbor Island at Naval Station Newport (NAVSTA Newport) (formerly the Naval Education and Training Center (NETC) in Newport, Rhode Island. The site (now known as Katy Field) is a park with a baseball field, playground, and picnic areas, located on the north end of Coasters Harbor Island. Formerly, the 5.5-acre OFFTA was used to train Navy personnel in fighting fires on ships during the period from approximately World War II until 1972. This report describes the background soil sampling investigation and presents the results of the laboratory and statistical analyses conducted as part of the investigation. This work plan was conducted by TtNUS under the Comprehensive Long Term Environmental Action Navy (CLEAN) Contract No. N62472-90-D-298, Contract Task Order (CTO) 218.

1.1 INVESTIGATION OBJECTIVES

Previous investigations have indicated that the background levels of certain metals such as arsenic may be higher in soils on Coasters Harbor Island and Aquidneck Island than other areas of Rhode Island. The objective of the investigation summarized in this report is to establish background concentrations of arsenic and other metals in soils in the vicinity of the OFFTA site by determining the occurrence, geochemical abundance, and variability (scatter) of surface and subsurface soil ambient metal concentrations. The background levels for metals will be used to evaluate the OFFTA site data during the remedial investigation and feasibility study.

The term "background", as defined in the RIDEM Site Remediation Regulation (DEM-DSR-01-93), refers to the ambient concentrations of hazardous substances present in the environment that have not been influenced by human activities, or the ambient concentrations of hazardous substances consistently present in the environment in the vicinity of the contaminated site that are the result of human activities unrelated to releases at the contaminated site. Background samples provide baseline measurements to determine what the concentrations of these chemicals would be at a site if no releases occurred there.

This report will summarize the investigation activities, data interpretation and statistical methods, and the results of the investigation.

1.2 REPORT ORGANIZATION

The report is presented in five sections: Introduction, Site Background, Field Investigation Activities, Data Analysis and Statistical Testing, and Summary and Conclusions.

2.0 SITE BACKGROUND

This section provides a brief description and history of the OFFTA site and surrounding area (Section 2.1) and a summary of the contaminants identified in previous investigations at the OFFTA site (Section 2.2).

2.1 SITE DESCRIPTION AND HISTORY

This section provides a brief description and history of the NAVSTA Newport, Coasters Harbor Island, and the OFFTA site.

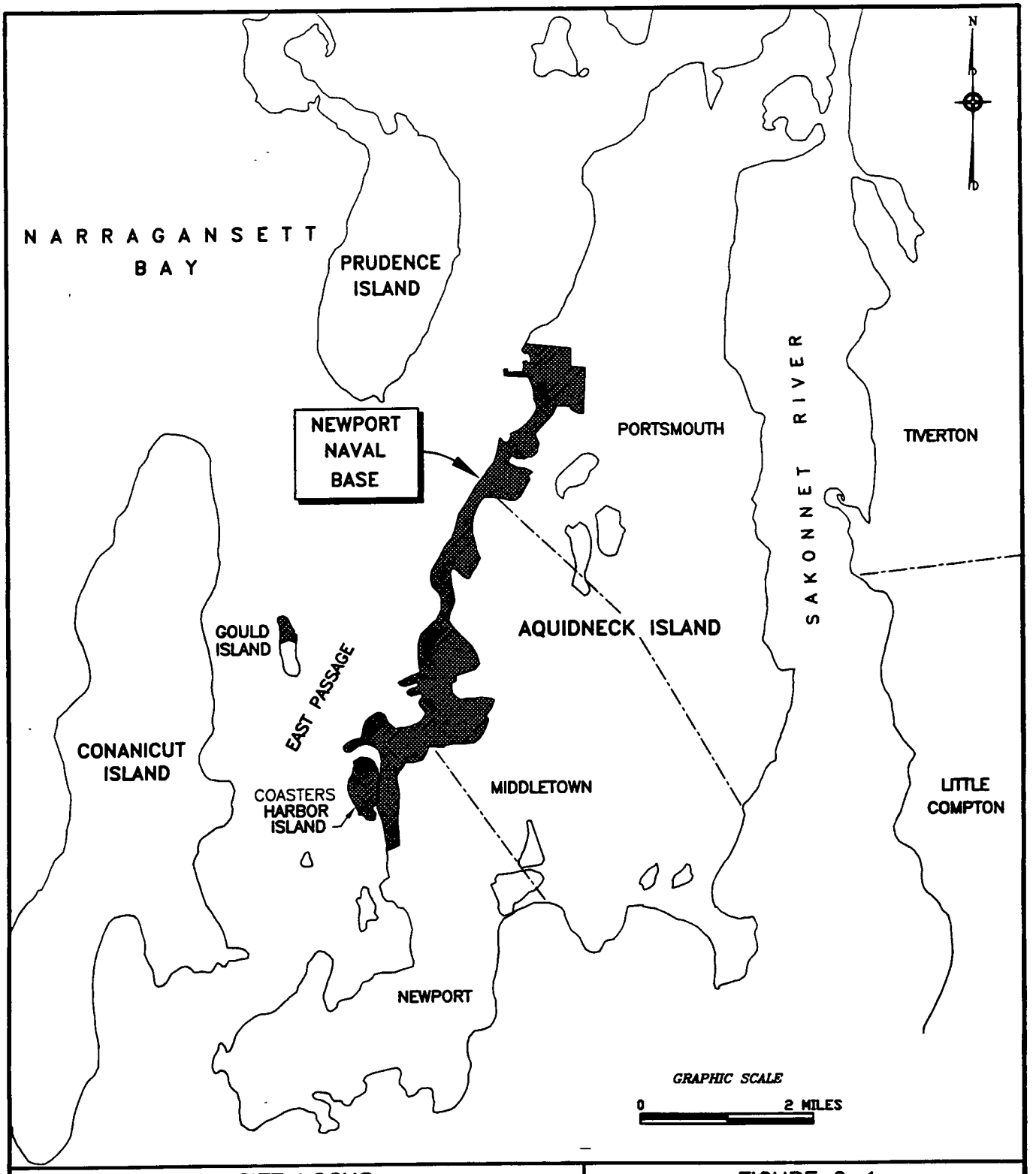
Naval Station Newport

NAVSTA Newport is located approximately 60 miles southwest of Boston, Massachusetts and 25 miles south of Providence, Rhode Island. It occupies approximately 1,063 acres, with portions of the facility located in the City of Newport and Towns of Middletown and Portsmouth, Rhode Island. The facility layout is long and narrow, following the western shoreline of Aquidneck Island for nearly 6 miles facing the east passage of Narragansett Bay (Figure 2-1).

The NAVSTA Newport facility has been in use by the Navy since the era of the Civil War. In 1883 the Naval Training Station was established at Newport. During World Wars I and II, military activities at the facility increased significantly and the base provided housing for many servicemen. In subsequent peacetime years, research and development and training became the major activities on base until Newport became the headquarters of the Commander Cruiser-Destroyer Force, Atlantic in 1962. In 1973 the Shore Establishment Realignment Program resulted in the reorganization of naval forces, the Commander Cruiser-Destroyer Force moved to Norfolk, Virginia, and activity on the base again declined. Since 1973 research and development and training have again become the primary activities at Newport. Major commands currently located at NAVSTA Newport include the Naval Education and Training Center, Surface Warfare Officers School Command, Naval Undersea Warfare Center, and the Naval War College.

Coasters Harbor Island

Coasters Harbor Island is located off the southern end of NAVSTA Newport (Figure 2-1). The island, which has a land area of 92 acres, was acquired by the Town of Newport in 1673. In 1721 a small house was built to quarantine persons arriving by sea to determine if they had small pox. In 1819 the Newport



SITE LOCUS			FIGURE 2-1
NAVAL STATION NEWPORT			
NEWPORT, RHODE ISLAND			
DRAWN BY:	D.W. MACDOUGALL	REV.:	0
CHECKED BY:	B. O'NEILL	DATE:	APRIL 14, 2000
SCALE:	AS NOTED	ACAD NAME:	DWG\5278\0551\SITE_LOC.DWG

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Asylum (poor house) was established on the island. Much of island was farmed or used for orchards to support the asylum in the 1800s. Farming continued on the island until 1892 when the Navy ended farming to use the island for training. In 1891 the island was ceded to the United States government for use in training of sailors. In 1894 the Naval War College was established and the old asylum and adjacent grounds were assigned to the Navy. The build up of training facilities occurred in the southern areas of the island. During the early 1940s the training facilities expanded to cover the northern part of the island. New facilities were recently completed in the central section of the island. Development has not been documented on a few areas located in the southern part of the island.

Old Fire Fighting Training Area /Katy Field

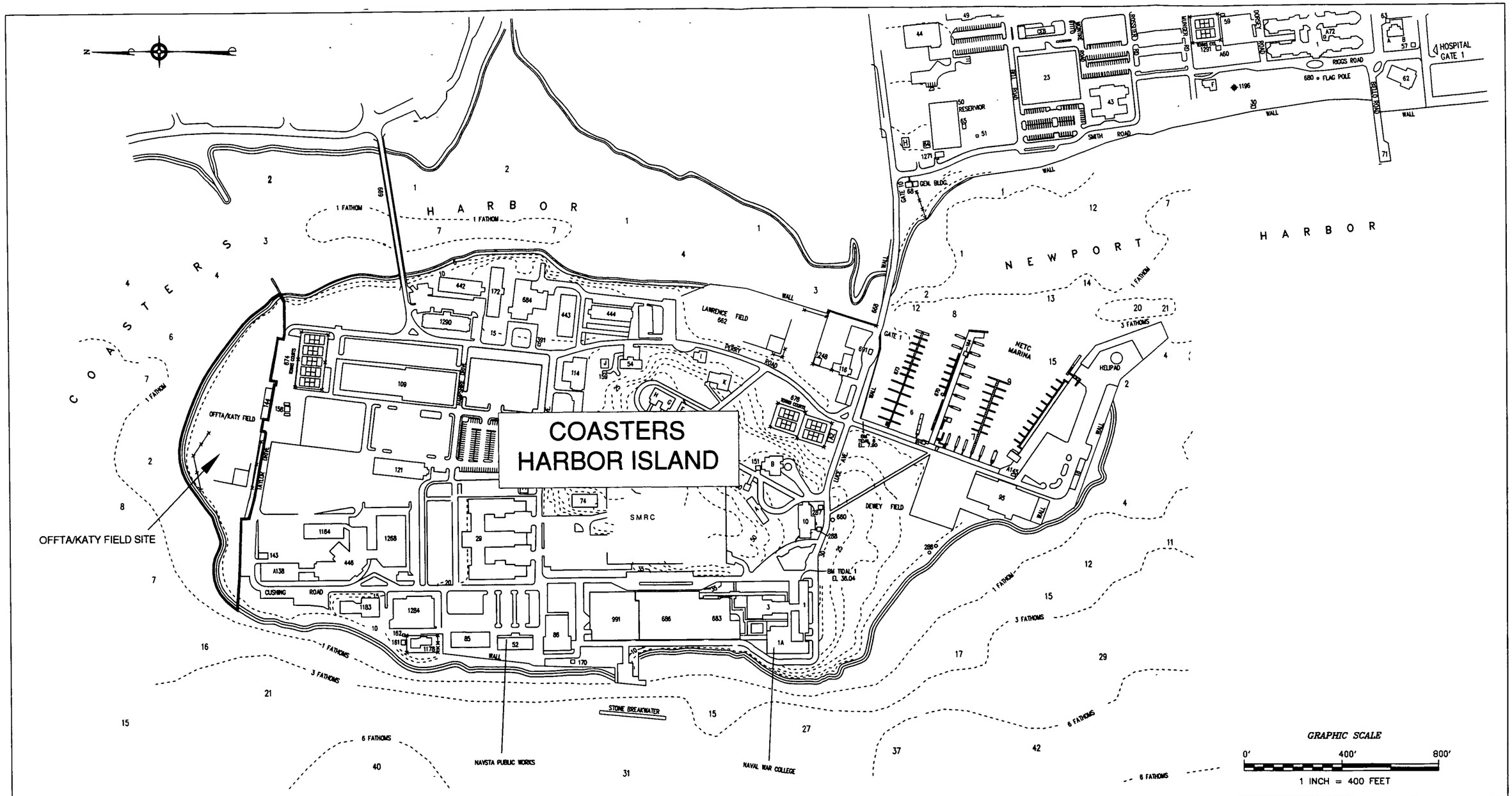
OFFTA/Katy Field is located at the northern end of Coasters Harbor Island (Figure 2-2). The site occupies approximately 5.5 acres and is bordered by Taylor Drive to the south and Narragansett Bay and Coasters Harbor to the west, north, and east.

The site was home to a former Navy fire fighter training facility from World War II until 1972. During the training operations, fuel oils were ignited in various structures at the site that simulated shipboard compartments, then extinguished by sailors. Upon closure in 1972, the training structures were reportedly demolished and buried in two mounds on the site, then the entire area was covered with topsoil. The rest of the site is generally flat, with surface elevations ranging from 8 to 12 feet above Naval Base mean low water (MLW).

In 1976 the site was converted to a recreational area (Katy Field) with a playground, a picnic area with an open pavilion and barbecue grills, and a baseball field. With the exception of the baseball infield, the site is entirely vegetated with grass. A day care center operated out of building 144 on the site from approximately 1983 to 1993. Katy Field was used as a recreational area until its closure in October 1998 due to potential environmental and human health concerns. Access to the area has been restricted since November 1, 1998, when a fence was erected around the field's perimeter.

2.2 SITE CONTAMINATION

The following briefly summarizes the nature of contamination detected in soils at the OFFTA site during investigations conducted to date. The Phase I investigation was conducted by TRC Environmental Corporation (TRC) from April to July 1990, with follow-up surface soil sampling in December 1991. A Phase II investigation was conducted by TRC from October 1993 to January 1994. The Phase III investigation was conducted by TtNUS in November 1998.



NOTES:

BASE MAP FROM PLAN BY DEPT OF NAVY, "COASTERS HARBOR ISLAND AND NAVAL HOSPITAL EXISTING CONDITIONS MAP", DATED: 9/98, NETC DWG NO.: 31058-307, CODE ID NO.: 80091, SCALE: 1"=200'

OFFTA/KATY FIELD LOCATION			FIGURE 2-2
OFFTA BACKGROUND SOIL INVESTIGATION			
NAVAL STATION NEWPORT – NEWPORT, RI			
DRAWN BY:	J.R. PICCUITO	REV:	0
CHECKED BY:	J. FORRELLI	DATE:	APRIL 18, 2000
SCALE:	1" = 400'	FILE NO.:	\DWG\5278\0551\KATY

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A wide range of compounds including VOCs, SVOCs, pesticides, PCBs, and inorganics were detected in OFFTA site soils. The most prevalent organic contaminants present in the site soils were PAHs. Elevated concentrations of PAHs, including carcinogenic PAHs, were detected in subsurface soil samples collected in the northern, western, and eastern portion of the site. Elevated VOC contamination (i.e., > 1 ppm) was detected in subsurface soils at the depth of the ground water table in the central portion of the site and in the north central portion of the site. Pesticides were detected in surface soils across the site at low levels (i.e., 10's of ppb), while PCBs were detected in only one soil sample at a very low concentration.

Numerous metals were detected in surface and subsurface soil samples collected throughout the site. The metals most common to the site surface soils included aluminum, arsenic, barium, calcium, chromium, copper, cobalt, iron, magnesium, manganese, and vanadium. The metals common to each of the subsurface soil samples include aluminum, arsenic, calcium, chromium, cobalt, iron, magnesium, manganese, nickel, potassium, and vanadium. The highest metals concentrations were generally detected in subsurface soils located in the northern portion of the site, although elevated levels were also present in the eastern portion of the site. Samples having the greatest overall metals concentrations were collected at or below the ground water table and were noted to have petroleum staining and odors.

The metals detected in site soils are elements that occur naturally in soil and bedrock, but some of them may also be present, in part, due to past site activities. The purpose of the background soil investigation is to determine the concentrations of metals that are naturally present in area soils so that the contribution of metals contamination from site activities can be evaluated.

3.0 FIELD INVESTIGATION ACTIVITIES

This section presents a description of the field investigation activities that were conducted as part of the background soil investigation for the OFFTA Site. The investigation activities included a reconnaissance survey to evaluate proposed background sampling locations, soil sampling and analysis of 20 background soil locations (plus QA/QC samples), and a global positioning system (GPS) survey of the background sample locations. The background soil sampling investigation was conducted in accordance with the Draft Final Work Plan (TtNUS, 2000). Additional detail concerning the sample locations, collection, and analysis are described in the following sections.

As scoped in the Work Plan, background soil samples having a composition similar to the soils that may have been found at the OFFTA Site prior to fire-fighting training activities were collected from undisturbed locations on Coasters Harbor Island determined to be free of influence from either the site or other non-uniformly distributed anthropogenic sources. Soil samples were collected from one soil type:

the Udorthents-Urban Land Complex. The United States Department of Agriculture (USDA) soil survey map of the area is presented as Figure 3-1.

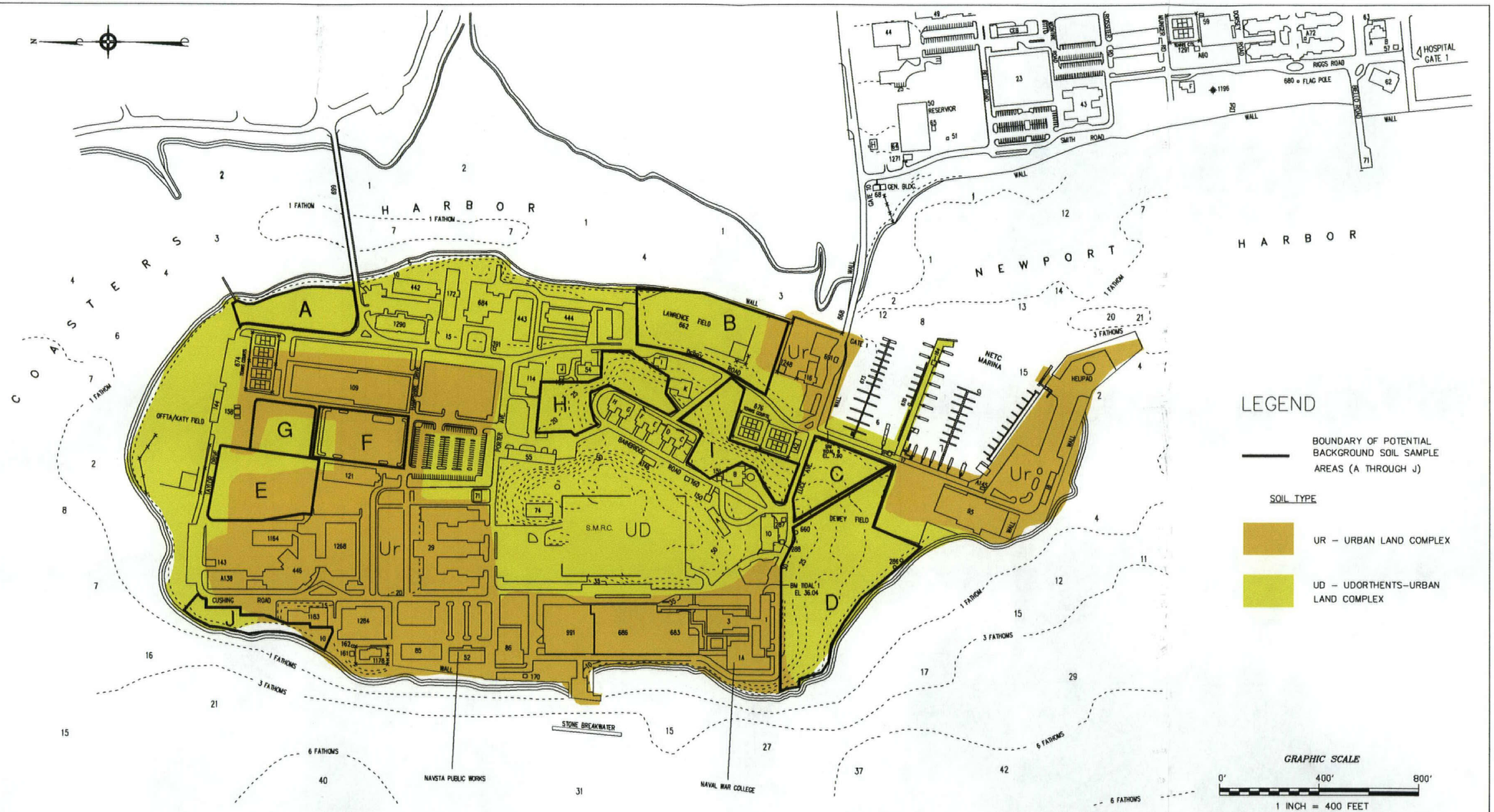
3.1 SAMPLING AREA SELECTION AND DESCRIPTION

Coasters Harbor Island has been the site of Navy activity since the 1880s and most of the island soil areas have been previously disturbed or impacted by imported fill. According to the USDA Soil Survey of Rhode Island, soils on Coasters Harbor Island, including the OFFTA Site, are classified mostly as Udorthents-Urban land complex (UD). Sites for buildings, paved roads, and parking lots are classified as Urban land (Ur). Udorthents-urban land complex areas consist of soils that have been disturbed by cutting and filling, and building and pavement areas (Fig. 3-1).

Ten areas on Coasters Harbor Island were identified as potential background sample locations for the OFFTA background study based on current land use and accessibility. These areas are indicated on Figure 3-1 as Areas A through J. Available historical information, maps, and aerial photographs were reviewed to identify prior land uses and activities at the ten areas to determine whether these areas were appropriate for collection of background soil samples. The historical land use information and background sampling determination are summarized in Table 3-1. Based on the research, two areas, Areas C and D (Dewey Field), were identified as primary sample areas, and two additional areas, Areas H and I (officers' quarters area), were identified as alternate sample areas. Areas C and D are located at the south end of the island, approximately 2,400 feet south of OFFTA, Area H is located approximately 1400 feet south of OFFTA, and Area I is located about 2,000 feet south of OFFTA. These four areas all have soils with the same USDA classification as those at OFFTA: Udorthents-Urban Land Complex.

3.2 SAMPLE LOCATIONS

The historical land use findings were presented to the EPA and RIDEM during a meeting at NAVSTA Newport on December 8, 1999. Sample locations were proposed in Areas C, D, H, and I, based on a 100 foot grid-spacing. After discussion and modification by EPA and RIDEM, sixteen proposed sample locations were selected in Areas C and D and two sample locations were selected in each of Areas H and Area I, for a total of 20 locations. It was agreed that none of the sample locations would be within 100 feet of a roadway and samples would not be collected from the northernmost part of Area H due to its proximity to a greenhouse. It was also agreed that if the statistical evaluation indicates that results for areas H and I samples are statistically different from the results for Areas C and D samples, the samples from Areas C and D would be sufficient for background analysis and no additional sampling would be required.



LEGEND

BOUNDARY OF POTENTIAL BACKGROUND SOIL SAMPLE AREAS (A THROUGH J)

SOIL TYPE

UR – URBAN LAND COMPLEX

UD – UDORTHENTS–URBAN LAND COMPLEX

GRAPHIC SCALE

0' 400' 800'

1 INCH = 400 FEET

NOTES:

SOURCE SOIL TYPES: USDA SOIL SURVEY OF RHODE ISLAND, 1981

BASE MAP FROM PLAN BY DEPT. OF NAVY, "COASTERS HARBOR ISLAND AND NAVAL HOSPITAL EXISTING CONDITIONS MAP", DATED: 9/98, NETC DWG NO.: 31058–307, CODE ID NO.: 80091, SCALE: 1"=200'.

NARRAGANSETT BAY

COASTERS HARBOR ISLAND SOIL TYPES
OFFTA BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT – NEWPORT, RI

DRAWN BY:	J.R. PICCUITO	REV.:	0
CHECKED BY:	D. BAXTER	DATE:	APRIL 18, 2000
SCALE:	1" = 400'	FILE NO.:	\DWG\5278\0551\OFFTA_SOIL

FIGURE 3–1

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TABLE 3-1
COASTERS HARBOR ISLAND HISTORICAL LAND USE SUMMARY
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

AREA*	1891/93	1912	1926	1940/44	1953	1975	1995/ CURRENT	HISTORICAL USE/ACTIVITIES	COMMENTS ON USE AS BACKGROUND LOCATION
A	undeveloped	hospital and contagious ward	area not shown	building occupies area	building occupies area	open area	grass covered open area	hospital site	rejected based on proximity to OFFTA site and former use
B	open water	¼ mile race track	open area	ball fields	ball fields	ball fields	ball fields	created by fill dredged from harbor	rejected based on potential bias introduced by dredged material
C	undeveloped	undeveloped	grass covered open area	grass covered open area	grass covered open area	grass covered open area	grass covered open area	no significant activities documented	selected as proposed background sampling area based on current and past use
D	undeveloped	parade ground area	parade ground area	parade ground area	parade ground area	parade ground area	parade ground area	no other significant activities documented	selected as proposed background sampling area based on current and past use
E	undeveloped	open area (firing range)	area not shown	open area	building occupies area	building occupies area	building site	orchard/agricultural use; firing range	rejected based on proximity of former firing range
F	undeveloped	open area (firing range)	area not shown	building occupies area	building occupies area	open area	parking lot	orchard/agricultural use; firing range	rejected based on proximity of former firing range
G	undeveloped	open area (firing range)	area not shown	building occupies area	building occupies area	open area	grass covered area	orchard/agricultural use; firing range	rejected based on proximity of former firing range
H	orchard	grass covered area (officer's quarters)	grass covered area (officer's quarters)	grass covered area (officer's quarters)	grass covered area (officer's quarters)	grass covered area (officer's quarters)	grass covered area (officer's quarters)	orchard/agricultural use	selected as proposed secondary background sampling area based on current and past use
I	farmer's house site	grass covered area (officer's quarters) tennis courts present	grass covered area (officer's quarters)	grass covered area (officer's quarters)	grass covered area (officer's quarters)	grass covered area (officer's quarters)	grass covered area (officer's quarters)	orchard/agricultural use; nearby tennis courts constructed over former graveyard site	selected as proposed secondary background sampling area based on current and past use
J	target area	pistol firing ranges	area not shown	open area	building occupies area	area not shown	grass covered open area	pistol firing range	rejected based former use

NOTES:

* Areas shown on Figure 2-2

Source: Historical maps and aerial photographs obtained from Naval War College Museum, Coasters Harbor Island

Upon mobilization to mark the final sample locations and conduct the soil sampling, TtNUS determined that, due to the presence of bedrock outcrops and buried utilities and the close proximity of roadways, there were no appropriate sample locations in Area H. As a result, all 20 soil sample locations (OFF-SO-BK01 through OFF-SO-BK20) were located within areas C, D, and I. Seventeen locations were sampled in Areas C and D, at the approximate locations agreed to at the December 8 meeting. Three locations were sampled in Area I. None of the sample locations were within 100 feet of the roadway. Background sample locations are shown on Figure 3-2. As indicated in Figure 3-1, all 20 locations were in areas where the soil type is classified as the Udorthents-Urban Land Complex.

3.3 SAMPLE COLLECTION AND ANALYSIS

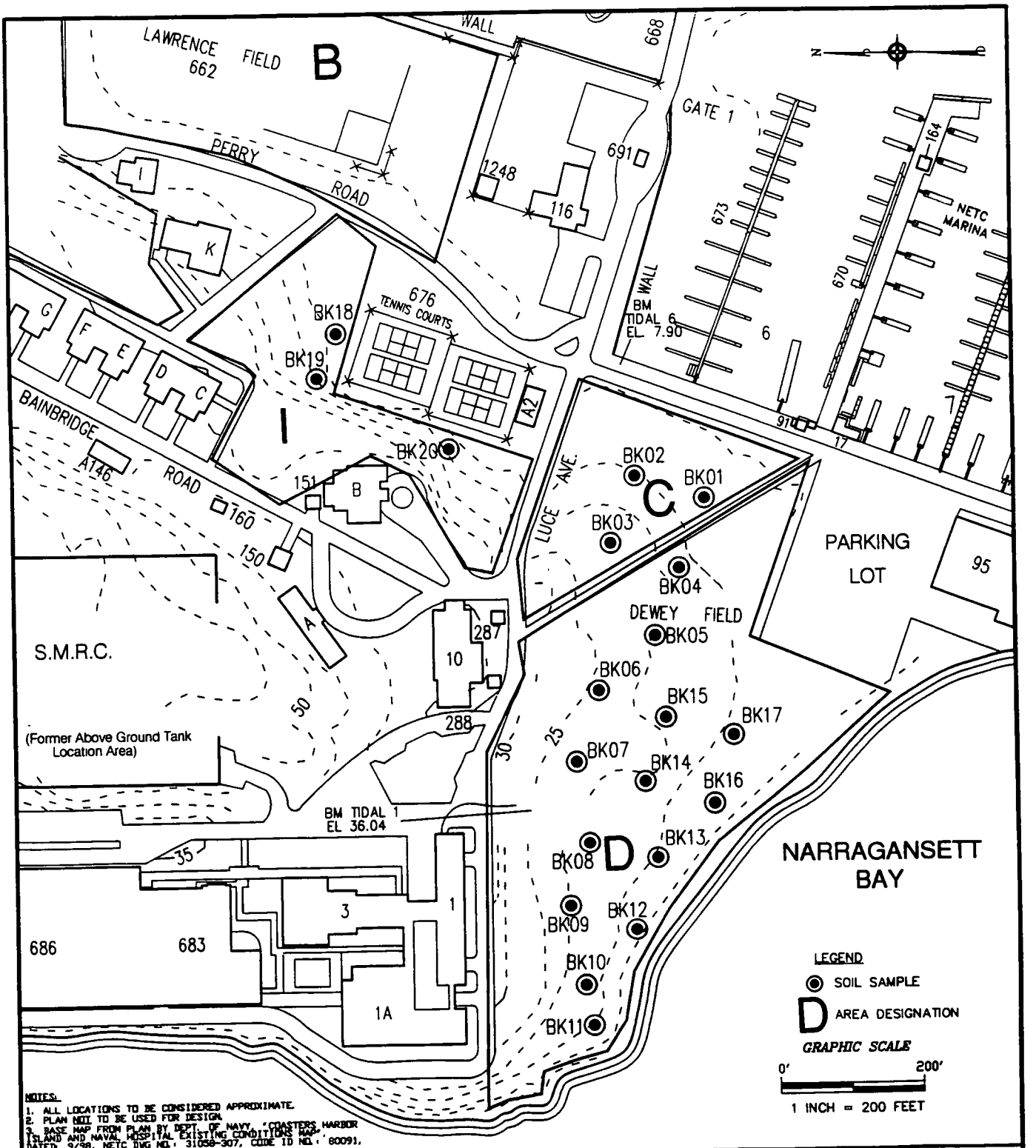
The objective of the sample collection was to obtain both surficial samples and shallow subsurface soil samples to use in establishing background concentrations of metals in the vicinity of the OFFTA Site. Consistent with the approved Draft Work Plan, two soil samples were collected from each of the 20 sample location points: a surface sample (from zero to two feet below ground surface (bgs)) and a subsurface sample (usually from four to six feet bgs). Where shallow refusals were met, multiple attempts were made to attempt to reach the target depth unless evidence of the top of bedrock was noted. Where refusal was encountered shallower than 6 feet bgs, the deep soil sample was generally collected from 4 feet to the refusal depth. Deep samples were not collected at three locations where refusal was encountered at less than 4 feet bgs. Table 3-2 presents a sampling summary including sample locations, a brief soil description/log for each location, sample depths, and any comments.

Consistent with the Work Plan, prior to collecting the soil samples, the grass and root mat and approximately the top 2 inches of soil was removed from the sample location to limit the effects of potential pollutant sources such as automobile emissions, road runoff, or other common anthropogenic sources of soil contamination. Soil samples were collected using a Geoprobe ™ direct push drill rig that advanced a decontaminated stainless steel sampler with a new acetate liner per sample to the target depths at each location. The soil samples were logged and sampled by TtNUS geologists after cutting open each sample liner. Each sample was homogenized using a clean disposable trowel and plastic bag then transferred to the appropriate sample containers. The only non-disposable sampling equipment that may have contacted the sample medium was the stainless steel sample core tube that was decontaminated to prevent cross-contamination between sampling points. Field data were recorded on boring logs and in the field logbook. Appropriate chain-of-custody and sample handling and shipping procedures was adhered to, as detailed in the Work Plan.

TtNUS staff surveyed all soil-sampling locations with GPS survey equipment (to sub-meter accuracy). The surveyed background soil sample locations are presented on Figure 3-2.

TABLE 3-2
SOIL SAMPLE SUMMARY
OFFTA BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

LOCATION	AREA	SOIL DESCRIPTION	SAMPLE INTERVALS (Depth in feet bgs)	COMMENTS
BK01	Area C	0-4' - Sand, 4'-6' - Till	0 to 2 and 4 to 6	Duplicate Sample (DUP01 - 4' to 6')
BK02	Area C	0-3.5' - Sand, 3.5'-5.3'(Refusal) - Till	0 to 2 and 4 to 5.3	
BK03	Area C	0-4' - Sand, 4'-4.5' - Till, 4.5' - Bedrock	0 to 2 and 4 to 4.5	Bedrock not Sampled
BK04	Area D	0-3' - Sand, 3-5' - Till, 5' - Bedrock	0 to 2 and 4 to 5	Bedrock not Sampled
BK05	Area D	0-3' - Sand, 3'-6'- Till	0 to 2 and 4 to 6	
BK06	Area D	0-3.5' - Sand, 3.5'-5.7' - Till, 5.7' - Bedock	0 to 2 and 4 to 5.7	Duplicate Sample (DUP02 - 4' to 5.7')
BK07	Area D	0-4' - Sand, 4'-6' - Till	0 to 2 and 4 to 6	
BK08	Area D	0-3.8' - Sand, 3.8'-6' - Till	0 to 2 and 4 to 6	
BK09	Area D	0-3.5' - Sand, 3.5'-6' - Till	0 to 2 and 4 to 6	
BK10	Area D	0-3' - Sand, 3'-3.8' - Till (Refusal - 3.8')	0 to 2	2-3' interval not sampled due to gravel
BK11	Area D	0-3' - Sand, 3'-6' - Till	0 to 2 and 4 to 6	
BK12	Area D	0-3.5' - Sand, 3.5'-6' - Till	0 to 2 and 4 to 6	
BK13	Area D	0-6' - Sand	0 to 2 and 4 to 6	
BK14	Area D	0-3' - Sand, 3'-6' - Till	0 to 2 and 4 to 6	
BK15	Area D	0-3' - Sand, 3'-6' - Till	0 to 2 and 4 to 6	Duplicate Sample (DUP03 - 4' to 6')
BK16	Area D	0-3' - Sand, 3'-6' - Till	0 to 2 and 4 to 6	
BK17	Area D	0-2' - Sand, 2'-3' - Till (Refusal - 3')	0 to 2 and 2 to 3	
BK18	Area I	0-4' - Sand, 4'-6' - Till	0 to 2 and 4 to 6	
BK19	Area I	0-4' - Sand, 4'-6' - Till	0 to 2	Saturated at 3', not sampled
BK20	Area I	0-2' - Sand, 2'-3' - Till, 3'-3.5' - Bedrock (Refusal - 3.5')	0 to 2	Duplicate Sample (DUP04 - 0' to 2')



SAMPLE LOCATIONS		FIGURE 3-2
OFFTA BACKGROUND SOIL INVESTIGATION		
NAVAL STATION NEWPORT – NEWPORT, RI		
DRAWN BY: D.W. MACDOUGALL	REV.: 0	
CHECKED BY: T. DORGAN	DATE: APRIL 14, 2000	
SCALE: 1" = 200'	ACAD NAME: DWG\5278\0551\SAMPLOC.DWG	

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Forty-six samples were collected (including QA/QC samples):

- 24 surficial soil samples from the zero to 2 foot depth interval (including four field duplicates)
- 20 subsurface soil samples from between 2 foot and 6 feet below ground surface, depending on refusal or depth to the water table (including three field duplicates)
- 1 aqueous equipment rinsate blank
- 1 aqueous source water blank

All soil samples were analyzed for EPA Target Analyte List (TAL) metals. A Rhode Island certified and Navy approved analytical laboratory subcontractor, Ceimic Corporation, performed the laboratory analysis. Standard EPA analytical procedures were employed, in accordance with the Work Plan. Laboratory data validation (Tier III) activities were then performed by a TtNUS chemist to ensure data quality and data validation memoranda were prepared. The analytical data and data validation memoranda are presented in Appendix A.

4.0 DATA ANALYSIS AND STATISTICAL TESTING

Following the completion of the background soil sample analyses and analytical data review, data analysis and statistical testing were performed. The background data for metals underwent an exploratory evaluation that consisted of several statistical comparisons that determined whether data from different sampled areas and depth categories are appropriately treated separately or combined into final background data set(s). All statistical tests were performed in accordance with the guidance and recommendations presented in several EPA and related publications (EPA, 1989a, 1989b, 1992b, 1992c, and 1996d; US Navy, 1999; Gilbert, 1987 and 1993) cited at the end of this report. The following tasks were performed:

Step 1: Background data sets were evaluated to determine if shallow surface soil data (defined as composite samples collected from less than or equal to 2 feet depth) are suitable for combination with deeper subsurface soil data (defined as composite samples from depths including points below 2 feet).

For Areas C and D soil, there were 16 subsurface soil samples (plus three duplicates) collected and 17 surface soil samples. Appendix B, Table B-1 presents W-Test results evaluating the distributional shape for metals in Areas C and D surface soil data. For surface soil, all but five metals passed the statistical tests for accepting the hypothesis of a lognormal distribution. Ten metals exhibited a better fit to a lognormal rather than a normal distribution, while aluminum, arsenic, beryllium, and vanadium passed the test for either type of distribution but had a slightly better fit when compared to a normal distribution.

Appendix B, Table B-2 presents distributional tests for subsurface soil. Five metals exhibited an acceptable best match to the lognormal distribution, while eight metals passed the test for either type of distribution but had a slightly better fit when compared to a normal distribution. One metal (silver) exhibited an acceptable match only to the normal distribution and four metals did not match either type of distribution.

Several quantitative statistical comparisons were performed to determine if either data set exhibits metals concentrations that are statistically greater than metals levels in the other data set. These tests are designed to identify any across-the-board differences in the overall or average concentration of a metal between the two populations and also any differences in subsets comprised of the highest ranking concentrations in one data set that happen to be statistically greater than the corresponding upper concentration rank subsets from the other data set. For Areas C and D, the subsurface soil data set was compared to the surface soil data set using the following tests:

- Student's t-test (difference in means for normal/lognormal data with equal variances)
- Satterthwaite t-test (difference in mean for normal/lognormal data with unequal variances)
- Bartlett's test (determines if background data subsets have equal variances)
- Mann-Whitney test (if rank distribution is similar given detection limits that are uniform)
- Gehan's test (if rank distribution is similar given that multiple detection limits exist)
- Quantile test (if rank distribution is similar for the upper concentrations subset of background)
- The test of proportions (if frequency of detection is similar given sufficient data points)
- Fisher's exact test (if frequency of detection is similar in the case of few data points)

- Within Areas C and D, a total of 13 metals exhibited concentrations that were greater in subsurface soil than in surface soil. An across-the-board trend of higher overall sample concentrations throughout most of the subsurface soil data set was seen for 13 metals (aluminum, arsenic, chromium, cobalt, copper, iron, magnesium, manganese, nickel, potassium, silver, vanadium, and zinc) based on either a test of means (t-test), a test comparing the overall ranks of the two data sets (Mann-Whitney or Gehan Test), or the Upper Ranks Test (also known as the Quantile Test) as shown in Table B-3. For 12 metals, the Upper Ranks Test indicated that at least two-thirds of all samples exhibited a pattern of elevated subsurface soil concentrations.

- Within Areas C and D, a total of four metals exhibited concentrations that were greater in surface soil than in subsurface soil. An across-the-board trend of higher overall sample concentrations throughout most of the surface soil data set was seen for four metals (antimony, barium, lead, and mercury) based on either a test of means (t-test), at test comparing the overall ranks of the two data sets (Mann-Whitney or Gehan Test), or the Upper Ranks Test (also known as the Quantile Test) as

shown in Table B-4. For barium, lead, and mercury, the Upper Ranks Test indicated that at least two-thirds of all samples exhibited a pattern of elevated surface soil concentrations.

- In conclusion, significant differences were found between the surface soil and subsurface soil data sets from Areas C and D, with 13 metals revealing higher concentrations in subsurface soil and 4 metals displaying greater levels in surface soil. Out of 19 metals, only two were not significantly different between surface and subsurface soil. Because the concentrations of many of the primary metallic constituents were different for soil samples collected at different depths, surface soil and subsurface soil data sets could not be combined together.

Step 2: After it was determined that surface soil and subsurface soil data sets should remain segregated within Areas C and D, these two soil data sets were then compared independently to the corresponding surface and subsurface soil data sets from Area I. The quantitative statistical tests were applied as listed for step 1. One additional test, the Upper Tolerance Limit (UTL) test, was also used to compare subsurface soil data sets because only one subsurface sample was collected in Area I and this test is applicable under these circumstances. The combination of tests was designed to identify any across-the-board differences in the overall or average concentration of a metal between the two populations and also any differences in subsets comprised of the highest ranking concentrations in one data set that happen to be statistically greater than the corresponding upper concentration rank subsets from the other data set.

- Because only one subsurface soil sample was collected within Area I, the UTL test was the only test that was applied. As shown in Table B-5, barium and cobalt exhibited subsurface soil concentrations within Area I that exceeded the 95 % UTL for Areas C and D. Therefore, it was determine that these two data sets are significantly different and Area I data were not considered for inclusion in the background subsurface soil data set.

- There were 17 surface soil samples (plus three duplicates) collected from Areas C and D and three surface soil samples from Area I. As shown in Table B-6, for surface soil, a total of four metals exhibited concentrations that were greater in Area I than in Areas C and D. An across-the-board trend of higher overall sample concentrations throughout most of the Area I surface soil data set was seen for four metals (aluminum, beryllium, manganese, and vanadium) based on either a test of means (t-test), a test comparing the overall ranks of the two data sets (Mann-Whitney or Gehan Test), or the Upper Ranks Test (also known as the Quantile Test).

- As shown in Table B-7, for surface soil, no metals exhibited concentrations that were greater in Areas C and D relative to Area I. The quantitative statistical tests described in step 1 were utilized;

however, the statistical power of several of these tests were limited by the sample size of three data points in the Area I data set.

- In conclusion, significant differences were found between the Areas C and D data sets versus the Area I data set for surface soil, with four metals revealing statistically higher concentrations in Area I. Therefore, it was determined that these two data sets are significantly different and Area I data were not considered appropriate for inclusion in the background surface soil data set.

  The differences between the Area I data set and the Area C/D data set are likely attributable to the small sample size of the Area I data set and not a difference in soil type. Because only three samples were included in the Area I data set, a high degree of variance is expected within this small data set and the representativeness of sampling is hard to guarantee with this small sample size. Therefore, there is a possibility of false positive errors in statistically evaluating the differences between these two data sets. The apparently higher Area I metals concentrations relative to Areas C and D could be a consequence of greater sampling bias within the small Area I data set. As a result, differences in Area I versus Areas C and D metals concentrations are not confidently attributable to different soil types.

Step 3: Once the appropriate surface soil and subsurface soil data sets were identified for use in the background soil investigation, the following statistics were estimated to describe the final background data sets:

- Two types of descriptive statistics were tabulated: Appendix B, Tables B-8 and B-9 present the minimum, maximum, and mean for metals in the surface and subsurface soil data sets, respectively. Appendix B, Tables B-10 and B-11 present the metals concentrations at the 25^{th}, 50^{th}, 75^{th}, and 95^{th} quantiles.

- 95 percent UTLs were calculated for use as background values for the OFFTA site. Appendix B, Tables B-12 and B-13 present the calculated UTL values. The 95 percent UTL is defined as a tolerance limit expected to contain 95 percent of all possible measurements for the background data set. Pertinent parameters such as log mean, log standard deviation, t-value, etc. that were applied to the UTL calculations for surface soil and subsurface soil, respectively are also presented. The UTLs for most metals were based on an assumption of a lognormal background population.

- UTLs were not calculated for several metals because of poor fit to normal or lognormal distributions (a UTL can not be calculated for a data set that is not normally or lognormally distributed). As an approximation, the maximum detected value is recommended for use in lieu of a UTL for these

metals; however, this value may not have the same confidence and may be somewhat less conservative than the UTL. For the metals without UTLs in Table B-12 (antimony, cadmium, potassium, and zinc), 17 sampling points comprised each data set. For the metals without UTLs in Table B-13 (antimony, beryllium, potassium, and zinc), 16 sampling points comprised each data set. For these metals, the observed maximum values represent a reasonable approximation to the upper 95th percentile of the population. This is because the largest data point out of a set of 16 or 17 points represents in the neighborhood of 6 percent of the sampling set, which is only slightly more than the top 5 percent of the sampled data set (for the 95 percent UTL). A more accurate approximation to the 95 percent UTL cannot be made for these metals because these data sets did not fit a normal or lognormal distributional shape.

- One high concentration data point for arsenic in subsurface soil was suspected to be an anomaly because this value was associated with an average of two disparate results (84.9 mg/kg and 21.7 mg/kg) from a field duplicate pair (samples OFF-SO-BK01-0406 and OFF-SO-DUP01). It was suspected that the UTL might be biased by this data point (the averaged duplicate pair). Outlier tests were evaluated for arsenic in subsurface soil following the procedures for Dixon's Test and the test for discordance (EPA, 1996; Navy, 1999) to determine whether the suspect data point was a statistical outlier. However, to be considered statistically valid, these outlier tests require that the data set –minus the suspected outlier– have a normal or lognormal distribution. As shown in Table B-14, the arsenic data set did not match either type of distribution after removal of the candidate outlier; therefore, it could not be determined whether this data point was an outlier and the original UTL was retained.

  The aforementioned arsenic outlier test for the subsurface soil data was performed using the average of the duplicate values –not the higher (84.9 mg/kg) duplicate value by itself– because there are no established criteria for rejecting a data point based on the relative percent difference of the duplicate values. However, at the request of the regulatory agencies, the effect of removal of the single 84.0 mg/kg data point was evaluated. The evaluation concluded that if the 84.9 mg/kg arsenic data point was removed and the arsenic level in the other half of the duplicate pair (21.7 mg/kg) was retained, then a revised UTL could be calculated for arsenic in subsurface soil as 33.6 mg/kg. This UTL value would not be justifiable statistically and is only slightly lower than the proposed UTL of 42.8 mg/kg, which is based on all data points in subsurface soil. The effect of outlier removal is not dramatic because the revised data set still includes a maximum arsenic value of 35.5 mg/kg and still presumes a lognormal population, which forces the data to be modeled assuming a skewed distribution with some values well above the mean concentration.

- One high concentration data point for lead in surface soil was suspected to be an outlier because its concentration was approximately 16 times higher than the next highest observed concentration. Outlier tests were evaluated following the procedures for Dixon's Test and the test for discordance to determine whether the suspect data point was a statistical outlier. As shown on Table B-15, a normal distribution of lead in surface soil resulted after removal of the suspect data point, which indicates that the outlier tests are statistically valid for the data set. The two outlier tests were then run to determine whether the data point was an outlier. The outlier tests for lead both indicated that the suspect data point is an outlier (the data point is not associated with a sample population statistically equivalent to the remaining data points, based on a 5 percent level of significance, i.e., there is less than a 5 percent chance that this data point is from a statistically equivalent population). The outlier tests for lead are presented in Table B-16. The UTL for lead in surface soil was calculated from the lead data set remaining after removal of the outlier.

- For antimony in surface soil and beryllium in subsurface soil, UTLs were not presented in Tables B-12 and B-13 because data sets did not fit a normal or lognormal shape. For these metals, outlier tests were investigated to determine whether an outlier was present that, when removed, would result in a normal or lognormal distributional shape and therefore enable calculation of a UTL. However, neither antimony nor beryllium matched a lognormal or normal distributional shape after removal of the highest data point, as shown in Tables B-17 and B-18, respectively. Therefore, outlier status could not be determined and a UTL could not be calculated. In addition, data for cadmium in surface soil and antimony in subsurface soil did not fit a normal or lognormal distribution. However, in the latter two cases the highest concentration data point was the only positive detection in the data set, so outlier removal could not be considered.

- One high concentration data point for manganese in subsurface soil was suspected to be an outlier because its concentration was approximately twice as large as the next highest observed concentration. Outlier tests were evaluated following the procedures for Dixon's Test and the test for discordance to determine whether the suspect data point was a statistical outlier. As shown on Table B-19, a normal distribution of manganese in subsurface soil resulted after removal of the suspect data point, which indicates that the outlier tests are statistically valid for the data set. The two outlier tests were then run to determine whether the data point was an outlier. The outlier tests for manganese both indicated that the suspect data point is an outlier (the data point is not associated with a sample population statistically equivalent to the remaining data points, based on a 5 percent level of significance, i.e., there is less than a 5 percent chance that this data point is from a statistically equivalent population). The outlier tests for manganese are presented in Table B-20. The UTL for manganese in subsurface soil was calculated from the manganese data set remaining after removal of the outlier.

As stated previously, the 95 percent UTL is defined as a tolerance limit expected to contain 95 percent of all possible measurements for the background data set. If a single sample collected from a site-related area yields a concentration greater than the 95 percent background UTL, then there is less than a 5 percent chance that this sample came from a population equivalent to the background data, and it is correct to conclude that site-related data are elevated above background. However, using the UTL test simultaneously on several site-related samples can lead to a false conclusion that the site data are elevated above background. For example, if the site population is really identical to the background population, then collecting 100 site-related samples would yield, on the average, 5 samples having concentrations exceeding the 95 percent background UTL.

As a result of this bias, the UTL test is not generally valid as a stand-alone background test to judge whether any remedial action is needed at a site. Statistical guidance (US Navy, 1999) acknowledges that the UTL test can produce an unacceptably high false positive rate in cases where the site population is really no different from the background population. Therefore, UTL exceedences should be confirmed by additional statistical tests in which the false positive rate is controlled to less than a 5 percent error rate. In particular, an "elevated" concentration for a metal should be indicated only if there is found to be either an overall difference between the entire populations of site and background sample results (the t-test, the Mann-Whitney test, or Gehan's Test); if hot spots are found on the site (the upper ranks test); or if no other tests are conclusive, an elevated frequency of detection in site versus background (the test of proportions or Fisher's Exact Test).

It should also be noted that the 95 percent UTL is an estimated quantity based on a limited number of samples which approximates the true 95^{th} percentile of the population's metal concentration. The UTL is therefore said to have a statistical coverage of 50 percent because such an estimated value is expected to be biased high one-half of the time or biased low one-half of the time, relative to the population's true 95^{th} percentile.

Appendix B, Tables B-21 and B-22 present a complete data list of all results for Areas C and D, with the analytical results for each element arranged in order of increasing concentration for surface and subsurface soil, respectively. Appendix B, Tables B-23 and B-24 present a complete data list of all results for Area I, with the analytical results for each element arranged in order of increasing concentration for surface and subsurface soil, respectively. (Note that Area I results were not used in the computation of final UTLs for OFFTA background soil.)

5.0 SUMMARY AND CONCLUSIONS

5.1 SUMMARY

To establish background levels for metals in soils at the OFFTA site, soil samples were collected from areas at the south end of Coasters Harbor Island determined to be unaffected by the site or by other non-uniformly distributed anthropogenic sources. Surface (0 – 2 ft. bgs) and subsurface (generally 4 – 6 ft. bgs) soil samples were collected from approximately 20 locations and analyzed for TAL metals by EPA approved analytical procedures. The areas selected for background sampling all had the same USDA soil classification as those at the OFFTA site (Udorthents-Urban Land Complex).

Analytical data were reviewed by standard data validation procedures to ensure data quality. Data analysis and statistical testing were then performed to determine appropriate background metals values for the site. The background data for metals underwent an exploratory evaluation that consisted of several statistical comparisons that determined whether data from different sampled areas and depth categories should be treated separately or combined. Once the appropriate background data sets were defined, additional statistical methods were used to determine the recommended background values.

5.2 CONCLUSIONS

Evaluation of the surface soil and subsurface soil data sets for Areas C and D (Dewey Field) (where the majority of samples were collected) determined that the surface and subsurface data could not be combined together because the overall mineral composition was very dissimilar for soil samples collected at different depths. Additionally, it was determined that the data sets from Areas C and D are significantly different from the data for Area I; therefore, the Area I data are not appropriate for inclusion in the background surface or subsurface soil data sets.

Once the appropriate background surface soil and subsurface soil data sets were identified, the final statistics were performed to determine recommended background values. It was determined that for most metals in both soil strata, the 95 percent UTL should be selected as the background value. UTLs were not calculated for several metals because of poor fit to normal or lognormal distributions. In place of a UTL for these metals, the maximum detected value is recommended for use as the background value. The observed maximum values for these metals represent a reasonable approximation to the upper 95th percentile of the population because the maximum value (in these 16 or 17 point data sets) represents in the neighborhood of 6 percent of the sampling set, which is only slightly more than the top 5 percent of the sampled data set represented by the 95 percent UTL. Table 5-1 presents the recommended background metals values for OFFTA surface and subsurface soils and presents the

TABLE 5-1
RECOMMENDED BACKGROUND VALUES[1]
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

SUBSTANCE	SURFACE SOIL	SUBSURFACE SOIL	RIDEM CRITERIA[2]
Aluminum	11900	15800	--
Antimony	** (0.67)	** (.42)	10
Arsenic	5.55	42.8	1.7
Barium	38.5	21.3	5500
Beryllium	0.439	** (1.1)	0.4
Cadmium	** (0.7)	ND	39
Calcium	1220	1080	--
Chromium	20.2	24.1	1400
Cobalt	9.01	20.3	--
Copper	23.8	30.9	3100
Iron	23200	46400	--
Lead	48.8	15.4	150
Magnesium	2240	5310	--
Manganese	372	563	390
Mercury	0.189	ND	23
Nickel	17.4	34.5	1000
Potassium	** (312)	** (539)	--
Silver	ND	12.7	200
Vanadium	22.6	26	550
Zinc	** (225)	** (175)	6000

Units are mg/kg.

1 - Recommended background values are the calculated 95% UTLs for each compound unless otherwise noted. See Appendix B, Tables B-12 and B-13 for parameters used in UTL calculations.

2 - State of Rhode Island Direct Exposure Criteria for Residential Soils. Source: RIDEM Remediation Regulations, DEM-DSR-01-93, March 31, 1993

** - UTL could not be determined for this analyte because the distribution did not match normal or lognormal distributional shape.

(value) - Value in parenthesis is the maximum detected concentration. As an approximation, the maximum detected value could be used in lieu of a UTL for these metals; however, this value may not have the same confidence or may be less conservative than the UTL.

ND - Analyte was not detected in samples from this depth range. No background value is recommended.

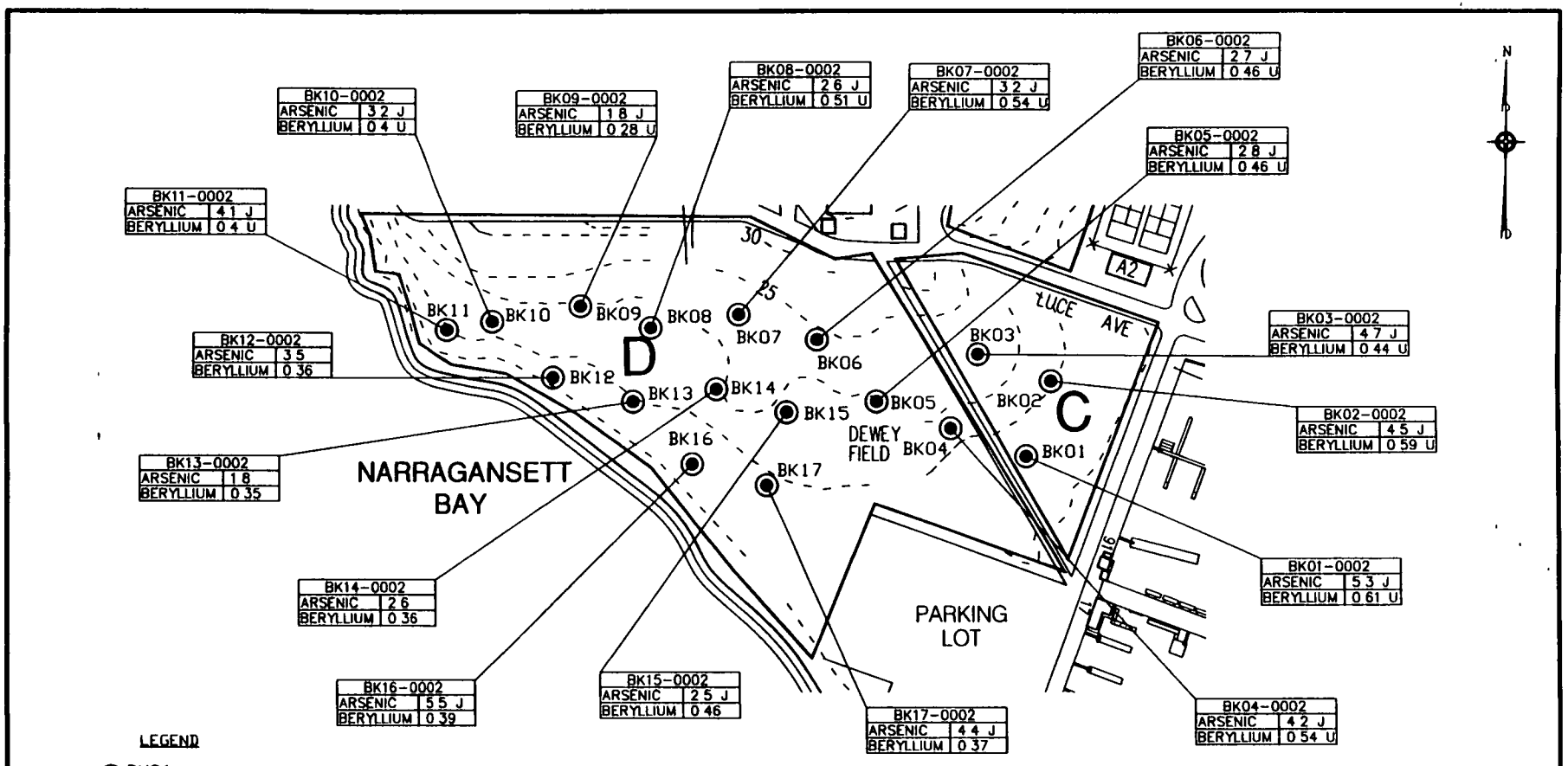
RIDEM Residential Soil Direct Exposure Criteria for comparison. Appendix B, Tables B-12 and B-13 present additional details of the UTL calculations, including the pertinent parameters used to determine the UTLs.

The calculated background values for 2 metals in surface soil (arsenic and beryllium) and 3 metals in subsurface soil (arsenic, beryllium, and manganese) exceed the RIDEM Direct Exposure Criteria. Concentrations of these substances at the surface and subsurface soil sample locations are shown on Figures 5-1 and 5-2. In general, background metals concentrations are higher in the subsurface soils than in the surface soils. The elevated metals concentrations in the Coasters Harbor Island soils are believed to be attributable to the composition of the local and regional bedrock formations and the shallow depth of bedrock and glacial till in the area.

Soil is produced by the combination of physical and chemical processes acting upon the geologic materials present (the parent materials). The parent material determines the mineralogical and chemical composition of the soil. The parent materials for the soils in the OFFTA study area consist of glacial till and regional and local bedrock. Till is a glacial deposit derived from the local and/or regional bedrock. Till consists of a poorly sorted mixture of sediment ranging from clay sized particles to cobbles and boulders, which were directly deposited by glaciers without being reworked by meltwater. The sediment load that formed the till unit consists of bedrock fragments from formations over which the glacial ice had already passed, which in this case is north-northeast of Coasters Harbor Island. The particles entrained within glacial ice and deposited as till may have traveled distances ranging from hundreds of miles to relatively short distances from local formations. Over time, the till deposited by the glaciers is degraded into soil; at locations where the till is not present or the thickness is slight, the bedrock is more directly degraded into soil.

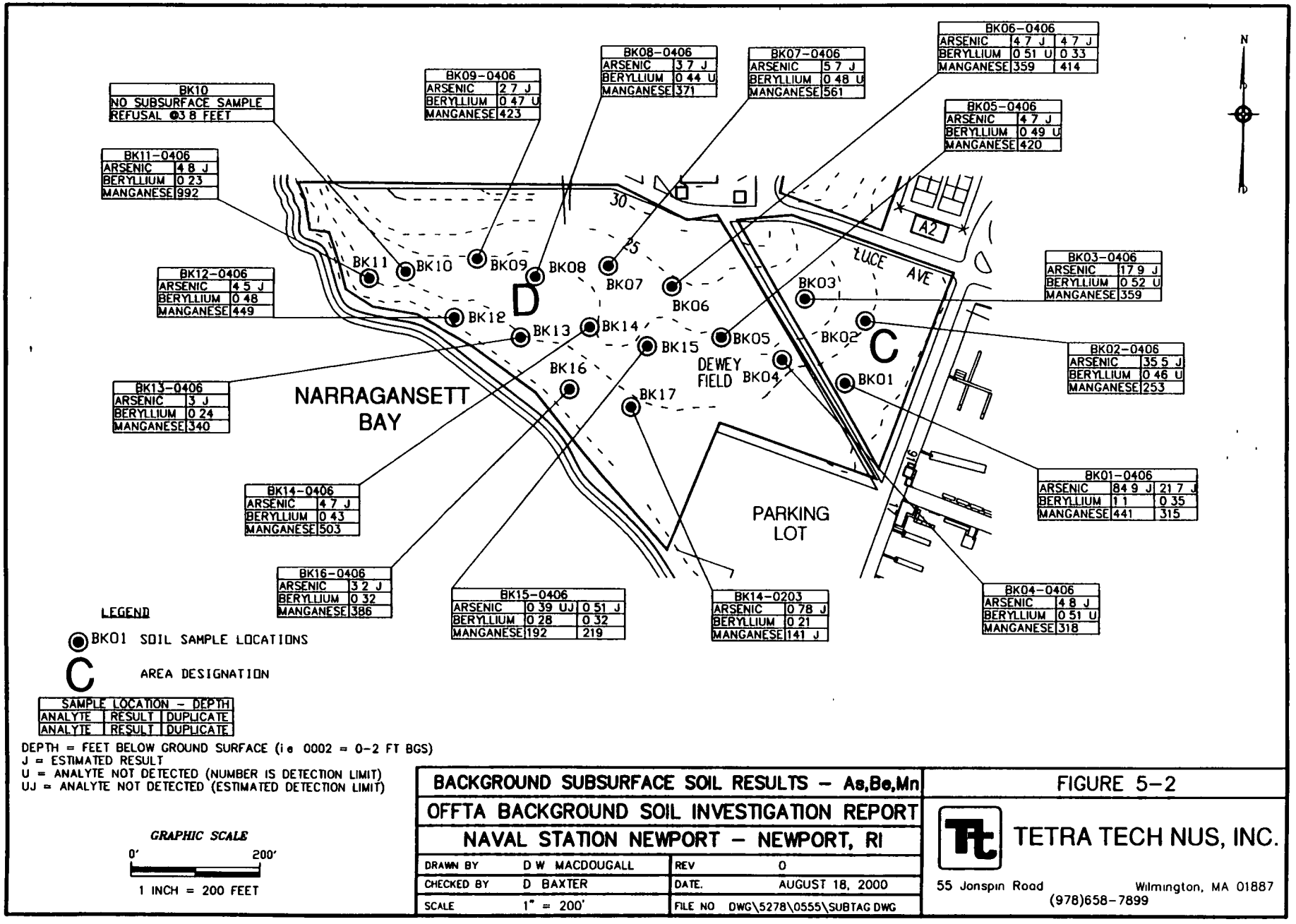
The Navy has not conducted an intensive investigation of area bedrock, therefore the exact composition of the bedrock matrix on Coasters Harbor Island and beneath the OFFTA site is not known. The limited information available indicates that the bedrock in the area generally consists of grey to black, highly weathered to competent carboniferous shale or phyllite. However a highly competent conglomerate, with large cobbles interbedded with sandstone and graywacke was observed at OFFTA. In addition the bedrock in the area (Rhode Island Formation) has been observed to contain beds of meta-anthracite and anthracite that may be associated with elevated concentrations of arsenic and beryllium. Arsenic and beryllium are trace constituents of anthracite and other coal and petroleum-related minerals.

Based on bedrock observations made throughout the NAVSTA Newport area north of Coasters Harbor Island it appears that the rock is a similar type (clastic metasedimentary rock type containing carbonate and sulfide minerals) to the bedrock that has been associated with elevated arsenic concentrations in groundwater in various locations throughout New England. (See Ayotte et al, 1999 for a discussion of the



BACKGROUND SURFACE SOIL RESULTS – As, Be		FIGURE 5-1
OFFTA BACKGROUND SOIL INVESTIGATION REPORT		
NAVAL STATION NEWPORT – NEWPORT, RI		
DRAWN BY D W MACDOUGALL	REV 0	
CHECKED BY D BAXTER	DATE AUGUST 22, 2000	
SCALE 1" = 200'	FILE NO: DWG\5278\0555\SURFTAG DWG	

TETRA TECH NUS, INC.
55 Jonspin Road Wilmington, MA 01887
(978)658-7899



BACKGROUND SUBSURFACE SOIL RESULTS – As,Be,Mn			FIGURE 5-2
OFFTA BACKGROUND SOIL INVESTIGATION REPORT			
NAVAL STATION NEWPORT – NEWPORT, RI			
DRAWN BY	D W MACDOUGALL	REV	0
CHECKED BY	D BAXTER	DATE.	AUGUST 18, 2000
SCALE	1" = 200'	FILE NO	DWG\5278\0555\SUBTAG DWG

TETRA TECH NUS, INC.
55 Jonspin Road Wilmington, MA 01887
(978)658-7899

relationship between elevated arsenic concentrations in groundwater and bedrock lithogeochemistry.) If this rock type does contribute high levels of arsenic to groundwater it is likely that soils generated from degradation of this material would also be anomalously high in arsenic and potentially other constituents, such as beryllium, related to the high carbon content (i.e. graphite, anthracite coal).

The calculated arsenic background (UTL) value for subsurface soil (42.8 mg/kg) is considerably higher than both the calculated surface soil background value (5.55 mg/kg) and the RIDEM soil criteria for arsenic (1.7 mg/kg). From a review of analytical data, it was suspected that the high UTL value may be driven by one elevated sample result (84.9 mg/kg) in the duplicate sample for location BK-01 Statistical outlier tests recommended by Navy and EPA guidance (Navy, 1999 and EPA, 1996) were investigated to determine whether the data point (the averaged values from the duplicate pair) was a statistical outlier that could be removed from the data set. However, because the arsenic data set did not match a lognormal or normal distributional shape after removal of the suspect data, it could not be determined whether the suspect data point was an outlier and the revised data set could not be used to calculate a new UTL. Therefore, the original UTL was retained.

The high suspect result within the duplicate pair (84.9 mg/kg) was not removed by itself because there are no established criteria for rejecting a data point based on the relative percent difference of the duplicate values. However, at the request of the regulatory agencies, removal of the 84.9 mg/kg value was investigated. Removal of this data point and recalculation of the UTL from the revised data set would result in a UTL of 33.6 mg/kg. This UTL value is only slightly lower than the recommended UTL of 42.8 mg/kg, which was calculated using the complete data set. The effect of the removal of this point is not dramatic because the revised data set still includes a maximum arsenic value of 35.5 mg/kg and still presumes a lognormal population, which forces the data to be modeled assuming a skewed distribution with some values well above the mean concentration. This lower UTL is not recommended because removal of the high data point is not statistically defensible.

Although it can not be conclusively determined based on statistical tests that the calculated arsenic UTL for subsurface soils is truly representative of the background subsurface soils on Coasters Harbor Island, various information supports the validity of the calculated value.

A review of historical information, maps, and aerial photographs of the island concluded that the area where the suspect sample was collected (Area C) has remained an undeveloped, open, grass covered area since at least 1891. Additionally, there is nothing visible at the surface that would differentiate the sample location (BK-01) from any other location in Areas C and D and visual observations made during sampling concluded that the subsurface soils throughout Areas C and D were very uniform. Nothing in

the appearance of the subsurface soil sample collected at BK-01 distinguished the soil as different from other subsurface samples collected from the area.

The higher concentrations of arsenic and other metals in subsurface soil versus surface soil may be explained by the proximity of the subsurface soils to the bedrock and the presence of glacial till in most subsurface samples. As stated above, the bedrock and glacial till are the predominant source of natural arsenic in area soils. Bedrock is relatively shallow across Coasters Harbor Island, with bedrock outcropping present in various locations. In Areas C and D bedrock was encountered shallower than 6 feet below ground surface at several locations. The subsurface samples collected for the background investigation were comprised mostly of the till that directly overlies bedrock in the area. The seemingly anomalous arsenic concentrations in the BK-01 sample are likely due to the presence in the sample of rock fragments bearing higher concentrations of arsenic.

The 95 percent UTL is defined as a tolerance limit expected to contain 95 percent of all possible measurements for the background data set. If a single sample collected from a site-related area yields a concentration greater than the background 95 percent UTL, then there is less than a 5 percent chance that this sample came from a population equivalent to the background data, and it is correct to conclude that site-related data are elevated above background.

As detailed in Section 4.0, the UTL test is not generally valid as a stand-alone background test to judge whether any remedial action is needed at a site. Statistical guidance (US Navy, 1999) acknowledges that the UTL test can produce an unacceptably high false positive rate in cases where the site population is really no different from the background population. Therefore, it is recommended that site exceedences of the UTL be confirmed by additional statistical tests in which the false positive rate is controlled to less than a 5 percent error rate An "elevated" concentration for a metal should be indicated only if there is found to be either an overall difference between the entire populations of site and background sample results; if a hot spot is found to be present; or, if no other tests are conclusive, if there is an elevated frequency of detection in site versus background data. Potential additional statistical tests to make these determinations include the t-test, the Mann-Whitney test, the Gehan's test, the upper ranks test, the test of proportions, and Fisher's Exact Test.

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APPENDIX A

DATA VALIDATION MEMORANDA
INCLUDING ANALYTICAL LABORATORY RESULTS

TETRA TECH NUS, INC. INTERNAL CORRESPONDENCE

C-NAVY-03-00-1432W

Date: March 24, 2000 c: File N5278-4.10

To: Diane Baxter

From: Ann Franke

Subject: Inorganic Tier III Data Validation
Case 5278, SDG BK01
Ceimic Corporation
CTO 218, Old Firefighter Training Area Site, Newport, Rhode Island
Background Soils Investigation

TAL Metals:
20 Soils/ OFF-SO-BK01-0002, OFF-SO-BK01-0406, OFF-SO-BK02-0002, OFF-SO-BK02-0406, OFF-SO-BK03-0002, OFF-SO-BK03-0406, OFF-SO-BK04-0002, OFF-SO-BK04-0406, OFF-SO-BK05-0002, OFF-SO-BK05-0406, OFF-SO-BK06-0002, OFF-SO-BK06-0406, OFF-SO-BK07-0002, OFF-SO-BK07-0406, OFF-SO-BK08-0002, OFF-SO-BK08-0406, OFF-SO-BK09-0002, OFF-SO-BK09-0406, OFF-SO-BK10-0002, OFF-SO-BK11-0002 (Field Duplicate Pairs: OFF-SO-BK01-0406/OFF-SO-DUP1, OFF-SO-BK06-0406/OFF-SO-DUP2; OFF-SO-DUP1 and OFF-SO-DUP2 from SDG BK11)

Dear Ms. Baxter:

TtNUS, Inc. (TtNUS) performed a Tier III data validation on the metals analytical data for Case 5278, SDG BK01, from soil samples collected by TtNUS at the Old Firefighter Training Area site. The samples were analyzed according to the CLP ILM04.0 Statement of Work. The data were validated according to the Region I, EPA-NE Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses, modified February 1989.

The data were evaluated based on the following parameters:

- Data Completeness
- Holding Times
- Calibration Verification
- Field and Laboratory Blank Analyses
- ICP Interference Check Sample Results
- Matrix Spike Recoveries
- Laboratory Control Sample Results
- Laboratory Duplicate Results
- Fi ld Duplicate Precision
- Furnace Atomic Absorption Results
- ICP Serial Dilution Results

* • Detection Limits
* • Sample Quantitation
NA • Performance Evaluation Results

* All quality control criteria were met for this parameter.

Data Completeness

The laboratory received two samples labeled as sample OFF-SO-BK02-0002, and there was no sample labeled OFF-SO-BK03-0002. The field sampler directed the laboratory to assign the number OFF-SO-BK03-0002 to the sample that was darker in color.

Calibration Verification

The percent recoveries of selenium and silver were above the 120% quality control criteria in the CRDL standard analysis. The following table summarizes the CRDL standard recovery results.

Analyte	% Recovery	Action		Samples Affected
		(+) < 3 x CRDL	ND	
Selenium	128.2	J		OFF-BK02-0002, BK02-0406, BK03-0002, BK04-0002, BK05-0002, BK06-0002, BK06-0406, BK07-0002, BK08-0406, BK09-0002, BK10-0002
Silver	139.0	J		OFF-BK01-0002, BK03-0002, BK04-0002, BK05-0002, BK06-0002, BK07-0002, BK08-0002, BK09-0002, BK10-0002

The positive results for selenium and silver are qualified as estimated (J) in the affected samples. The results may be biased high.

Field and Laboratory Blank Analyses

The field blank (OFF-BK-RB01, from SDG BK11), and laboratory blank analyses were used to calculate the maximum concentrations of the following contaminants affecting the soil sample results.

Analyte	Maximum Concentration (ug/L)	Action Level (mg/Kg)
Beryllium	0.8	0.8
Calcium	-801	801
Potassium	233	233
Selenium	4.0	4.0
Silver	6.2	6.2
Sodium	366	366

(continued)

Analyte	Maximum Concentration (ug/L)	Action Level (mg/Kg)
Thallium	3.0	3.0

Blank actions were applied to affected soil samples for beryllium, calcium, potassium, selenium, silver, sodium, and thallium.

The following actions apply for blank contamination:

- Accept values > Action Level.
- Report as (U) values > 2x IDL and < Action Level. The reporting limit is the associated value.
- Report as (UJ) values < 2x IDL and < Action Level. The reporting limit is the associated estimated value.

ICP Interference Check Sample Results

The following analytes were detected in the ICSA solution at absolute levels greater than 2x IDL when these analytes were not supposed to be present in the solution: cadmium, potassium, sodium, and thallium. Estimate (J) positive results for the analytes with levels of interferents of 50% or more of that in the ICS solution and reject (R) positive results if the reported concentration is due entirely (≥ 80%) to the interfering analyte. The samples listed in the table below had iron levels greater than 50% of their respective levels in the ICSA solution. Therefore, the following actions were taken:

Sample	Analyte Affected	Sample Concentration (ug/L)	Sample Interferent Fe (ug/L)	Estimated Interference (ug/L)	Action
OFF-SO-BK01-0002	Cadmium	(U)	109980	3.8	Accept
	Potassium	1380	109980	268	J
	Sodium	368	109980	-66.5	J
	Thallium	(U)	109980	3.3	Accept
OFF-SO-BK01-0406	Cadmium	(U)	133600	4.7	Accept
	Potassium	2185	472350	1150	J
	Sodium	308	472350	-286	J
	Thallium	10.4	472350	14.2	Reject
OFF-SO-BK02-0002	Cadmium	(U)	159530	5.6	Accept
	Potassium	1606	159530	388	J
	Sodium	312	159530	-96.5	J
	Thallium	5.4	159530	4.8	Reject
OFF-SO-BK02-0406	Cadmium	(U)	244940	8.6	Accept
	Potassium	1648	244940	596	J
	Sodium	187	244940	-148	J
	Thallium	(U)	244940	7.3	Accept
OFF-SO-BK03-0406	Cadmium	(U)	168900	5.9	Accept
	Potassium	2598	299020	728	J

(continued)

Sample	Analyte Affected	Sample Concentration (ug/L)	Sample Interferent Fe (ug/L)	Estimated Interference (ug/L)	Action
OFF-SO-BK03-0406	Sodium	191	299020	-181	J
	Thallium	(U)	299020	9.0	Accept
OFF-SO-BK04-0406	Cadmium	(U)	206170	7.2	Accept
	Potassium	2668	206170	502	J
	Sodium	169	206170	-125	J
	Thallium	(U)	206170	6.2	Accept
OFF-SO-BK05-0406	Cadmium	(U)	220160	7.7	Accept
	Potassium	3494	220160	536	J
	Sodium	182	220160	-133	J
	Thallium	(U)	220160	6.6	Accept
OFF-SO-BK06-0406	Cadmium	(U)	190160	6.7	Accept
	Potassium	2576	190160	463	J
	Sodium	56	190160	-115	J
	Thallium	(U)	190160	5.7	Accept
OFF-SO-BK07-0406	Cadmium	(U)	151000	5.3	Accept
	Potassium	3716	251730	613	J
	Sodium	143	251730	-152	J
	Thallium	(U)	251730	7.6	Accept
OFF-SO-BK08-0406	Cadmium	(U)	157990	5.5	Accept
	Potassium	2668	157990	385	J
	Sodium	138	157990	-95.6	J
	Thallium	(U)	157990	4.7	Accept
OFF-SO-BK09-0406	Cadmium	(U)	226590	7.9	Accept
	Potassium	3473	226590	552	J
	Sodium	125	226590	-137	J
	Thallium	(U)	226590	6.8	Accept
OFF-SO-BK11-0002	Cadmium	(U)	110090	3.9	Accept
	Potassium	2142	110090	268	J
	Sodium	316	110090	-66.6	J
	Thallium	2.8	110090	3.3	Reject

The positive results for potassium in the samples listed above are estimated (J) due to positive interference attributed to iron. The results may be biased high. The positive sodium results are estimated (J) due to negative interference attributed to iron. These results may be biased low. The positive thallium results in samples OFF-SO-BK01-0406, OFF-SO-BK02-0002, and OFF-SO-BK11-0002 are rejected (R) since the reported concentrations might be due entirely to the iron interference. The non-detected cadmium and thallium results are not affected by the positive interference and are therefore accepted without qualification.

Matrix Spike Recoveries

The results of the matrix spike analysis of sample OFF-SO-BK01-0406 were below the 75% criterion for antimony, cadmium, silver, and zinc. The positive and non-detected results for antimony, cadmium, silver, and zinc are estimated (J, UJ). The results may be biased low. Acceptable post-digestion spike analyses were performed for antimony and zinc; the recovery for cadmium was 3.1%. A post-digestion spike analysis is not required for silver.

Field Duplicate Precision

The relative percent differences (RPD) for arsenic, iron, silver, and zinc were greater than the 50% quality control criterion for soil samples in the field duplicate analysis of field duplicate pair OFF-SO-BK01-0406/OFF-SO-DUP01. The absolute difference in results for nickel in these two samples was greater than the 4x CRDL criterion for soil samples, which applies when the sample results are less than 5x CRDL, and the RPD was greater than 50%. The positive results for arsenic, iron, nickel, silver, and zinc are estimated (J) due to poor field duplicate precision.

Overall Assessment of the Data

The data are acceptable for use as qualified. Many sample results are estimated (J, UJ) for selenium and silver due to poor linearity at low concentrations as identified by the analysis of the CRDL standard. Detection limits are raised for beryllium, calcium, potassium, selenium, silver, sodium, and thallium due to laboratory and/or field blank contamination. Results for potassium and sodium are estimated (J) in numerous samples, and thallium results are rejected (R) in thre samples, due to positive or negative interference from iron. The positive and non-detected results for antimony, cadmium, silver, and zinc are estimated (J, UJ) due to poor matrix spike recoveries. Positive results for arsenic, iron, nickel, silver, and zinc are estimated (J) due to poor field duplicate precision.

NOTE. Sample results less than 2x IDL and/or less than the CRDL are estimated (J) due to uncertainty in values near the instrument detection limit.

Attachments

c: **File N5278-4.10**

Soil TAL Metal Analysis (mg/kg)
Site: Old Firefighter Training Area
Case 5278, SDG. BK01

EPA Sample Number	OFF-SO-BK01-0002	OFF-SO-BK01-0406	OFF-SO-BK02-0002	OFF-SO-BK02-0406	OFF-SO-BK03-0002	OFF-SO-BK03-0406
Station Location	OFF-SO-BK01-0002	OFF-SO-BK01-0406	OFF-SO-BK02-0002	OFF-SO-BK02-0406	OFF-SO-BK03-0002	OFF-SO-BK03-0406
Date Sampled	2/15/00	2/15/00	2/15/00	2/15/00	2/15/00	2/15/00
Date Extracted						
Date Analyzed						
Dilution Factor	1	1	1	1	1	1
Percent Solids	89 2	88 8	81 6	93 5	83 7	91 8
QC Identifier	None	Field Dup OFF-SO-BK01-0406	None	None	None	None
Aluminum	9600	14200	11900	10200	8860	14300
Antimony	0 32 UJ	0 31 UJ	0 43 J	0 28 UJ	0 67 J	0 30 UJ
Arsenic	5 3 J	84 9 J	4 5 J	35 5 J	4 7 J	17 9 J
Barium	18 9	15 3	30 8	11 6	24 0	10 8
Beryllium	0 61 U	1 1	0 59 U	0 46 U	0 44 U	0 52 U
Cadmium	0 05 UJ	0 19 UJ	0 05 UJ	0 04 UJ	0 05 UJ	0 09 UJ
Calcium	906	461 U	686 U	692 U	238 U	491 U
Chromium	11 6	19 1	19 2	11 7	14 2	13 4
Cobalt	6 9 B	29 2	9 6	16 6	5 3	16 4
Copper	10 3	32 9	13 1	17 5	10 9	20 7
Iron	16200 J	67300 J	22900 J	31600 J	12100 J	40700 J
Lead	30 5	11 4	31 5	9 7	48 3	11 6
Magnesium	1900	3210	1960	2990	1200	5270
Manganese	274	441	372	253	198	359
Mercury	0 03 U	0 02 U	0 12	0 02 U	0 14	0 03 U
Nickel	12 1 J	48 9 J	18 5 J	24 8 J	9 4 J	30 2 J
Potassium	204 UJ	311 J	230 UJ	212 UJ	197 U	354 J
Selenium	0 44 U	0 43 U	0 79 UJ	0 41 UJ	0 81 UJ	0 82 U
Silver	4 0 UJ	16 7 J	5 5 UJ	8 0 J	3 4 UJ	10 1 J
Sodium	54 2 UJ	43 9 UJ	44 7 UJ	24 1 UJ	20 3 U	26 0 UJ
Thallium	0 35 U	R	R	0 31 U	0 35 U	0 33 U
Vanadium	16 5	28 7	23 4	18 9	15 7	20 1
Zinc	33 9 J	159 J	52 9 J	63 9 J	34 0 J	68 1 J

U - Not detected, UJ - Detection limit approximate, J - Quantitation approximate, R - Rejected

Soil TAL Metal Analysis (mg/kg)
Site Old Firefighter Training Area
Case 5278, SDG. BK01

EPA Sample Number	OFF-SO-BK04-0002	OFF-SO-BK04-0406	OFF-SO-BK05-0002	OFF-SO-BK05-0406	OFF-SO-BK06-0002	OFF-SO-BK06-0406	
Station Location	OFF-SO-BK04-0002	OFF-SO-BK04-0406	OFF-SO-BK05-0002	OFF-SO-BK05-0406	OFF-SO-BK06-0002	OFF-SO-BK06-0406	
Date Sampled	2/15/00	2/15/00	2/15/00	2/15/00	2/15/00		2/15/00
Date Extracted							
Date Analyzed							
Dilution Factor	1	1	1	1	1		1
Percent Solids	85 4	86 8	80 9	89 7	86 3		89 0
QC Identifier	None	None	None	None	None	Field Dup OFF-SO-BK06-0406	
Aluminum	9230	9890	8270	10800	10500		8040
Antimony	0 33 UJ	0 31 UJ	0 34 UJ	0 30 UJ	0 31 UJ		0 31 UJ
Arsenic	4 2 J	4 8 J	2 8 J	4 7 J	2 7 J		4 7 J
Barium	27 5	13 6	27 8	16 1	27 7		14 4
Beryllium	0 54 U	0 51 U	0 46 U	0 49 U	0 46 U		0 51 U
Cadmium	0 05 UJ	0 05 UJ	0 05 UJ	0 05 UJ	0 05 UJ		0 05 UJ
Calcium	412 U	143 U	653 U	260 U	310 U		95 0 U
Chromium	18 4	15 4	9 4	15 9	10 0		14 2
Cobalt	6 5	13 0	4 5	14 5	5 2		12 6
Copper	11 8	25 5	7 2	20 3	6.5		17 9
Iron	12700 J	29500 J	11700 J	30500 J	11600 J		27200 J
Lead	36.3	10 3	30.4	12 2	15.2		8 9
Magnesium	1390	2900	1300	3540	1130		2280
Manganese	262	318	255	420	242		359
Mercury	0 11	0 02 U	0 05	0 02 U	0 04 J		0 02 U
Nickel	11 6 J	21 4 J	8 8 J	22 9 J	9 7 J		19 6 J
Potassium	253	382 J	216 U	484 J	254		369 J
Selenium	0 54 UJ	0.43 U	0 78 UJ	0 42 U	0 70 UJ		0 73 UJ
Silver	3 6 UJ	7 7 J	3 3 UJ	8 0 J	3 6 UJ		7 3 J
Sodium	35 7 U	24 1 UJ	29 4 U	25 2 UJ	21 3 U		8 0 UJ
Thallium	0 36 U	0 34 U	0 37 U	0 33 U	0 34 U		0 34 U
Vanadium	18 8	19 5	16 2	22 0	14 7		18 3
Zinc	40 8 J	52 9 J	33 6 J	55 4 J	29 0 J		52 0 J

U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate,R - Rejected

Soil TAL Metal Analysis (mg/kg)
Site Old Firefighter Training Area
Case: 5278, SDG BK01

EPA Sample Number	OFF-SO-BK07-0002	OFF-SO-BK07-0406	OFF-SO-BK08-0002	OFF-SO-BK08-0406	OFF-SO-BK09-0002	OFF-SO-BK09-0406
Station Location	OFF-SO-BK07-0002	OFF-SO-BK07-0406	OFF-SO-BK08-0002	OFF-SO-BK08-0406	OFF-SO-BK09-0002	OFF-SO-BK09-0406
Date Sampled	2/15/00	2/15/00	2/15/00	2/15/00	2/15/00	2/15/00
Date Extracted						
Date Analyzed						
Dilution Factor	1	1	1	1	1	1
Percent Solids	83 5	89 5	80 0	89 7	91 0	90 6
QC Identifier	None	None	None	None	None	None
Aluminum	10300	10700	7560	9210	5000	11600
Antimony	0 33 UJ	0 42 J	0 34 UJ	0 30 UJ	0 32 UJ	0 32 UJ
Arsenic	3 2 J	5 7 J	2 6 J	3 7 J	1 8 J	2 7 J
Barium	38 1	21 4	21 8	19 1	9 2	18 0
Beryllium	0 54 U	0 48 U	0 51 U	0 44 U	0 28 U	0 47 U
Cadmium	0 05 UJ	0 10 UJ	0 70 J	0 05 UJ	0 05 UJ	0 05 UJ
Calcium	257 U	166 U	303 U	374 U	115 U	167 U
Chromium	8 7	19.8	7 0	11 1	4 3	17 8
Cobalt	4 8	17 0	3 2	10 6	4 0	16 7
Copper	9 3	27 3	33 9	14 9	3 5	24 4
Iron	11800 J	36500 J	8140 J	21200 J	5540 J	32500 J
Lead	30 2	14 1	28 8	7 0	6 1	9 5
Magnesium	1130	3400	837	2990	725	3680
Manganese	420	561	286	371	200	423
Mercury	0 12	0 02 U	0.06	0 03 U	0 02 U	0 02 U
Nickel	9 4 J	26 2 J	6 9 J	16 7 J	5 6 J	28 1 J
Potassium	236	539 J	177	358 J	169 U	498 J
Selenium	0 79 UJ	0 44 U	0 47 U	0 56 UJ	0 49 UJ	0 43 U
Silver	3 6 UJ	9 5 J	2 5 UJ	5 8 UJ	1 7 UJ	8 7 J
Sodium	23 0 U	20 8 UJ	18 0 U	18 5 UJ	6 9 U	17 9 UJ
Thallium	0 36 U	0 35 U	0 37 U	0 32 U	0 35 U	0 34 U
Vanadium	14 3	22 3	15 2	17 7	7 4	18 5
Zinc	36 2 J	67 9 J	225 J	40 0 J	14 6 J	61 5 J

U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate,R - Rejected

Soil TAL Metal Analysis (mg/kg)
Site. Old Firefighter Training Area
Case 5278, SDG· BK01

EPA Sample Number	OFF-SO-BK10-0002	OFF-SO-BK11-0002
Station Location	OFF-SO-BK10-0002	OFF-SO-BK11-0002
Date Sampled	2/15/00	2/15/00
Date Extracted		
Date Analyzed		
Dilution Factor	1	1
Percent Solids	85 7	84 3
QC Identifier	None	None
Aluminum	6480	9030
Antimony	0 39 J	0 34 J
Arsenic	3 2 J	4 1 J
Barium	12 0	22 6
Beryllium	0 40 U	0 40 U
Cadmium	0 05 UJ	0 05 UJ
Calcium	195 U	1060
Chromium	7 5	10 2
Cobalt	3 6	6 8
Copper	7.3	12 2
Iron	9840 J	16000 J
Lead	798	49 7
Magnesium	1110	1640
Manganese	172	247
Mercury	0 05	0 06
Nickel	7 3 J	11 9 J
Potassium	187 U	312 J
Selenium	0 71 UJ	0 44 U
Silver	3 3 UJ	4 8 UJ
Sodium	16 3 U	46 0 UJ
Thallium	0.35 U	R
Vanadium	10 6	16 3
Zinc	28 6 J	46 9 J

U - Not detected UJ - Detection limit approximate J - Quantitation approximate R - Rejected

Soil TAL Metal Analysis (mg/kg)
Site Old Firefighter Training Area
Case 5278, SDG BK01

EPA Sample Number	OFF-SO BK01-0002	OFF-SO-BK01-0406	OFF-SO-BK02-0002	OFF-SO-BK02 0406	OFF-SO-BK03-0002	OFF-SO BK03 0406
Station Location	OFF-SO-BK01-0002	OFF-SO-BK01-0406	OFF-SO-BK02-0002	OFF-SO-BK02-0406	OFF-SO-BK03-0002	OFF-SO-BK03-0406
Date Sampled	2/15/00	2/15/00	2/15/00	2/15/00	2/15/00	2/15/00
Date Extracted						
Date Analyzed						
Dilution Factor	1	1	1	1	1	1
Percent Solids	89 2	88 8	81 6	93 5	83 7	91 8
QC Identifier	None	Field Dup OFF-SO-BK01-0406	None	None	None	None
Aluminum	9600	14200	11900	10200	8860	14300
Antimony	0 32 UJ	0 31 UJ	0 43 J	0 28 UJ	0 67 J	0 30 UJ
Arsenic	5 3 J	84 9 J	4 5 J	35 5 J	4 7 J	17 9 J
Barium	18 9	15 3	30 8	11 6	24 0	10 8
Beryllium	0 61 U	1 1	0 59 U	0 46 U	0 44 U	0 52 U
Cadmium	0 05 UJ	0 19 UJ	0 05 UJ	0 04 UJ	0 05 UJ	0 09 UJ
Calcium	906	461 U	686 U	692 U	238 U	491 U
Chromium	11 6	19 1	19 2	11 7	14 2	13 4
Cobalt	6 9 B	29 2	9 6	16 6	5 3	16 4
Copper	10 3	32 9	13 1	17 5	10 9	20 7
Iron	16200 J	67300 J	22900 J	31600 J	12100 J	40700 J
Lead	30 5	11 4	31 5	9 7	48 3	11 6
Magnesium	1900	3210	1960	2990	1200	5270
Manganese	274	441	372	253	198	359
Mercury	0 03 U	0 02 U	0 12	0 02 U	0 14	0 03 U
Nickel	12 1 J	48 9 J	18 5 J	24 8 J	9 4 J	30 2 J
Potassium	204 UJ	311 J	230 UJ	212 UJ	197 U	354 J
Selenium	0 44 U	0 43 U	0 79 UJ	0 41 UJ	0 81 UJ	0 82 U
Silver	4 0 UJ	16 7 J	5 5 UJ	8 0 J	3 4 UJ	10 1 J
Sodium	54 2 UJ	43 9 UJ	44 7 UJ	24 1 UJ	20 3 U	26 0 UJ
Thallium	0 35 U	R	R	0 31 U	0 35 U	0 33 U
Vanadium	16 5	28 7	23 4	18 9	15 7	20 1
Zinc	33 9 J	159 J	52 9 J	63 9 J	34 0 J	68 1 J

U - Not detected, UJ - Detection limit approximate, J - Quantitation approximate, R - Rejected

Soil TAL Metal Analysis (mg/kg)
Site Old Firefighter Training Area
Case 5278, SDG BK01

EPA Sample Number	OFF-SO-BK04-0002	OFF-SO-BK04-0406	OFF-SO-BK05-0002	OFF-SO-BK05-0406	OFF-SO-BK06-0002	OFF-SO-BK06-0406	
Station Location	OFF-SO-BK04-0002	OFF-SO-BK04-0406	OFF-SO-BK05-0002	OFF-SO-BK05-0406	OFF-SO-BK06-0002	OFF-SO-BK06-0406	
Date Sampled	2/15/00	2/15/00	2/15/00	2/15/00	2/15/00		2/15/00
Date Extracted							
Date Analyzed							
Dilution Factor	1	1	1	1	1		1
Percent Solids	85 4	86 8	80 9	89 7	86 3		89 0
QC Identifier	None	None	None	None	None	Field Dup OFF-SO-BK06-0406	
Aluminum	9230	9890	8270	10800	10500		8040
Antimony	0 33 UJ	0 31 UJ	0 34 UJ	0 30 UJ	0 31 UJ		0 31 UJ
Arsenic	4 2 J	4 8 J	2 8 J	4 7 J	2 7 J		4 7 J
Barium	27 5	13 6	27 8	16 1	27 7		14 4
Beryllium	0 54 U	0 51 U	0 46 U	0 49 U	0 46 U		0 51 U
Cadmium	0 05 UJ	0 05 UJ	0 05 UJ	0 05 UJ	0 05 UJ		0 05 UJ
Calcium	412 U	143 U	653 U	260 U	310 U		95 0 U
Chromium	18 4	15 4	9 4	15 9	10 0		14 2
Cobalt	6 5	13 0	4 5	14 5	5 2		12 6
Copper	11 8	25 5	7 2	20 3	6 5		17 9
Iron	12700 J	29500 J	11700 J	30500 J	11600 J		27200 J
Lead	36.3	10 3	30 4	12 2	15 2		8 9
Magnesium	1390	2900	1300	3540	1130		2280
Manganese	262	318	255	420	242		359
Mercury	0 11	0 02 U	0 05	0 02 U	0 04 J		0 02 U
Nickel	11 6 J	21 4 J	8 8 J	22 9 J	9 7 J		19 6 J
Potassium	253	382 J	216 U	484 J	254		369 J
Selenium	0 54 UJ	0 43 U	0 78 UJ	0 42 U	0 70 UJ		0 73 UJ
Silver	3 6 UJ	7 7 J	3 3 UJ	8 0 J	3 6 UJ		7 3 J
Sodium	35 7 U	24 1 UJ	29 4 U	25 2 UJ	21 3 U		8 0 UJ
Thallium	0 36 U	0 34 U	0 37 U	0 33 U	0 34 U		0 34 U
Vanadium	18 8	19 5	16 2	22 0	14 7		18 3
Zinc	40 8 J	52 9 J	33 6 J	55 4 J	29 0 J		52 0 J

U - Not detected; UJ - Detection limit approximate; J - Quantitation approximate,R - Rejected
Note The pairs to the field duplicate samples are in SDG BK11

Soil TAL Metal Analysis (mg/kg)
Site Old Firefighter Training Area
Case 5278, SDG BK01

EPA Sample Number	OFF-SO-BK07-0002	OFF-SO-BK07-0406	OFF-SO-BK08-0002	OFF-SO-BK08-0406	OFF-SO-BK09-0002	OFF-SO-BK09-0406
Station Location	OFF-SO-BK07-0002	OFF-SO-BK07-0406	OFF-SO-BK08-0002	OFF-SO-BK08-0406	OFF-SO-BK09-0002	OFF-SO-BK09-0406
Date Sampled	2/15/00	2/15/00	2/15/00	2/15/00	2/15/00	2/15/00
Date Extracted						
Date Analyzed						
Dilution Factor	1	1	1	1	1	1
Percent Solids	83 5	89 5	80 0	89 7	91 0	90 6
QC Identifier	None	None	None	None	None	None
Aluminum	10300	10700	7560	9210	5000	11600
Antimony	0 33 UJ	0 42 J	0 34 UJ	0 30 UJ	0 32 UJ	0 32 UJ
Arsenic	3 2 J	5 7 J	2 6 J	3 7 J	1 8 J	2 7 J
Barium	38 1	21 4	21 8	19 1	9 2	18 0
Beryllium	0 54 U	0 48 U	0 51 U	0 44 U	0 28 U	0 47 U
Cadmium	0 05 UJ	0 10 UJ	0 70 J	0 05 UJ	0 05 UJ	0 05 UJ
Calcium	257 U	166 U	303 U	374 U	115 U	167 U
Chromium	8 7	19 8	7 0	11 1	4 3	17 8
Cobalt	4 8	17 0	3 2	10 6	4 0	16 7
Copper	9 3	27 3	33 9	14 9	3 5	24 4
Iron	11800 J	36500 J	8140 J	21200 J	5540 J	32500 J
Lead	30 2	14 1	28 8	7 0	6 1	9 5
Magnesium	1130	3400	837	2990	725	3680
Manganese	420	561	286	371	200	423
Mercury	0 12	0 02 U	0 06	0 03 U	0 02 U	0 02 U
Nickel	9 4 J	26 2 J	6 9 J	16 7 J	5 6 J	28 1 J
Potassium	236	539 J	177	358 J	169 U	498 J
Selenium	0 79 UJ	0 44 U	0 47 U	0 56 UJ	0 49 UJ	0 43 U
Silver	3 6 UJ	9 5 J	2 5 UJ	5 8 UJ	1 7 UJ	8 7 J
Sodium	23 0 U	20 8 UJ	18 0 U	18 5 UJ	6 9 U	17 9 UJ
Thallium	0 36 U	0 35 U	0 37 U	0 32 U	0 35 U	0 34 U
Vanadium	14 3	22 3	15 2	17 7	7 4	18 5
Zinc	36 2 J	67 9 J	225 J	40 0 J	14 6 J	61 5 J

U - Not detected, UJ - Detection limit approximate; J - Quantitation approximate,R - Rejected

Note The pairs to the field duplicate samples are in SDG BK11

Soil TAL Metal Analysis (mg/kg)
Site: Old Firefighter Training Area
Case 5278, SDG BK01

EPA Sample Number	OFF-SO-BK10-0002	OFF-SO-BK11-0002
Station Location	OFF-SO-BK10-0002	OFF-SO-BK11-0002
Date Sampled	2/15/00	2/15/00
Date Extracted		
Date Analyzed		
Dilution Factor	1	1
Percent Solids	85 7	84 3
QC Identifier	None	None
Aluminum	6480	9030
Antimony	0 39 J	0 34 J
Arsenic	3 2 J	4 1 J
Barium	12 0	22 6
Beryllium	0 40 U	0 40 U
Cadmium	0 05 UJ	0 05 UJ
Calcium	195 U	1060
Chromium	7 5	10 2
Cobalt	3 6	6 8
Copper	7 3	12 2
Iron	9840 J	16000 J
Lead	798	49 7
Magnesium	1110	1640
Manganese	172	247
Mercury	0 05	0 06
Nickel	7 3 J	11 9 J
Potassium	187 U	312 J
Selenium	0 71 UJ	0 44 U
Silver	3 3 UJ	4 8 UJ
Sodium	16 3 U	46 0 UJ
Thallium	0 35 U	R
Vanadium	10 6	16 3
Zinc	28 6 J	46 9 J

U - Not detected, UJ - Detection limit approximate; J - Quantitation approximate,R - Rejected
Note The pairs to the field duplicate samples are in SDG BK11

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C-NAVY-03-00-1435W

Date: March 30, 2000 **c: File N5278-4.10**

To: Diane Baxter

From: Linda Terzis

Subject: Inorganic Tier III Data Validation
Case 5278, SDG BK11
Ceimic Corporation
CTO 218, Old Firefighter Training Area Site, Newport, Rhode Island
Background Soils Investigation

TAL Metals:
21 Soils/ OFF-SO-BK11-0406, OFF-SO-BK12-0002, OFF-SO-BK12-0406, OFF-SO-BK13-0002, OFF-SO-BK13-0406. OFF-SO-BK14-0002, OFF-SO-BK14-0406, OFF-SO-BK15-0002, OFF-SO-BK15-0406, OFF-SO-BK16-0002. OFF-SO-BK16-0406, OFF-SO-BK17-0002, OFF-SO-BK17-0203, OFF-SO-BK18-0002, OFF-SO-BK18-0406. OFF-SO-BK19-0002, OFF-SO-BK20-0002, OFF-SO-DUP01, OFF-SO-DUP02, OFF-SO-DUP03, OFF-SO-DUP04 (Field Duplicate Pairs: OFF-SO-BK15-0406/OFF-SO-DUP03, OFF-SO-BK20-0002/OFF-SO-DUP04)

1/Aqueous Rinsate Blank/ OFF-BK-RB01

1/Aqueous Source Blank/ OFF-BK-FB01

Dear Ms. Baxter:

TtNUS, Inc. (TtNUS) performed a Tier III data validation on the metals analytical data for Case 5278, SDG BK11, from soil samples collected by TtNUS at the Old Firefighter Training Area site. The samples and blanks were analyzed according to the CLP ILM04.0 Statement of Work The data were validated according to the Region I, EPA-NE Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses, modified February 1989.

The data were evaluated based on the following parameters:

- Data Completeness
- Holding Times
- Calibration Verification
- Field and Laboratory Blank Analyses
- ICP Interference Check Sample Results
- Matrix Spike Recoveries
- Laboratory Control Sample Results

*	•	Laboratory Duplicate Results
*	•	Field Duplicate Precision
NA	•	Furnace Atomic Absorption Results
	•	ICP Serial Dilution Results
*	•	Detection Limits
*	•	Sample Quantitation
NA	•	Performance Evaluation Results

* All quality control criteria were met for this parameter.

Data Completeness

The laboratory was contacted on March 22, 2000 regarding the following items:

- The mercury calibration coefficient page of the data package (page 265) was too light to read. A darker copy was requested.
- An interference check form (Form IV) that includes aluminum, calcium, iron, and magnesium results was requested for the cadmium only, and the selenium and cadmium analytical sequences.
- Selenium was not reported on the Form I for sample OFF-BK-FB01. A result within the linear range of the instrument was not found in the raw data. A selenium result was requested for this sample.

The laboratory responded on March 23, 2000. The requested mercury calibration coefficient page could not be re-generated by the laboratory. The response stated that the corr lation coefficient was 0.999. The requested interference check forms were not submitted, how ver. the data are not affected. A selenium result was submitted for sample OFF-BK-FB01 along with associated reporting forms.

Calibration Verification

The percent recoveries of selenium, manganese, and silver failed to meet the 80-120% criteria during the ICP CRDL standard analysis. The following table summarizes the CRDL standard recovery results.

Analyte	% Recovery	Action		Samples Affected
		(+) < 3 x CRDL	ND	
Selenium	66.8		UJ	All samples
Manganese	122.2	J		OFF-BK-FB01
Silver	123.2	J		OFF-BK12-0002, -BK13-0002, -BK14-0002, -BK15-0002, -BK16-0002, -BK19-0002

The above actions were taken due to questionable linearity near the CRDL.

Field and Laboratory Blank Analyses

The field blank (OFF-BK-RB01) and laboratory blank analyses were used to calculate the maximum concentrations of the following contaminants affecting the soil sample results.

Analyte	Maximum Concentration (mg/Kg)	Action Level (mg/Kg)
Calcium	115	575
Potassium	65.86	329
Silver	1.66	8.30
Sodium	73.20	366
Thallium	0.66	3.30

Blank actions were applied to the soil samples for the analytes listed above.

The laboratory blank analyses were used to calculate the maximum concentrations of the following contaminants affecting the aqueous sample results.

Analyte	Maximum Concentration (ug/L)	Action Level (ug/L)
Aluminum	104	521
Barium	8.30	41.50
Calcium	575	2874
Iron	25.20	126
Manganese	4.60	23.00
Sodium	358	1790
Thallium	3.30	16.50
Zinc	17.80	89.00

The following actions apply for blank contamination:

- Accept values > Action Level.
- Report as (U) values > 2x IDL and < Action Level. The reporting limit is the associated value.
- Report as (UJ) values < 2x IDL and < Action Level. The reporting limit is the associated estimated value.

ICP Interference Check Sample Results

The following analytes were detected in the ICSA solution at absolute levels greater than 2x IDL when these analytes were not supposed to be present in the solution: arsenic, barium, cadmium, manganese, sodium, and thallium. Estimate (J) positive results for the analytes with levels of interferents of 50% or more of that in the ICS solution and reject (R) positive results if the reported concentration is due entirely (≥ 80%) to the interfering analyte. The samples listed in the table below had iron levels greater than 50% of their respective levels in the ICSA solution. Therefore, the following actions were taken:

Sample	Analyte Affected	Sample Concentration (ug/L)	Sample Interferenct (ug/L)	Estimated Interference (ug/L)	Action
OFF-SO-BK11-0406	Arsenic	37.92	241060	-14.90	J
	Barium	118.50	241060	12.20	J
	Sodium	892.70	241060	-143.30	J
	Thallium	11.06	241060	10.80	R
OFF-SO-BK12-0406	Arsenic	30.87	263960	-16.30	J
	Barium	126.22	263960	13.30	J
	Sodium	1516	263960	-156.90	J
	Thallium	5.9	263960	11.80	R
OFF-SO-BK13-0406	Arsenic	20.55	133360	-8.20	J
	Barium	94.53	133360	6.70	J
	Sodium	476.10	133360	-79.30	J
	Thallium	3.84	133360	6.00	R
OFF-SO-BK14-0406	Arsenic	33.42	260050	-16.00	J
	Barium	118.00	260050	13.10	J
	Sodium	380.00	260050	-154.60	J
	Thallium	7.82	260050	11.70	R
OFF-SO-BK15-0002	Arsenic	17.70	98978	-6.10	J
	Barium	122.50	98978	5.00	J
	Sodium	397.20	98978	-58.80	J
OFF-SO-BK15-0406	Arsenic	ND	314870	-19.40	UJ
	Barium	73.70	314870	15.90	J
	Sodium	472.70	314870	-187.20	J
	Thallium	10.52	314870	14.10	R
OFF-SO-BK16-0002	Arsenic	34.70	102550	-6.30	J
	Barium	109.20	102550	5.20	J
	Sodium	662.60	102550	-61.00	J
	Thallium	4.80	102550	4.60	R
OFF-SO-BK16-0406	Arsenic	22.30	227940	-14.10	J
	Barium	106.50	227940	11.50	J
	Sodium	462.10	227940	-135.50	J
	Thallium	6.40	227940	10.20	R
OFF-SO-BK17-0002	Arsenic	29.10	142210	-8.80	J
	Barium	126.40	142210	7.20	J
	Sodium	523.00	142210	-84.60	J
	Thallium	5.76	142210	6.40	R
OFF-SO-BK17-0203	Arsenic	6.16	264630	-16.30	J
	Barium	68.70	264630	13.40	J
	Manganese	1114	264630	11.90	J
	Sodium	552.20	264630	-157.30	J
	Thallium	7.66	264630	11.90	R
OFF-SO-DUP01	Arsenic	164.30	256450	-15.80	J
	Barium	106.00	256450	12.90	J
	Sodium	355.00	256450	-152.50	J
	Thallium	6.43	256450	11.50	R
OFF-SO-DUP02	Arsenic	37.60	256060	-15.80	J
	Barium	128.60	256060	12.90	J
	Sodium	417.90	256060	-152.20	J
	Thallium	6.71	256060	11.50	R

Sample	Analyte Affected	Sample Concentration (ug/L)	Sample Interferenct (ug/L)	Estimated Interference (ug/L)	Action
OFF-SO-DUP03	Arsenic	3.90	281250	-17.40	J
	Barium	70.40	281250	14.20	J
	Sodium	472.00	281250	-167.20	J
	Thallium	9.18	281250	12.60	R
OFF-SO-DUP04	Arsenic	41.42	108930	-6.70	J
	Barium	201.80	108930	5.50	J
	Sodium	323.80	108930	-64.80	J
	Thallium	5.27	108930	4.90	R
OFF-SO-BK18-0002	Arsenic	28.04	134510	-8.30	J
	Barium	255.60	134510	6.80	J
	Sodium	316.90	134510	-80.00	J
OFF-SO-BK18-0406	Arsenic	105.70	231540	-14.30	J
	Barium	199.50	231540	11.70	J
	Sodium	352.40	231540	-137.70	J
	Thallium	8.64	231540	10.40	R
OFF-SO-BK20-0002	Arsenic	48.61	120070	-7.40	J
	Barium	215.60	120070	6.10	J
	Sodium	414.70	120070	-71.40	J
	Thallium	2.74	120070	5.40	R

The positive results listed above are estimated (J) due to positive interference attributed to iron. Results may be biased high. Positive results affected by negative interference attributed to iron are also estimated (J). These results may be biased low. Non-detected results affected by negative interference attributed to iron are estimated (UJ). These results may be false negatives. Results for samples where the estimated interference accounted for less than one percent of the reported sample concentration were accepted without qualification. Where interference accounted for greater than 80 percent of the reported sample concentration, results were rejected (R). The data are unusable. Cadmium was non-detected in all samples, and therefore, it was not included in the table above since the results are unaffected by the positive iron interference.

Matrix Spike Recoveries

The result of the matrix spike analysis of sample OFF-SO-BK12-0002 was outside the 75-125% criteria for antimony (44%). The positive and non-detected soil sample results for antimony are estimated (J, UJ). The results may be biased low. An acceptable post-digestion spike analysis was performed for this analyte.

ICP Serial Dilution Results

The percent difference values for calcium and zinc exceeded the 15% quality control criterion in the serial dilution analysis of soil sample OFF-SO-BK12-0002. The positive results for these anlaytes are estimated (J) in the soil samples.

Overall Assessment of the Data

The data are acceptable for use as qualified. Many sample results are estimated (J, UJ) for selenium, manganese, and silver due to poor linearity at low concentrations as identified by the analysis of the CRDL standard. Detection limits for several analytes are raised (and som also estimated) in the samples due to laboratory and/or field blank contamination. Many analyte results are estimated (J, UJ) or rejected (R) due to positive or negative interference from iron. The positive and non-detected antimony results are estimated in the soils due to low matrix spike recovery. The results may be biased low. Positive results for calcium and zinc are estimated in the soil samples due to exceeded percent difference values in the ICP serial dilution analysis.

NOTE: Sample results less than 2x IDL and/or less than the CRDL are estimated (J) du to uncertainty in values near the instrument detection limit.

Attachments

c: **File N5278-C - 4.10**

Soil TAL Metal Analysis (mg/kg)
Site. Old Firefighter Training Area
Case· 5278, SDG BK11

EPA Sample Number	OFF-SO-BK11-0406		OFF-SO-BK12-0002		OFF-SO-BK12-0406		OFF-SO-BK13-0002		OFF-SO-BK13-0406		OFF-SO-BK14-0002	
Station Location	OFF-SO-BK11-0406		OFF-SO-BK12-0002		OFF-SO-BK12-0406		OFF-SO-BK13-0002		OFF-SO-BK13-0406		OFF-SO-BK14-0002	
Date Sampled	2/15/00		2/15/00		2/15/00		2/15/00		2/15/00		2/15/00	
Date Extracted												
Date Analyzed												
Dilution Factor	1		1		1		1		1		1	
Percent Solids	94 9		87 1		89 7		86 4		90 7		88 2	
QC Identifier	None		None		None		None		None		None	
Aluminum	11500		8640		12900		8060		7930		8460	
Antimony	0 31	UJ	0 32	UJ	0 32	UJ	0 31	UJ	0 32	UJ	0 32	UJ
Arsenic	4 8	J	3 5		4 5	J	1 8		3 0	J	2 6	
Barium	15 0	J	13 8		18 4	J	19 6		13 8	J	17 6	
Beryllium	0 23		0 36		0 48		0 35		0 24		0 36	
Cadmium	0 19	U	0 05	U	0 20	U	0 05	U	0 05	U	0 05	U
Calcium	868	J	690	J	409	UJ	405	UJ	471	UJ	341	UJ
Chromium	16 2		10 1		25 5		5 9		10 9		8 5	
Cobalt	16 6		4 8		17 5		3 3		9 8		5 8	
Copper	16 8	U	7 4	U	25 4		4 1	U	14 3	U	5 8	U
Iron	33600		12300		38500		8740		19500		11900	
Lead	16 1		18 7		12 8		16 0		6 6		8 4	
Magnesium	3520		1200		4010		837		2340		1180	
Manganese	992		156		449		209		340		203	
Mercury	0 03	U	0 03	J	0 02	U	0 04	J	0 01	U	0 04	
Nickel	25 1		10 1		29 1		7 1		16 3		10 3	
Potassium	330		273	U	399		241	U	337		192	U
Selenium	0 42	UJ	0 44	UJ	1 7	UJ	0 42	UJ	0 44	UJ	0 44	UJ
Silver	8 5		3 4	UJ	9 7		2 7	UJ	5 2	U	3 9	UJ
Sodium	113	UJ	154	UJ	221	UJ	74 0	UJ	69 5	UJ	59 1	UJ
Thallium		R	0 43	UJ		R	0 34	U		R	0 44	UJ
Vanadium	20 0		15 7		25 4		10 7		14 6		12 7	
Zinc	62 6		28 9		175		24 3		37 7		26 9	

Soil TAL Metal Analysis (mg/kg)
Site: Old Firefighter Training Area
Case: 5278, SDG: BK11

EPA Sample Number	OFF-SO BK14-0406		OFF-SO-BK15-0002		OFF-SO-BK15-0406		OFF-SO-BK16-0002		OFF-SO-BK16-0406		OFF-SO-BK17-0002	
Station Location	OFF-SO-BK14-0406		OFF-SO-BK15-0002		OFF-SO-BK15-0406		OFF-SO-BK16-0002		OFF-SO-BK16-0406		OFF-SO BK17-0002	
Date Sampled	2/15/00		2/15/00		2/15/00		2/15/00		2/15/00		2/15/00	
Date Extracted												
Date Analyzed												
Dilution Factor	1		1		1		1		1		1	
Percent Solids	90 0		84 3		94 3		83 6		87 5		82 8	
QC Identifier	None		None		Field Dup. OFF-SO-BK15-0406		None		None		None	
Aluminum	10600		8040		15700		10300		11100		11000	
Antimony	0 31	UJ	0 31	UJ	0 25	UJ	0 62	J	0 32	UJ	0 33	UJ
Arsenic	4 7	J	2 5	J	0 39	UJ	5 5	J	3 2	J	4 4	J
Barium	16 6	J	17 3	J	8 4	J	17 3	J	15 3	J	19 1	J
Beryllium	0 43		0 46		0 28		0 39		0 32		0 37	
Cadmium	0 19	U	0 05	U	0 16	U	0 05	U	0 20	U	0 05	U
Calcium	362	UJ	331	UJ	852	J	615	J	186	UJ	807	J
Chromium	18 9		9 7		26 3		14 3		17 8		13 8	
Cobalt	16 6		5 8		14 1		6 1		14 4		7 3	
Copper	25 4		8 1	U	17 2	U	9 9	U	22 5	U	10 4	U
Iron	36600		14000		35900		16200		32800		21500	
Lead	12 6		16 2		11 6		28 0		10 1		25 5	
Magnesium	3560		1110		5080		1720		3810		2260	
Manganese	503		237		192		203		386		220	
Mercury	0 02	U	0 06		0 03	U	0 07		0 03	U	0 08	
Nickel	26 6		10 4		32 0		12 7		24 6		16 6	
Potassium	409		186	U	237	U	261	U	416		184	U
Selenium	1 7	UJ	0 42	UJ	1 4	UJ	0 48	UJ	1 7	UJ	0 45	UJ
Silver	9 6		4 0	UJ	8 6		4 3	UJ	8 2	U	5 9	U
Sodium	53 4	UJ	56 1	UJ	53 9	UJ	105	UJ	66 4	UJ	79 0	UJ
Thallium		R	0 34	U		R		R		R		R
Vanadium	23 9		13 3		19 9		18 4		19 6		22 1	
Zinc	65 5		32 1		57 2		41 8		59 4		52 5	

U - Not detected, UJ - Detection limit approximate; J - Quantitation approximate;
* - From dilution analysis; R - Rejected; EB/TB - Equipment/Trip Blank contamination

Soil TAL Metal Analysis (mg/kg)
Site: Old Firefighter Training Area
Case: 5278, SDG: BK11

EPA Sample Number	OFF-SO-BK17-0203		OFF-SO-BK18-0002		OFF-SO-BK18-0406		OFF-SO-BK19-0002		OFF-SO-BK20-0002		OFF-SO-DUP01	
Station Location	OFF-SO-BK17-0203		OFF-SO-BK18-0002		OFF-SO-BK18-0406		OFF-SO-BK19-0002		OFF-SO-BK20-0002		OFF-SO-DUP01	
Date Sampled	2/15/00		2/16/00		2/16/00		2/16/00		2/16/00		2/15/00	
Date Extracted												
Date Analyzed												
Dilution Factor	1		1		1		1		1		1	
Percent Solids	95 2		79 5		88 1		83 5		83 0		88 0	
QC Identifier	None		None		None		None		Field Dup. OFF-SO-BK20-0002		None	
Aluminum	14900		11500		11300		9940		10500		10000	
Antimony	0 28	UJ	0 34	UJ	0 33	UJ	0 32	UJ	0 28	UJ	0 29	UJ
Arsenic	0 78	J	4 3	J	15 9	J	3 3		6 2	J	21 7	J
Barium	8 7	J	39 2	J	30 0	J	23 0		27 5	J	14 0	J
Beryllium	0 21		0 69		0 49		0 48		0 57		0 35	
Cadmium	0 17	U	0 05	U	0 20	U	0 05	U	0 04	U	0 18	U
Calcium	1240	J	358	UJ	454	UJ	268	UJ	297	UJ	367	UJ
Chromium	19 5		12 8		15 8		7 5		13 4		15 6	
Cobalt	10 4		9 1		22 4		3 7		6 1		12 3	
Copper	10 1	U	13 7	U	27 9		6 1	U	8 5	U	20 8	U
Iron	33500		20600		34800		11000		15300		33900	
Lead	9 9		24 0		13 6		23 5		35 2		10 0	
Magnesium	4570		1780		3610		928		1320		2790	
Manganese	141	J	447		366		236		492		315	
Mercury	0 02	U	0 04	J	0 02	U	0 07		0 06		0 03	U
Nickel	22 5		16 9		30 2		8 5		11 9		22 6	
Potassium	241	U	302	U	366		221	U	209	U	378	
Selenium	1 5	UJ	0 46	UJ	1 8	UJ	0 44	UJ	0 38	UJ	1 6	UJ
Silver	8 3	U	5 6	U	9 0		3 4	UJ	4 1	U	8 7	
Sodium	69 9	UJ	48 6	UJ	53 0	UJ	56 0	UJ	52 9	UJ	46 9	UJ
Thallium		R	0 37	U		R	0 35	U		R		R
Vanadium	24 4		21 2		18 2		17 6		17 5		21 1	
Zinc	48 8		69 4		66 9		33 0		35 9		60 5	

U - Not detected, UJ - Detection limit approximate, J - Quantitation approximate,
* - From dilution analysis; R - Rejected; EB/TB - Equipment/Trip Blank contamination

Soil TAL Metal Analysis (mg/kg)
Site Old Firefighter Training Area
Case 5278, SDG: BK11

EPA Sample Number	OFF-SO-DUP02		OFF-SO-DUP03		OFF-SO-DUP04	
Station Location	OFF-SO-DUP02		OFF-SO-DUP03		OFF-SO-DUP04	
Date Sampled	2/15/00		2/15/00		2/16/00	
Date Extracted						
Date Analyzed						
Dilution Factor	1		1		1	
Percent Solids	87 3		92 7		82 3	
QC Identifier	None		Field Dup OFF-SO-BK15-0406		Field Dup. OFF-SO-BK20-0002	
Aluminum	9040		16100		10400	
Antimony	0 28	UJ	0 29	UJ	0 29	UJ
Arsenic	4 7	J	0 51	J	5 5	J
Barium	16 1	J	9 2	J	26 8	J
Beryllium	0 33		0 32		0 60	
Cadmium	0 17	U	0 18	U	0 05	U
Calcium	265	UJ	1010	J	304	UJ
Chromium	16 8		19 3		12 1	
Cobalt	14 4		15 0		5 8	
Copper	20 5	U	20 4	U	8 0	U
Iron	32100		36800		14500	
Lead	9 7		14 0		32 5	
Magnesium	2540		5160		1280	
Manganese	414		219		470	
Mercury	0 02	U	0 03	U	0 04	J
Nickel	24 4		31 5		11 7	
Potassium	411		275	U	207	U
Selenium	1 5	UJ	1 6	UJ	0 40	UJ
Silver	8 2	U	9 2		4 2	U
Sodium	52 3	UJ	61 7	UJ	43 0	UJ
Thallium		R		R		R
Vanadium	21 3		20 3		17 6	
Zinc	58 4		58 6		34.5	

Aqueous TAL Metal Analysis (ug/l)
Site. Old Firefighter Training Area
Case 5278, SDG. BK11

EPA Sample Number	OFF-BK-FB01		OFF-BK-RB01	
Station Location	OFF-BK-FB01		OFF-BK-RB01	
Date Sampled	2/16/00		2/16/00	
Date Extracted				
Date Analyzed				
Dilution Factor	1		1	
Percent Solids	0 0		0 0	
QC Identifier	Field Blank		Rinsate Blank	
Aluminum	97 8	U	50 0	UJ
Antimony	2 2	U	2 2	U
Arsenic	3 4	U	3 4	U
Barium	11 4	U	6 6	UJ
Beryllium	0 66	U	0 66	U
Cadmium	0 34	U	0 34	U
Calcium	21700		501	U
Chromium	6 2	U	6 2	U
Cobalt	6 2	U	6 2	U
Copper	23 9		5 4	U
Iron	307		27 5	U
Lead	1 4	U	1 4	U
Magnesium	3480		117	U
Manganese	21 4	UJ	3 9	U
Mercury	0 07	U	0 07	U
Nickel	6 0	U	6 0	U
Potassium	3310		209	U
Selenium	12 0	UJ	3 0	UJ
Silver	3 9	U	3 9	U
Sodium	32300		366	U
Thallium	2 4	U	3 0	UJ
Vanadium	5 7	U	5 7	U
Zinc	31 5		17 8	U

APPENDIX B

STATISTICAL ANALYSIS TABLES

TABLE B-1
STATISTICAL DISTRIBUTION OF AREAS C AND D SURFACE SOIL DATA
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

Substance	Number of Sample Results	Degrees of Freedom	Statistical Distribution of Data	Results of Shapiro-Wilk or Shapiro-Francia Distribution Tests			Standard Deviation or Log Standard Deviation	Arithmetic Mean of All Site Results	Maximum Positive Site Concentration
				W-norm	W-lognorm	W-Table			
Aluminum	17	16	normal	0.9756	0.9248	0.892	1690	8896	11900
Antimony	17	16	nonparametric	0.6552	0.6854	0 892	0 526	0 258	0 67
Arsenic	17	16	normal	0.9479	0.9458	0 892	1.15	3.49	5 50
Barium	17	16	lognormal	0 9719	0.9746	0.892	0.357	21 5	38 10
Beryllium	17	16	normal	0 974	0.9704	0 892	0.0836	0 289	0 46
Cadmium	17	16	nonparametric	0.2615	0 2615	0 892	0.808	0 0647	0 70
Calcium	17	16	lognormal	0.8102	0.9358	0 892	0 867	364.76	1060 00
Chromium	17	16	lognormal	0 9418	0.9737	0 892	0 389	10 75	19 20
Cobalt	17	16	lognormal	0.953	0.9758	0 892	0.298	5 5	9 60
Copper	17	16	lognormal	0 7142	0.9726	0 892	0.688	8 76	33 90
Iron	17	16	lognormal	0.9325	0.9559	0 892	0.346	13127	22900
Lead	17	16	nonparametric	0.3178	0.78	0 892	1 03	71 64	798 00
Magnesium	17	16	lognormal	0.9242	0.9566	0 892	0.315	1331	2260
Manganese	17	16	lognormal	0.8729	0.9481	0 892	0.252	244.47	420 00
Mercury	17	16	lognormal	0.926	0.9272	0 892	0.709	0 0644	0.14
Nickel	17	16	lognormal	0.9223	0.9733	0 892	0.306	10 49	18 50
Potassium	17	16	nonparametric	0.7872	0.8502	0 892	0.426	147 18	312 00
Vanadium	17	16	normal	0.9713	0.9448	0.892	3 99	15.41	23 40
Zinc	17	16	nonparametric	0.4564	0.7929	0 892	0.557	46	225 00

Notes:

Units are mg/kg.
Number of sample results excludes rejected data or blank-qualified data. Duplicates are consolidated into one result.
Statistical distribution of data is determined using Shapiro-Wilk test for n <= 50, Shapiro-Francia test for n > 50. Statistical significance level is 0.05.
A normal distribution is assumed if the test statistic W-norm. is >= than the reference value (W-table), and W-norm > W-lognorm.
A lognormal distribution is assumed if the test statistic W-lognorm. is >= the reference value (W-table), and W-lognorm. >= W-norm.
A nonparametric distribution is assumed if neither distribution passes Shapiro test.
Arithmetic mean may include positive detections and non-detected results (detection limits are divided by two).

TABLE B-2
STATISTICAL DISTRIBUTION OF AREAS C AND D SUBSURFACE SOIL DATA
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

Substance	Number of Sample Results	Number of Site Results	Statistical Distribution of Data	Results of Shapiro-Wilk or Shapiro-Francia Distribution Tests			Standard Deviation or Log Standard Deviation	Arithmetic Mean of All Site Results	Maximum Positive Site Concentration
				W-norm	W-lognorm	W-Table			
Aluminum	16	15	lognormal	0.9575	0.9784	0.887	0.192	11400	16100
Antimony	16	15	nonparametric	0.3733	0.4538	0.887	0.261	0.168	0 42
Arsenic	16	15	lognormal	0.5846	0.8925	0.887	1.22	9 65	84 9
Barium	16	15	normal	0.9715	0.9363	0.887	3.58	14.8	21 4
Beryllium	16	15	nonparametric	0.6783	0.7897	0 887	0.339	0 307	1 1
Calcium	16	15	lognormal	0.6939	0.8937	0 887	0.902	325	1240
Chromium	16	15	normal	0.9617	0.9608	0.887	4.04	16 8	26.3
Cobalt	16	15	normal	0.9339	0 9093	0 887	2.95	14.9	29 2
Copper	16	15	normal	0.9227	0 8926	0 887	7.46	17.4	32.9
Iron	16	15	normal	0 9363	0.9143	0.887	7250	33400	67300
Lead	16	15	normal	0.9702	0.9536	0 887	2.47	11	16.1
Magnesium	16	15	lognormal	0.9334	0.9599	0 887	0 234	3570	5270
Manganese	16	15	lognormal	0 8071	0.9315	0 887	0 43	405	992
Nickel	16	15	normal	0.9787	0.9606	0 887	5 13	25 3	48 9
Potassium	16	15	nonparametric	0 8741	0.7513	0 887	129	350	539
Silver	16	15	normal	0 9244	0.8542	0.887	2.87	7 55	16 7
Vanadium	16	15	normal	0.9459	0.9371	0 887	2 91	20 7	28 7
Zinc	16	15	nonparametric	0.655	0 8337	0.887	0.363	67 6	175

Notes:

Units are mg/kg.
Number of sample results excludes rejected data or blank-qualified data Duplicates are consolidated into one result.
Statistical distribution of data is determined using Shapiro-Wilk test for n <= 50, Shapiro-Francia test for n > 50. Statistical significance level is 0.05
A normal distribution is assumed if the test statistic W-norm. is >= than the reference value (W-table), and W-norm. > W-lognorm.
A lognormal distribution is assumed if the test statistic W-lognorm. is >= the reference value (W-table), and W-lognorm. >= W-norm.
A nonparametric distribution is assumed if neither distribution passes Shapiro test.
Arithmetic mean may include positive detections and non-detected results (detection limits are divided by two).

TABLE B-3

TESTS TO EVALUATE IF SUBSURFACE SOIL LEVELS ARE GREATER THAN SURFACE IN AREAS C AND D

OFFTA SITE BACKGROUND SOIL INVESTIGATION

NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

[illegible] Question Posed:		Detection Freq. Z or Fisher: SB Freq > SS Freq ?				Upper Ranks: Majority are SB?				Mann-Whitney/Gehan: Ranks of SB > SS?				Student's or Satterthwaite T-test: SB Mean > SS Mean ?					Bartlett's Test for Equal Standard Deviations: SB Standard Deviation = SS Std.Dev.?						
ASBumptions Valid: Test Criterion.		#ND & Pos >=5 or use Fisher P value <= 0 05 ?				# SB spls (s) in Top r P<=0 05 that #s>=k				<40% ND or use Gehan P value <=0 05 ?				#s>2,#b>2,>=85% Pos, both norm/log t-Value > t-Table					#s>2,#b>2, SB & SS both normal or both lognorm F-Value<=F-Table (Students T) If not, Satterthwaite						
Substance	Conclusion: SB > SS? YN	SS Freq	SB Freq	P Value	YN	r	k	P Value	YN	P Value	Test	Used	YN	SS Mean@	SB Mean@	t Value	t Table	YN	SS Distrib	SB Distrib	Std Dev SS@	Std Dev SB@	F Value	F Table	YN
Aluminum	Y	17/17	16/16		NA	21	14	0 0072	Y	0 0010			Y	9 0744	9 32	3 5603	1 6955	Y	lognor	lognor	0 208	0 192	0 0890	3 8433	Y
Antimony	N	5/17	1/16	0 9888	N	4	1	0 9418	N	0 9647	Gehan	Test	N	0 2582	0 168			NA	nonpar	nonpar					NA
Arsenic	Y	17/17	16/16		NA	14	10	0 0272	Y	0 0386			Y	1 1974	1 55	1 0974	1 7396	N	lognor	lognor	0 344	1 22	20 1060	3 8433	N
Barium	N	17/17	16/16		NA	23	9	0 9789	N	0 9987			N	21 476	14 8	-3 3576	1 7139	N	normal	normal	7 29	3 58	6 9339	3 8433	N
Beryllium	N	6/17	9/16	0 1953	N	1	1	0 4848	N	0 3847	Gehan	Test	N	0 2885	0 307			NA	normal	nonpar					NA
Calcium	N	5/17	3/16		NA	5	3	0 4697	N	0 6778	Gehan	Test	N	364 76	325			NA	lognor	lognor					NA
Chromium	Y	17/17	16/16		NA	22	16	0 0001	Y	0 0002			Y	10 753	16 8	4 3049	1 6955	Y	normal	normal	4 09	4 04	0 0027	3 8433	Y
Cobalt	Y	17/17	16/16		NA	16	16	< 0001	Y	< 0001			Y	5 5	14 9	11 2514	1 7139	Y	normal	normal	1 65	2 95	4 8967	3 8433	N
Copper	Y	11/17	11/16		NA	6	5	0 0743	N	0 0009	Gehan	Test	Y	8 7559	17 4			NA	lognor	normal					NA
Iron	Y	17/17	16/16		NA	20	16	< 0001	Y	< 0001			Y	13127	33400	9 7316	1 6955	Y	normal	normal	4440	7250	3 5005	3 8433	Y
Lead	N	17/17	16/16		NA	23	8	0 9978	N	0 9999			N	71 635	11			NA	nonpar	normal					NA
Magnesium	Y	17/17	16/16		NA	16	16	< 0001	Y	< 0001			Y	7 1469	8 15	10 3761	1 6955	Y	lognor	lognor	0 315	0 234	1 2894	3 8433	Y
Manganese	Y	17/17	16/16		NA	20	14	0 0028	Y	0 0006			Y	5 4677	5 92	3 6474	1 7139	Y	lognor	lognor	0 252	0 43	4 1513	3 8433	N
Nickel	Y	17/17	16/16		NA	18	16	< 0001	Y	< 0001			Y	10 494	25 3	9 8648	1 6955	Y	normal	normal	3 32	5 13	2 7729	3 8433	Y
Potassium	Y	5/17	13/16	0 0036	Y	13	13	< 0001	Y	< 0001	Gehan	Test	Y	147 18	350			NA	nonpar	nonpar					NA
Silver	Y	0/17	12/16		NA	8	8	0 0009	Y				NA	1 8676	7 55			NA							NA
Vanadium	Y	17/17	16/16		NA	19	15	< 0001	Y	0 0001			Y	15 412	20 7	4 3522	1 6955	Y	normal	normal	3 99	2 91	1 4692	3 8433	Y
Zinc	Y	17/17	16/16		NA	22	16	0 0001	Y	0 0001			Y	46	67 6			NA	nonpar	nonpar					NA

Units are mg/kg.

A statistical significance level (P value) of 0 05 is used for all tests that directly compare SB to SS A two-sided significance level of 0 1 is used for Bartlett's test for equal variance

For each test, a YES or NO decision is presented only if all aSBumptions are met. The overall decision (is SB > SS) for each chemical appears at the left and is based on four criteria

(1) Overall decision is YES if any one of the Mann-Whitney/Gehan, Upper Ranks Test, or T-Test is YES, regardless of other test results

(2) Overall decision is NO if at least one of Mann-Whitney/Gehan, Upper Ranks Test, or T-Test is NO, and none of the aforementioned tests are YES

(3) Overall decision is YES/NO if Z/Fisher Test is YES/NO, respectively, and other tests are NA Z-test is treated as lowest priority since it relies on detection frequency, not magnitude of results

(4) Overall decision is NA if all tests are NA (Chemicals assigned NA are still included in human health risk-based screening and/or risk assessment)

SS and SB	SS = surface soil levels, SB = subsurface soil levels
# NDs or # Pos	Number of non-detected (ND) or positive (Pos) results in data set, not including rejected data or blank-qualified data
# s or # b	Number of SB (s) or SS (b) samples, not including rejected data or blank-qualified data
s = b	Standard deviation of SB results must not be different from the standard deviation of SS results
P value	Probability or significance level is defined as the chance of a false positive If P <= 0 05 then test determines SB > SS with 95 % confidence
% ND	Mann-Whitney test used if < 40% of data Non-Detected and detect limits uniformly below the range of positive values If not, the Gehan Test is used

TABLE B-3
TESTS TO EVALUATE IF SUBSURFACE SOIL LEVELS ARE GREATER THAN SURFACE IN AREAS C AND D
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

@	Mean and standard deviations are shown of log-transformed data when distributions are of this type; ie , if SB and SS distributions both match lognormal, and both T-test and Bartlett's test are applicable. (Arithmetic mean and normal standard deviation are shown only for illustration in the event that these tests are NA)
r,k	The upper ranks test calculates the probability that k or more samples from the top r ranks of the combined SB and SS data set are comprised of I data if both populations are in fact equal

TABLE B-4
TESTS TO EVALUATE IF SURFACE SOIL LEVELS ARE GREATER THAN SUBSURFACE IN AREAS C AND D
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

Question Posed:	Detection Freq. Z or Fisher: SS Freq > SB Freq ?				Upper Ranks: Majority are SS?				Mann-Whitney/Gehan: Ranks of SS > SB?				Student's or Satterthwaite T-test: SS Mean > SB Mean ?					Bartlett's Test for Equal Standard Deviations: SS Standard Deviation = SB Std Dev.?					
Assumptions Valid:	#ND & Pos >=5 or use Fisher				# SS spls (s) in Top r				<40% ND or use Gehan				#s>2,#b>2,>=85% Pos, both norm/log					#s>2,#b>2, SS & SB both normal or both lognorm					
Test Criterion:	P value <= 0 05 ?				P<=0 05 that #s>=k				P value <=0 05 ?				t-Value > t-Table					F-Value<=F-Table (Students T) If not Satterthwaite					
Conclusion: SS > SB? YN	SB Freq	SS Freq	P Value	YN	r	k	P Value	YN	P Value	Test	Used	YN	SB Mean@	SS Mean@	t Value	t Table	YN	SB Distrib	SS Distrib	Std Dev SB@	Std Dev SS@	F Value	F Table	YN
Substance																								
Aluminum	N	16/16	17/17		NA	6	1	0 9928	N	0 9991			N	11400	8895 9	-3 6409	1 6955	N	normal	normal	2220	1690	1 1338	3 8433	Y
Antimony	N	1/16	5/17	0 1006	N	6	5	0 1006	N	0 0400	Gehan	Test	Y	0 168	0 2582			NA	nonpar	nonpar					NA
Arsenic	N	16/16	17/17		NA	22	10	0 9129	N	0 9644			N	1 55	1 1974	-1 0974	1 7396	N	lognor	lognor	1 22	0 344	20 1060	3 8433	N
Barium	N	16/16	17/17		NA	18	14	0 0013	Y	0 0014			Y	2 67	3 0099	3 1475	1 6955	Y	lognor	lognor	0 261	0 357	1 4426	3 8433	Y
Beryllium	N	9/16	6/17	0 9404	N				NA	0 5334	Gehan	Test	N	0 307	0 2885			NA	nonpar	normal					NA
Cadmium	N	0/16	1/17		NA	1	1	0 5152	N				NA		0 0647			NA							NA
Calcium	N	3/16	5/17		NA	6	3	0 7022	N	0 3397	Gehan	Test	N	325	364 76			NA	lognor	lognor					NA
Chromium	N	16/16	17/17		NA	7	2	0 9655	N	0 9998			N	2 8	2 3062	-4 3092	1 6955	N	lognor	lognor	0 243	0 389	3 1725	3 8433	Y
Cobalt	N	16/16	17/17		NA	24	8	1 0000	N	1 0000			N	2 68	1 6633	-11 3219	1 6955	N	lognor	lognor	0 209	0 298	1 8178	3 8433	Y
Copper	N	11/16	11/17		NA	1	1	0 5152	N	0 9992	Gehan	Test	N	17 4	8 7559			NA	normal	lognor					NA
Iron	N	16/16	17/17		NA	16	2	1 0000	N	1 0000			N	10 4	9 428	-9 3712	1 6955	N	lognor	lognor	0 229	0 346	2 4933	3 8433	Y
Lead	N	16/16	17/17		NA	19	15	0 0003	Y	0 0001			Y	11	71 635			NA	normal	nonpar					NA
Magnesium	N	16/16	17/17		NA	13		1 0000	N	1 0000			N	8 15	7 1469	-10 3761	1 6955	N	lognor	lognor	0 234	0 315	1 2894	3 8433	Y
Manganese	N	16/16	17/17		NA	23	9	0 9956	N	0 9995			N	5 92	5 4677	-3 6474	1 7139	N	lognor	lognor	0 43	0 252	4 1513	3 8433	N
Mercury	N	0/16	15/17	<.0001	Y	15	15	< 0001	Y				NA		0 0644			NA							NA
Nickel	N	16/16	17/17		NA	15	1	1 0000	N	1 0000			N	3 21	2 3063	-9 8010	1 6955	N	lognor	lognor	0 211	0 306	2 0175	3 8433	Y
Potassium	N	13/16	5/17	0 9997	N	14	1	1 0000	N	1 0000	Gehan	Test	N	350	147 18			NA	nonpar	nonpar					NA
Vanadium	N	16/16	17/17		NA	7	2	0 9655	N	0 9999			N	20 7	15 412	-4 3522	1 6955	N	normal	normal	2 91	3 99	1 4692	3 8433	Y
Zinc	N	16/16	17/17		NA	1	1	0 5152	N	0 9999			N	67 6	46			NA	nonpar	nonpar					NA

Units are mg/kg

A statistical significance level (P value) of 0 05 is used for all tests that directly compare SS to SB A two-sided significance level of 0 1 is used for Bartlett's test for equal variance

For each test, a YES or NO decision is presented only if all assumptions are met The overall decision (is SS > SB) for each chemical appears at the left and is based on four criteria

(1) Overall decision is YES if any one of the Mann-Whitney/Gehan, Upper Ranks Test, or T-Test is YES, regardless of other test results

(2) Overall decision is NO if at least one of Mann-Whitney/Gehan, Upper Ranks Test, or T-Test is NO, and none of the aforementioned tests are YES

(3) Overall decision is YES/NO if Z/Fisher Test is YES/NO, respectively, and other tests are NA Z-test is treated as lowest priority since it relies on detection frequency, not magnitude of results

(4) Overall decision is NA if all tests are NA (Chemicals assigned NA are still included in human health risk-based screening and/or risk assessment)

SS and SB	SS = surface soil levels, SB = subsurface soil levels
# NDs or # Pos.	Number of non-detected (ND) or positive (Pos) results in data set, not including rejected data or blank-qualified data
# s or # b	Number of SS (s) or SB (b) samples, not including rejected data or blank-qualified data.
s = b	Standard deviation of SS results must not be different from the standard deviation of SB results
P value	Probability or significance level is defined as the chance of a false positive If P <= 0 05 then test determines SS > SB with 95 % confidence

TABLE B-4
TESTS TO EVALUATE IF SURFACE SOIL LEVELS ARE GREATER THAN SUBSURFACE IN AREAS C AND D
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

% ND	Mann-Whitney test used if < 40% of data Non-Detected and detect. limits uniformly below the range of positive values If not, the Gehan Test is used
@	Mean and standard deviations are shown of log-transformed data when distributions are of this type, ie , if SS and SB distributions both match lognormal, and both T-test and Bartlett's test are applicable (Arithmetic mean and normal standard deviation are shown only for illustration in the event that these tests are NA)
r,k	The upper ranks test calculates the probability that k or more samples from the top r ranks of the combined SS and SB data set are comprised of I data if both populations are in fact equal

TABLE B-5
SUBSURFACE SOIL UTL TEST FOR AREA I (I) CONCENTRATIONS VERSUS AREAS C AND D (CD)
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

Name of Test:	95 % Upper Tolerance Limit (UTL)							
Question Posed:	Area I Maximum > UTL for Areas C & D Data ?							
Assumptions Valid:	Areas C & D data must fit lognormal or normal shape							
Test Criterion.	Area I Concentration > Areas C & D 95% UTL?							
Constituents Subsurface > UTL? Y/N	Areas C & D	Area I	Mean or Log	Std. Deviation	L,N	t	Areas C & D	Area I
Substance	Detect Freq.	Detect Freq.	Mean	or Log S.D	Q	Value	UTL	Maximum
Aluminum N	16/16	1/1	9.32	0 192	L	1 7531	15800	11300
Arsenic N	16/16	1/1	1 55	1 22	L	1 7531	42 8	15 9
Barium Y	16/16	1/1	14 8	3 58	N	1 7531	21 3	30
Beryllium NA	9/16	1/1	0 307					0 49
Chromium N	16/16	1/1	16 8	4 04	N	1 7531	24 1	15 8
Cobalt Y	16/16	1/1	14 9	2.95	N	1 7531	20 3	22 4
Copper N	11/16	1/1	17.4	7 46	N	1 7531	30 9	27 9
Iron N	16/16	1/1	33400	7250	N	1 7531	46400	34800
Lead N	16/16	1/1	11	2 47	N	1.7531	15 4	13 6
Magnesium N	16/16	1/1	8 15	0 234	L	1 7531	5310	3610
Manganese N	16/16	1/1	5.92	0 43	L	1 7531	808	366
Nickel N	16/16	1/1	25 3	5 13	N	1 7531	34 5	30 2
Potassium NA	13/16	1/1	350					366
Silver N	12/16	1/1	7 55	2 87	N	1 7531	12 7	9
Vanadium N	16/16	1/1	20 7	2 91	N	1 7531	26	18 2
Zinc NA	16/16	1/1	67 6					66 9

Units are mg/kg.

L, N, or Q UTL is based on 95 % upper limit (using t-value) when data are lognormal (L) or normal (N). Otherwise, an upper 95 % quantile (Q) is used if there are > 18 Area C and D points.

TABLE B-6
SURFACE SOIL EVALUATION TO DETERMINE IF AREA I (I) CONCENTRATIONS ARE ELEVATED ABOVE AREAS C AND D (CD)
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

Conclusion: I > CD?		Z or Fisher: I > CD ?				Upper Ranks: Majority are I ?				Mann-Whitney/Gehan: Ranks of I > CD?				Student's or Satterthwaite T-test: I Mean > CD Mean ?					Bartlett's Test for Equal Standard Deviations: I Standard Deviation > CD Std.Dev.?					
Assumptions Valid. Test Criterion		#ND & Pos >=5 or use Fisher P value <= 0 05 ?				# I spls (s) in Top r P<=0 05 that #s>=k				<40% ND or use Gehan P value <=0 05 ?				#s>2,#b>2,>=85% Pos, both norm/log t-Value > t-Table					#s>2,#b>2, I & CD both normal or both lognorm F-Value<=F-Table (Students T) If not, Satterthwaite					
Substance		CD Freq	I Freq	P Value	YN	r	k	P Value	YN	P Value	Test	Used	YN	CD Mean@	I Mean@	t Value	t Table	YN	CD Distrib	I Distrib	Std Dev CD@	Std Dev I@	F Value	F Table	YN
Aluminum	Y	17/17	3/3		NA	8	3	0 0491	Y	0 0451			Y	9 0744	9 2696	1 5806	1 7341	N	lognor	lognor	0 208	0 0741	1 9788	3 9200	Y
Arsenic	N	17/17	3/3		NA	11	3	0 1447	N	0 1017			N	1 1974	1 473	1 3017	1 7341	N	lognor	lognor	0 344	0 287	0 0918	3 9200	Y
Barium	N	17/17	3/3		NA	9	3	0 0737	N	0 0691			N	3 0099	3 3685	1 6437	1 7341	N	lognor	lognor	0 357	0 273	0 1893	3 9200	Y
Beryllium	Y	6/17	3/3	0 0737	N	1	1	0 1500	N	< 0001	Gehan	Test	Y	0 2885	0 585			NA	normal	normal					NA
Chromium	N	17/17	3/3		NA	7	2	0 2702	N	0 4369			N	10 753	11 017			NA	lognor	nonpar					NA
Cobalt	N	17/17	3/3		NA	2	1	0 2842	N	0 3359			N	1 6633	1 7667	0 5185	1 7341	N	lognor	lognor	0 298	0 45	0 6413	3 9200	Y
Iron	N	17/17	3/3		NA	7	2	0 2702	N	0 2983			N	9 428	9 6159	0 8759	1 7341	N	lognor	lognor	0 346	0 314	0 0277	3 9200	Y
Lead	N	17/17	3/3		NA	14	3	0 3193	N	0 5421			N	71 635	27 117			NA	nonpar	lognor					NA
Magnesium	N	17/17	3/3		NA	9	2	0 4211	N	0 4368			N	7 1469	7 1625	0 0791	1 7341	N	lognor	lognor	0 315	0 326	0 0035	3 9200	Y
Manganese	Y	17/17	3/3		NA	2	2	0 0158	Y	0 0451			Y	5 4677	5 9141	2 6329	1 7341	Y	lognor	lognor	0 252	0 392	0 7471	3 9200	Y
Mercury	N	15/17	3/3	0 7158	N	17	3	0 5965	N	0 6255			N	-2 9411	-2 958	-0 0399	1 7341	N	lognor	lognor	0 709	0 282	1 6619	3 9200	Y
Nickel	N	17/17	3/3		NA	7	2	0 2702	N	0 2626			N	2 3063	2 4785	0 8859	1 7341	N	lognor	lognor	0 306	0 344	0 0434	3 9200	Y
Vanadium	Y	17/17	3/3		NA	7	3	0 0307	Y	0 0561			N	15 412	18 783			NA	normal	nonpar					NA
Zinc	N	17/17	3/3		NA	13	3	0 2509	N	0 2293			N	46	45 867			NA	nonpar	lognor					NA

Units are mg/kg

A statistical significance level (P value) of 0 05 is used for all tests that directly compare I to CD A two-sided significance level of 0 1 is used for Bartlett's test for equal variance

For each test, a YES or NO decision is presented only if all assumptions are met The overall decision (is I > CD) for each chemical appears at the left and is based on four criteria

(1) Overall decision is YES if any one of the Mann-Whitney/Gehan, Upper Ranks Test, or T-Test is YES, regardless of other test results

(2) Overall decision is NO if at least one of Mann-Whitney/Gehan, Upper Ranks Test, or T-Test is NO, and none of the aforementioned tests are YES

(3) Overall decision is YES/NO if Z/Fisher Test is YES/NO, respectively, and other tests are NA Z-test is treated as lowest priority since it relies on detection frequency, not magnitude of results

(4) Overall decision is NA if all tests are NA (Chemicals assigned NA are still included in human health risk-based screening and/or risk assessment)

# NDs or # Pos	Number of non-detected (ND) or positive (Pos) results in data set, not including rejected data or blank-qualified data
# s or # b	Number of I (s) or CD (b) samples, not including rejected data or blank-qualified data
s = b	Standard deviation of I results must not be different from the standard deviation of CD results
P value	Probability or significance level is defined as the chance of a false positive If P <= 0 05 then test determines I > CD with 95 % confidence
% ND	Mann-Whitney test used if < 40% of data Non-Detected and detect limits uniformly below the range of positive values If not, the Gehan Test is used
@	Mean and standard deviations are shown of log-transformed data when distributions are of this type, ie , if I and CD distributions both match lognormal, and both T-test and Bartlett's test are applicable (Arithmetic mean and normal standard deviation are shown only for illustration in the event that these tests are NA)
r,k	The upper ranks test calculates the probability that k or more samples from the top r ranks of the combined I and CD data set are comprised of I data if both populations are in fact equal

TABLE B-7
SURFACE SOIL EVALUATION TO DETERMINE IF AREAS C AND D (CD) CONCENTRATIONS ARE ELEVATED ABOVE AREA I (I)
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

Question Posed:	Z/Fisher Test: Are CD Freq > I Freq?				Upper Ranks Test: Majority are CD?				Mann-Whitney/Gehan: Ranks of CD > I?				Student's or Satterthwaite T-test: CD Mean > I Mean?					Bartlett's Test for Equal Standard Deviations: CD Standard Deviation = I Std Dev.?					
Assumptions Valid: Test Criterion.	#ND & Pos >=5 or use Fisher P value <= 0 05 ?				# CD spls (s) in Top r P<=0 05 that #s>=k				<40% ND or use Gehan P value <=0 05 ?				#s>2,#b>2,>=85% Pos, both norm/log t-Value > t-Table					#s>2,#b>2, CD & I both normal or both lognorm F-Value<=F-Table (Students T) If not, Satterthwaite					
Conclusion: CDs > I? YN	I Freq	CD Freq	P Value	YN	r	k	P Value	YN	P Value	Test	Used	YN	I Mean[@]	CD Mean[@]	t Value	t Table	YN	I Distrib	CD Distrib	Std Dev I[@]	Std Dev CD[@]	F Value	F Table	YN
Substance																								
Aluminum	N	3/3	17/17		NA	1	1	0 8500	N	0 9641			N	10630	8895 9	-1 7185	1 7341	N	normal	normal	795	1690	1 1850	3 9200	Y
Antimony	N	0/3	5/17	0 3991	N	5	5	0 3991	N				NA	0 1575	0 2582			NA							NA
Arsenic	N	3/3	17/17		NA	6	5	0 7982	N	0 9158			N	4 4833	3 4941	-1 3581	1 7341	N	normal	normal	1 28	1 15	0 0413	3 9200	Y
Barium	N	3/3	17/17		NA	6	5	0 7982	N	0 9439			N	3 3685	3 0099	-1 6437	1 7341	N	lognor	lognor	0 273	0 357	0 1893	3 9200	Y
Beryllium	N	3/3	6/17	1 0000	N				NA	1 0000	Gehan	Test	N	0 585	0 2885			NA	normal	normal					NA
Cadmium	N	0/3	1/17	0 8500	N	1	1	0 8500	N				NA	0 0242	0 0647			NA							NA
Calcium	N	0/3	5/17		NA	4	4	0 4912	N				NA	154 42	364 76			NA							NA
Chromium	N	3/3	17/17		NA	5	5	0 3991	N	0 6044			N	11 017	10 753			NA	nonpar	lognor					NA
Cobalt	N	3/3	17/17		NA	16	14	0 5088	N	0 7018			N	1 7667	1 6633	-0 5185	1 7341	N	lognor	lognor	0 45	0 298	0 6413	3 9200	Y
Copper	N	0/3	11/17	0 0737	N	1	1	0 8500	N				NA	4 675	8 7559			NA							NA
Iron	N	3/3	17/17		NA	15	13	0 6009	N	0 7374			N	9 6159	9 428	-0 8759	1 7341	N	lognor	lognor	0 314	0 346	0 0277	3 9200	Y
Lead	N	3/3	17/17		NA	12	11	0 3439	N	0 5000			N	27 117	71 635			NA	lognor	nonpar					NA
Magnesium	N	3/3	17/17		NA	16	14	0 5088	N	0 6045			N	7 1625	7 1469	-0 0791	1 7341	N	lognor	lognor	0 326	0 315	0 0035	3 9200	Y
Manganese	N	3/3	17/17		NA	11	9	0 8553	N	0 9641			N	5 9141	5 4677	-2 6329	1 7341	N	lognor	lognor	0 392	0 252	0 7471	3 9200	Y
Mercury	N	3/3	15/17	1 0000	N	5	5	0 3991	N	0 4155			N	-2 958	-2 9411	0 0399	1 7341	N	lognor	lognor	0 282	0 709	1 6619	3 9200	Y
Nickel	N	3/3	17/17		NA	15	13	0 6009	N	0 7708			N	2 4785	2 3063	-0 8859	1 7341	N	lognor	lognor	0 344	0 306	0 0434	3 9200	Y
Potassium	N	0/3	5/17	0 3991	N	1	1	0 8500	N				NA	121 83	147 18			NA							NA
Vanadium	N	3/3	17/17		NA	2	2	0 7158	N	0 9549			N	18 783	15 412			NA	nonpar	normal					NA
Zinc	N	3/3	17/17		NA	8	7	0 6561	N	0 8014			N	45 867	46			NA	lognor	nonpar					NA

Units are mg/kg.

A statistical significance level (P value) of 0 05 is used for all tests that directly compare CD to I A two-sided significance level of 0 1 is used for Bartlett's test for equal variance

For each test, a YES or NO decision is presented only if all assumptions are met The overall decision (is CD > I) for each chemical appears at the left and is based on four criteria

(1) Overall decision is YES if any one of the Mann-Whitney/Gehan, Upper Ranks Test, or T-Test is YES, regardless of other test results

(2) Overall decision is NO if at least one of Mann-Whitney/Gehan, Upper Ranks Test, or T-Test is NO, and none of the aforementioned tests are YES

(3) Overall decision is YES/NO if Z/Fisher Test is YES/NO, respectively, and other tests are NA Z-test is treated as lowest priority since it relies on detection frequency, not magnitude of results

(4) Overall decision is NA if all tests are NA (Chemicals assigned NA are still included in human health risk-based screening and/or risk assessment)

# NDs or # Pos	Number of non-detected (ND) or positive (Pos) results in data set, not including rejected data or blank-qualified data
# s or # b	Number of CD (s) or I (b) samples, not including rejected data or blank-qualified data
s = b	Standard deviation of CD results must not be different from the standard deviation of I results
P value	Probability or significance level is defined as the chance of a false positive If P <= 0 05 then test determines CD > I with 95 % confidence
% ND	Mann-Whitney test used if < 40% of data Non-Detected and detect limits uniformly below the range of positive values If not, the Gehan Test is used

TABLE B-7
SURFACE SOIL EVALUATION TO DETERMINE IF AREAS C AND D (CD) CONCENTRATIONS ARE ELEVATED ABOVE AREA I (I)
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

@	Mean and standard deviations are shown of log-transformed data when distributions are of this type, ie , if CD and I distributions both match lognormal, and both T-test and Bartlett's test are applicable (Arithmetic mean and normal standard deviation are shown only for illustration in the event that these tests are NA)
r,k	The upper ranks test calculates the probability that k or more samples from the top r ranks of the combined CD and I data set are comprised of I data if both populations are in fact equal.

TABLE B-8
OCCURRENCE AND DISTRIBUTION OF METALS IN BACKGROUND SURFACE SOIL
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

	Areas C and D Background Surface Soil Data								
Chemical	Frequency of Detection	Minimum Detected Concentration	Minimum Qualifier	Maximum Detected Concentration	Maximum Qualifier	Mean of All Data	Location of Maximum Concentration	Minimum Detection Limit	Maximum Detection Limit
Aluminum	17/17	5000		11900		8896	OFF-SO-BK02-0002	N/A	N/A
Antimony	5/17	0.34	J	0.67	J	0.26	OFF-SO-BK03-0002	0 31	0 34
Arsenic	17/17	1.8	J	5.5	J	3 49	OFF-SO-BK16-0002	N/A	N/A
Barium	17/17	9.2		38.1		21 48	OFF-SO-BK07-0002	N/A	N/A
Beryllium	6/17	0.35		0.46		0.29	OFF-SO-BK15-0002	0 28	0 61
Cadmium	1/17	0.7	J	0.7	J	0.06	OFF-SO-BK08-0002	0.05	0 05
Calcium	5/17	615	J	1060		364.76	OFF-SO-BK11-0002	115	686
Chromium	17/17	4.3		19.2		10.75	OFF-SO-BK02-0002	N/A	N/A
Cobalt	17/17	3.2		9.6		5 50	OFF-SO-BK02-0002	N/A	N/A
Copper	11/17	3.5		33.9		8.76	OFF-SO-BK08-0002	4.1	10 4
Iron	17/17	5540	J	22900	J	13127	OFF-SO-BK02-0002	N/A	N/A
Lead	17/17	6.1		798		71.64	OFF-SO-BK10-0002	N/A	N/A
Magnesium	17/17	725		2260		1331	OFF-SO-BK17-0002	N/A	N/A
Manganese	17/17	156		420		244 47	OFF-SO-BK07-0002	N/A	N/A
Mercury	15/17	0.03	J	0.14		0 06	OFF-SO-BK03-0002	0 02	0 03
Nickel	17/17	5 6	J	18 5	J	10 49	OFF-SO-BK02-0002	N/A	N/A
Potassium	5/17	177		312	J	147 18	OFF-SO-BK11-0002	169	273
Vanadium	17/17	7.4		23.4		15 41	OFF-SO-BK02-0002	N/A	N/A
Zinc	17/17	14.6	J	225	J	46.00	OFF-SO-BK08-0002	N/A	N/A

Notes:

Units are mg/kg.
Number of sample results excludes rejected data or blank-qualified data. Duplicates are consolidated into one result.
Mean of all data includes positive detections and non-detected results. Detection limits are divided by two.
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 B-9
OCCURRENCE AND DISTRIBUTION OF METALS IN BACKGROUND SUBSURFACE SOIL
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

	Areas C and D Background Subsurface Soil Data								
Chemical	Frequency of Detection	Minimum Detected Concentration	Minimum Qualifier	Maximum Detected Concentration	Maximum Qualifier	Mean of All Data	Location of Maximum Concentration	Minimum Detection Limit	Maximum Detection Limit
Aluminum	16/16	7930		16100		11400	OFF-SO-DUP03		
Antimony	1/16	0 42	J	0.42	J	0 17	OFF-SO-BK07-0406	0 25	0 32
Arsenic	16/16	0 51	J	84 9	J	9 65	OFF-SO-BK01-0406	0 39	0 39
Barium	16/16	8 4	J	21.4		14 80	OFF-SO-BK07-0406		
Beryllium	9/16	0 21		1.1		0 31	OFF-SO-BK01-0406	0 44	0 52
Calcium	3/16	852	J	1240	J	325 00	OFF-SO-BK17-0203	95	692
Chromium	16/16	10 9		26 3		16.80	OFF-SO-BK15-0406		
Cobalt	16/16	9 8		29 2		14 90	OFF-SO-BK01-0406		
Copper	11/16	14.9		32 9		17 40	OFF-SO-BK01-0406	10 1	22 5
Iron	16/16	19500		67300	J	33400 00	OFF-SO-BK01-0406		
Lead	16/16	6 6		16 1		11 00	OFF-SO-BK11-0406		
Magnesium	16/16	2280		5270		3570 00	OFF-SO-BK03-0406		
Manganese	16/16	141	J	992		405 00	OFF-SO-BK11-0406		
Nickel	16/16	16 3		48.9	J	25 30	OFF-SO-BK01-0406		
Potassium	13/16	311	J	539	J	350	OFF-SO-BK07-0406	212	275
Silver	12/16	7.3	J	16.7	J	7 55	OFF-SO-BK01-0406	5 2	8 3
Vanadium	16/16	14 6		28 7		21	OFF-SO-BK01-0406		
Zinc	16/16	37 7		175		67 60	OFF-SO-BK12-0406		

Notes:

Units are mg/kg.
Number of sample results excludes rejected data or blank-qualified data. Duplicates are consolidated into one result
Mean of all data includes positive detections and non-detected results. Detection limits are divided by two
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 B-10
QUANTILE RANGE DISTRIBUTIONS OF BACKGROUND SURFACE SOIL DATA SETS
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

	Areas C and D Background Surface Soil Data Sets																
	Concentration Range of NONDETECTED Results									Concentration Range of POSITIVE Results							
	Min.	Min. to 25 %		25% to 75%		75% to 95%		95% to Max		Min. to 25 %		25% to 75%		75% to 95%		95% to Max	
Substance	Detect. Limit	No. Pts	25% Quantile	No. Pts	75% Quantile	No. Pts	95% Quantile	No. Pts	Max. D.L.	No. Pts	25% Quantile	No. Pts	75% Quantile	No. Pts	95% Quantile	No. Pts	Max. Conc
Aluminum										4	8050	9	10300	4	11900		11900
Antimony	0.31	3	0.313	6	0 33	3	0 34		0 34	1	0 365	3	0 645	1	0 67		0 67
Arsenic										4	2 6	9	4 45	4	5 5		5 5
Barium										4	17 3	9	27 6	4	38 1		38 1
Beryllium	0.28	3	0 4	6	0 54	2	0.61		0 61	1	0 358	4	0 408	1	0 46		0 46
Cadmium	0.05	4	0 05	8	0.05	4	0 05		0 05		0 35	1	0 7		0 7		0 7
Calcium	115	3	243	6	410	3	686		686	1	653	3	983	1	1060		1060
Chromium										4	8	9	14	4	19 2		19 2
Cobalt										4	4 25	9	6 65	4	9 6		9 6
Copper	4 1	1	5.38	4	10	1	10.4		10 4	3	7 2	6	12 2	2	33 9		33 9
Iron										4	10700	9	16100	4	22900		22900
Lead										4	16 1	9	33 9	4	798		798
Magnesium										4	1110	9	1680	4	2260		2260
Manganese										4	202	9	268	4	420		420
Mercury	0.02	1	0 015	2	0 03	1	0.03		0.03	4	0 04	8	0 11	3	0 14		0 14
Nickel										4	8 05	9	12	4	18 5		18 5
Potassium	169	3	186	6	238	3	273		273	1	207	3	283	1	312		312
Vanadium										4	13	9	17 5	4	23 4		23 4
Zinc										4	28 8	9	44 4	4	225		225

Notes:

Units are mg/kg.

The 25 % quantile of a set of samples is an estimate of the concentration such that 25 % of the population has concentrations less than this magnitude

Number of points refers to the number of samples in the set displaying concentrations between the quantile shown to the imm diate left and the quantile shown to the right

Number of sample results excludes rejected data or blank-qualified data. Duplicates are consolidated into one result.

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

TABLE B-11
QUANTILE RANGE DISTRIBUTIONS OF BACKGROUND SUBSURFACE SOIL DATA SETS
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

	Subsurface Soil Data Sets															
							Concentration Range of POSITIVE Results									
							Min. to 25 %		25% to 75%		75% to 95%		95% to Max			
	Min. Detect. Limit	No. Pts	25% Quantile	No. Pts	75% Quantile	No. Pts	95% Quantile	No. Pts	Max. D.L.	No. Pts	25% Quantile	No. Pts	75% Quantile	No. Pts	95% Quantile	No. Pts	Max. Conc
Aluminum										4	10000	8	12700	4	15900		15900
Antimony	0 27		0.295		0.32	3	0 32		0 32		0 21	1	0 42		0 42		0 42
Arsenic										4	3.05	8	5 48	4	53.3		53 3
Barium										4	12.1	8	17.7	4	21.4		21 4
Beryllium	0.44		0.46		0.51	1	0.52		0 52	2	0 235	5	0 455	2	0 725		0 725
Calcium	143		174		443		692		692	1	868	2	1240		1240		1240
Chromium										4	13 9	8	19 4	4	25 5		25 5
Cobalt										4	13 1	8	16 7	4	20 8		20 75
Copper	10.1		12.2		20.7	2	22.5		22.5	3	17 5	6	25 4	2	27.3		27 3
Iron										4	29900	8	36600	4	50600		50600
Lead										4	9 55	8	12.8	4	16 1		16 1
Magnesium										4	2990	8	3960	4	5270		5270
Manganese										4	324	8	443	4	992		992
Nickel										4	22 1	8	28 9	4	35 8		35 75
Potassium	212		212		256		256		256	3	349	7	450	3	539		539
Silver	5.2	1	5 35	2	8.28	1	8 3		8 3	3	8	6	9 68	3	12 7		12 7
Vanadium										4	19 1	8	23 5	4	25 4		25 4
Zinc										4	53.5	8	67 3	4	175		175

Notes:

Units are mg/kg.
The 25 % quantile of a set of samples is an estimate of the concentration such that 25 % of the population has concentrations less than this magnitude.
Number of points refers to the number of samples in the set displaying concentrations between the quantile shown to the immediate left and the quantile shown to the right.
Number of sample results excludes rejected data or blank-qualified data. Duplicates are consolidated into one result.
Number of samples may vary based on the number of usable results.

TABLE B-12
UPPER TOLERANCE LIMIT FOR SURFACE SOIL FROM AREAS C AND D
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

Name of Statistic:	95 % Upper Tolerance Limit (UTL)					
Assumptions Valid:	Background data must fit lognormal or normal shape					
Substance	Areas C & D Detect Freq	Mean or Log Mean	Std. Deviation or Log S D.	L,N Q	t Value	Areas C & D UTL
Aluminum	17/17	8895 882353	1690	N	1 7459	11900
Antimony	5/17	0 258235				**
Arsenic	17/17	3.494118	1.15	N	1.7459	5 55
Barium	17/17	3.009928	0 357	L	1.7459	38 5
Beryllium	6/17	0.288529	0.0836	N	1.7459	0 439
Cadmium	1/17	0.064706				**
Calcium	5/17	5.545287	0.867	L	1.7459	1220
Chromium	17/17	2.30615	0 389	L	1 7459	20 2
Cobalt	17/17	1 663286	0.298	L	1 7459	9 01
Copper	11/17	1 931803	0.688	L	1 7459	23 8
Iron	17/17	9 42797	0 346	L	1 7459	23200
Lead	16/16*	26.2375	12 5	N	1 7531	48 8
Magnesium	17/17	7.146856	0.315	L	1 7459	2240
Manganese	17/17	5 467681	0.252	L	1.7459	372
Mercury	15/17	-2.941098	0 709	L	1.7459	0 189
Nickel	17/17	2.306268	0.306	L	1.7459	17 4
Potassium	5/17	147 176471				**
Vanadium	17/17	15 411765	3.99	N	1 7459	22 6
Zinc	17/17	46				**

Units are mg/kg.

L, N, or Q UTL is based on 95 % upper limit (using t-value) when data are lognormal (L) or normal (N). Otherwise, an upper 95 % quantile (Q) is used if there are > 18 Area C and D points.

* Lead data set after removal of one outlier data point.

** Antimony, cadmium, potassium, and zinc did not match normal or lognormal distributional shape which precludes UTL estimation

TABLE B-13
UPPER TOLERANCE LIMIT FOR BACKGROUND SUBSURFACE SOIL DATA SET
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

Name of Statistic:	95% Upper Tolerance Limit (UTL)					
Assumptions Valid:	Background data must fit lognormal or normal shape					
Substance	Areas C & D Detect Freq	Mean or Log Mean	Std. Deviation or Log S D	L,N Q	t Value	Areas C & D UTL
Aluminum	16/16	9.32	0.192	L	1.7531	15800
Antimony	1/16	0.168				**
Arsenic	16/16	1 55	1 22	L	1 7531	42.8
Barium	16/16	14.8	3 58	N	1.7531	21 3
Beryllium	9/16	0.307				**
Calcium	3/16	5 35	0.902	L	1.7531	1080
Chromium	16/16	16 8	4.04	N	1 7531	24.1
Cobalt	16/16	14 9	2 95	N	1 7531	20 3
Copper	11/16	17 4	7.46	N	1 7531	30.9
Iron	16/16	33400	7250	N	1 7531	46400
Lead	16/16	11	2.47	N	1 7531	15 4
Magnesium	16/16	8.15	0 234	L	1.7531	5310
Manganese	15/15*	366	108	N	1.7613	563
Nickel	16/16	25 3	5 13	N	1.7531	34 5
Potassium	13/16	350				**
Silver	12/16	7.55	2.87	N	1 7531	12 7
Vanadium	16/16	20.7	2 91	N	1 7531	26
Zinc	16/16	67.6				**

Units are mg/kg.

L, N, or Q UTL is based on 95 % upper limit (using t-value) when data are lognormal (L) or normal (N). Otherwise, an upper 95 % quantile (Q) is used if there are > 18 Area C and D points.

* Manganese data set after removal of one outlier data point.

** Antimony, beryllium, potassium, and zinc did not match normal or lognormal distributional shape, which precludes UTL estimation.

TABLE B-14
ARSENIC POST-OUTLIER REMOVAL DISTRIBUTION OF AREAS C AND D SUBSURFACE SOIL DATA
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

Substance	Number of Sample Results	Degrees of Freedom	Statistical Distribution of Data	Results of Shapiro-Wilk or Shapiro-Francia Distribution Tests			Standard Deviation or Log Standard Deviation	Arithmetic Mean of All Site Results	Maximum Positive Site Concentration
				W-norm	W-lognorm	W-Table			
Arsenic	15	14	nonparametric	0.5691	0.8732	0.881	1 07	6 74	35 5

Notes:

Units are mg/kg
Number of sample results excludes rejected data or blank-qualified data. Duplicates are consolidated into one result
Statistical distribution of data is determined using Shapiro-Wilk test for n <= 50, Shapiro-Francia test for n > 50. Statistical significance level is 0 05
A normal distribution is assumed if the test statistic W-norm is >= than the reference value (W-table), and W-norm > W-lognorm.
A lognormal distribution is assumed if the test statistic W-lognorm. is >= the reference value (W-table), and W-lognorm >= W-norm
A nonparametric distribution is assumed if neither distribution passes Shapiro test.
Arithmetic mean may include positive detections and non-detected results (detection limits are divided by two)

TABLE B-15
LEAD POST-OUTLIER REMOVAL DISTRIBUTION OF AREAS C AND D SURFACE SOIL DATA
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

Substance	Number of Sample Results	Degrees of Freedom	Statistical Distribution of Data	Results of Shapiro-Wilk or Shapiro-Francia Distribution Tests			Standard Deviation or Log Standard Deviation	Arithmetic Mean of All Site Results	Maximum Positive Site Concentration
				W-norm	W-lognorm	W-Table			
Lead	16	15	normal	0.9473	0.9087	0.887	12.5	26.2375	49.7

Notes:

Units are mg/kg.
Number of sample results excludes rejected data or blank-qualified data. Duplicates are consolidated into one result.
Statistical distribution of data is determined using Shapiro-Wilk test for n <= 50, Shapiro-Francia test for n > 50. Statistical significance level is 0 05.
A normal distribution is assumed if the test statistic W-norm. is >= than the reference value (W-table), and W-norm. > W-lognorm.
A lognormal distribution is assumed if the test statistic W-lognorm. is >= the reference value (W-table), and W-lognorm >= W-norm.
A nonparametric distribution is assumed if neither distribution passes Shapiro test.
Arithmetic mean may include positive detections and non-detected results (detection limits are divided by two).

TABLE B-16
LEAD OUTLIER TESTS FOR AREAS C AND D SURFACE SOIL DATA
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

Sample I.D.	Lead (mg/kg)
OFF-SO-BK09-0002	6.1
OFF-SO-BK14-0002	8.4
OFF-SO-BK06-0002	15.2
OFF-SO-BK13-0002	16.0
OFF-SO-BK15-0002	16.2
OFF-SO-BK12-0002	18.7
OFF-SO-BK17-0002	25.5
OFF-SO-BK16-0002	28.0
OFF-SO-BK08-0002	28.8
OFF-SO-BK07-0002	30.2
OFF-SO-BK05-0002	30.4
OFF-SO-BK01-0002	30.5
OFF-SO-BK02-0002	31.5
OFF-SO-BK04-0002	36.3
OFF-SO-BK03-0002	48.3
OFF-SO-BK11-0002	49.7
OFF-SO-BK10-0002	798.0

Dixon's Test	
Estimated C=	0.958
Critical Value D(17,0.05)=	0.490
Dixon's two-sided fails	(outlier exists)

Discordance Test	
s=	12.48
mean=	26 24
Estimated Discordance=	61.850
critical Value=	2.443
Discord. one-sided fails	(outlier exists)

Notes:

- Decision criteria for Dixon's test is based on comparing the estimated C, which is calculated from the sample data set, to the critical value (from published table, EPA, 1996).
- Decision criteria for Discordance test is based on comparing the estimated discordance, which is calculated from the sample data set, to the critical value (from published table, EPA, 1996).
- If the estimated value is greater than the critical value for either Dixon's test or discordance test, then the data point is judged to be an outlier.

TABLE B-17
ANTIMONY POST-OUTLIER REMOVAL DISTRIBUTION OF AREAS C AND D SURFACE SOIL DATA
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

Substance	Number of Sample Results	Degrees of Freedom	Statistical Distribution of Data	Results of Shapiro-Wilk or Shapiro-Francia Distribution Tests			Standard Deviation or Log Standard Deviation	Arithmetic Mean of All Site Results	Maximum Positive Site Concentration
				W-norm.	W-lognorm.	W-Table			
Antimony	16	15	nonparametric	0.6233	0 6545	0 887	0.457	0 2325	0 62

Notes.

Units are mg/kg.
Number of sample results excludes rejected data or blank-qualified data. Duplicates are consolidated into one result
Statistical distribution of data is determined using Shapiro-Wilk test for n <= 50, Shapiro-Francia test for n > 50 Statistical significance level is 0 05
A normal distribution is assumed if the test statistic W-norm is >= than the reference value (W-table), and W-norm > W-lognorm.
A lognormal distribution is assumed if the test statistic W-lognorm. is >= the reference value (W-table), and W-lognorm >= W-norm.
A nonparametric distribution is assumed if neither distribution passes Shapiro test
Arithmetic mean may include positive detections and non-detected results (detection limits are divided by two).

TABLE B-18
BERYLLIUM POST-OUTLIER REMOVAL DISTRIBUTION OF AREAS C AND D SUBSURFACE SOIL DATA
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

Substance	Number of Sample Results	Number of Detects	Statistical Distribution of Data	Results of Shapiro-Wilk or Shapiro-Francia Distribution Tests			Standard Deviation or Log Standard Deviation	Arithmetic Mean of All Site Results	Maximum Positive Site Concentration
				W-norm	W-lognorm	W-Table			
Beryllium	15	14	nonparametric	0.7542	0.826	0.881	0.241	0 279	0 48

Notes:

Units are mg/kg.
Number of sample results excludes rejected data or blank-qualified data. Duplicates are consolidated into one result
Statistical distribution of data is determined using Shapiro-Wilk test for n <= 50, Shapiro-Francia test for n > 50 Statistical significance level is 0 05
A normal distribution is assumed if the test statistic W-norm is >= than the reference value (W-table), and W-norm > W-lognorm
A lognormal distribution is assumed if the test statistic W-lognorm is >= the reference value (W-table), and W-lognorm >= W-norm
A nonparametric distribution is assumed if neither distribution passes Shapiro test.
Arithmetic mean may include positive detections and non-detected results (detection limits are divided by two)

TABLE B-19
MANGANESE POST-OUTLIER DISTRIBUTION OF AREAS C AND D SUBSURFACE SOIL DATA
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

Substance	Number of Sample Results	Degrees of Freedom	Statistical Distribution of Data	Results of Shapiro-Wilk or Shapiro-Francia Distribution Tests			Standard Deviation or Log Standard Deviation	Arithmetic Mean of All Site Results	Maximum Positive Site Concentration
				W-norm	W-lognorm	W-Table			
Manganese	15	14	normal	0.9667	0.8833	0.881	108	366	561

Notes:

Units are mg/kg.
Number of sample results excludes rejected data or blank-qualified data. Duplicates are consolidated into one result.
Statistical distribution of data is determined using Shapiro-Wilk test for n <= 50, Shapiro-Francia test for n > 50. Statistical significance level is 0.05
A normal distribution is assumed if the test statistic W-norm. is >= than the reference value (W-table), and W-norm. > W-lognorm.
A lognormal distribution is assumed if the test statistic W-lognorm. is >= the reference value (W-table), and W-lognorm. >= W-norm.
A lognormal distribution is also the default assumption if neither distribution passes Shapiro test.
Arithmetic mean may include positive detections and non-detected results (detection limits are divided by two).

TABLE B-20
MANGANESE OUTLIER TESTS FOR AREAS C AND D SURFACE SOIL DATA
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

Sample I.D.	Manganese (mg/kg)
OFF-SO-BK17-0203	141.0
OFF-SO-BK15-0406	205.5
OFF-SO-BK02-0406	253.0
OFF-SO-BK04-0406	318.0
OFF-SO-BK13-0406	340.0
OFF-SO-BK03-0406	359.0
OFF-SO-BK08-0406	371.0
OFF-SO-BK01-0406	378.0
OFF-SO-BK16-0406	386.0
OFF-SO-BK06-0406	386.5
OFF-SO-BK05-0406	420.0
OFF-SO-BK09-0406	423.0
OFF-SO-BK12-0406	449.0
OFF-SO-BK14-0406	503.0
OFF-SO-BK07-0406	561.0
OFF-SO-BK11-0406	992.0

Dixon's Test	
Estimated C=	0.662
Critical Value D(16,0.05)=	0.507
Dixon's two-sided fails	(outlier exists)

Discordance Test	
s=	107.91
mean=	366.27
Estimated Discordance=	5 799
critical Value=	2.443
Discord. one-sided fails	(outlier exists)

Decision criteria for Dixon's test is based on comparing the estimated C, which is calculated from the sample data set, to the critical value (from published table, EPA, 1996).

Decision criteria for Discordance test is based on comparing the estimated discordance, which is calculated from the sample data set, to the critical value (from published table, EPA, 1996).

If the estimated value is greater than the critical value for either Dixon's test or discordance test, then the data point is judged to be an outlier.

TABLE B-21
DATA FOR AREAS C AND D SURFACE SOIL
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

SAMPLE I.D.	ANALYTE	CONCENTRATION	QUALIFIER
OFF-SO-BK09-0002	ALUMINUM	5000	
OFF-SO-BK10-0002	ALUMINUM	6480	
OFF-SO-BK08-0002	ALUMINUM	7560	
OFF-SO-BK15-0002	ALUMINUM	8040	
OFF-SO-BK13-0002	ALUMINUM	8060	
OFF-SO-BK05-0002	ALUMINUM	8270	
OFF-SO-BK14-0002	ALUMINUM	8460	
OFF-SO-BK12-0002	ALUMINUM	8640	
OFF-SO-BK03-0002	ALUMINUM	8860	
OFF-SO-BK11-0002	ALUMINUM	9030	
OFF-SO-BK04-0002	ALUMINUM	9230	
OFF-SO-BK01-0002	ALUMINUM	9600	
OFF-SO-BK07-0002	ALUMINUM	10300	
OFF-SO-BK16-0002	ALUMINUM	10300	
OFF-SO-BK06-0002	ALUMINUM	10500	
OFF-SO-BK17-0002	ALUMINUM	11000	
OFF-SO-BK02-0002	ALUMINUM	11900	
OFF-SO-BK06-0002	ANTIMONY	0.31	UJ
OFF-SO-BK13-0002	ANTIMONY	0.31	UJ
OFF-SO-BK15-0002	ANTIMONY	0.31	UJ
OFF-SO-BK01-0002	ANTIMONY	0.32	UJ
OFF-SO-BK09-0002	ANTIMONY	0.32	UJ
OFF-SO-BK12-0002	ANTIMONY	0.32	UJ
OFF-SO-BK14-0002	ANTIMONY	0.32	UJ
OFF-SO-BK04-0002	ANTIMONY	0.33	UJ
OFF-SO-BK07-0002	ANTIMONY	0.33	UJ
OFF-SO-BK17-0002	ANTIMONY	0.33	UJ
OFF-SO-BK05-0002	ANTIMONY	0.34	UJ
OFF-SO-BK08-0002	ANTIMONY	0.34	UJ
OFF-SO-BK11-0002	ANTIMONY	0.34	J
OFF-SO-BK10-0002	ANTIMONY	0.39	J
OFF-SO-BK02-0002	ANTIMONY	0.43	J
OFF-SO-BK16-0002	ANTIMONY	0.62	J
OFF-SO-BK03-0002	ANTIMONY	0.67	J
OFF-SO-BK09-0002	ARSENIC	1.8	J
OFF-SO-BK13-0002	ARSENIC	1.8	
OFF-SO-BK15-0002	ARSENIC	2.5	J
OFF-SO-BK08-0002	ARSENIC	2.6	J
OFF-SO-BK14-0002	ARSENIC	2.6	
OFF-SO-BK06-0002	ARSENIC	2.7	J
OFF-SO-BK05-0002	ARSENIC	2.8	J
OFF-SO-BK07-0002	ARSENIC	3.2	J
OFF-SO-BK10-0002	ARSENIC	3.2	J
OFF-SO-BK12-0002	ARSENIC	3.5	
OFF-SO-BK11-0002	ARSENIC	4.1	J

TABLE B-21
DATA FOR AREAS C AND D SURFACE SOIL
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

SAMPLE I.D.	ANALYTE	CONCENTRATION	QUALIFIER
OFF-SO-BK04-0002	ARSENIC	4.2	J
OFF-SO-BK17-0002	ARSENIC	4.4	J
OFF-SO-BK02-0002	ARSENIC	4.5	J
OFF-SO-BK03-0002	ARSENIC	4.7	J
OFF-SO-BK01-0002	ARSENIC	5.3	J
OFF-SO-BK16-0002	ARSENIC	5.5	J
OFF-SO-BK09-0002	BARIUM	9.2	
OFF-SO-BK10-0002	BARIUM	12	
OFF-SO-BK12-0002	BARIUM	13.8	
OFF-SO-BK15-0002	BARIUM	17.3	J
OFF-SO-BK16-0002	BARIUM	17.3	J
OFF-SO-BK14-0002	BARIUM	17.6	
OFF-SO-BK01-0002	BARIUM	18.9	
OFF-SO-BK17-0002	BARIUM	19.1	J
OFF-SO-BK13-0002	BARIUM	19.6	
OFF-SO-BK08-0002	BARIUM	21.8	
OFF-SO-BK11-0002	BARIUM	22.6	
OFF-SO-BK03-0002	BARIUM	24	
OFF-SO-BK04-0002	BARIUM	27.5	
OFF-SO-BK06-0002	BARIUM	27.7	
OFF-SO-BK05-0002	BARIUM	27.8	
OFF-SO-BK02-0002	BARIUM	30.8	
OFF-SO-BK07-0002	BARIUM	38.1	
OFF-SO-BK09-0002	BERYLLIUM	0.28	U
OFF-SO-BK13-0002	BERYLLIUM	0.35	
OFF-SO-BK12-0002	BERYLLIUM	0.36	
OFF-SO-BK14-0002	BERYLLIUM	0.36	
OFF-SO-BK17-0002	BERYLLIUM	0.37	
OFF-SO-BK16-0002	BERYLLIUM	0.39	
OFF-SO-BK10-0002	BERYLLIUM	0.4	U
OFF-SO-BK11-0002	BERYLLIUM	0.4	U
OFF-SO-BK03-0002	BERYLLIUM	0.44	U
OFF-SO-BK05-0002	BERYLLIUM	0.46	U
OFF-SO-BK06-0002	BERYLLIUM	0.46	U
OFF-SO-BK15-0002	BERYLLIUM	0.46	
OFF-SO-BK08-0002	BERYLLIUM	0.51	U
OFF-SO-BK04-0002	BERYLLIUM	0.54	U
OFF-SO-BK07-0002	BERYLLIUM	0.54	U
OFF-SO-BK02-0002	BERYLLIUM	0.59	U
OFF-SO-BK01-0002	BERYLLIUM	0.61	U
OFF-SO-BK01-0002	CADMIUM	0.05	UJ
OFF-SO-BK02-0002	CADMIUM	0.05	UJ
OFF-SO-BK03-0002	CADMIUM	0.05	UJ
OFF-SO-BK04-0002	CADMIUM	0.05	UJ
OFF-SO-BK05-0002	CADMIUM	0.05	UJ

TABLE B-21
DATA FOR AREAS C AND D SURFACE SOIL
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

SAMPLE I.D.	ANALYTE	CONCENTRATION	QUALIFIER
OFF-SO-BK06-0002	CADMIUM	0.05	UJ
OFF-SO-BK07-0002	CADMIUM	0.05	UJ
OFF-SO-BK09-0002	CADMIUM	0.05	UJ
OFF-SO-BK10-0002	CADMIUM	0.05	UJ
OFF-SO-BK11-0002	CADMIUM	0.05	UJ
OFF-SO-BK12-0002	CADMIUM	0.05	U
OFF-SO-BK13-0002	CADMIUM	0.05	U
OFF-SO-BK14-0002	CADMIUM	0.05	U
OFF-SO-BK15-0002	CADMIUM	0.05	U
OFF-SO-BK16-0002	CADMIUM	0.05	U
OFF-SO-BK17-0002	CADMIUM	0.05	U
OFF-SO-BK08-0002	CADMIUM	0.7	J
OFF-SO-BK09-0002	CALCIUM	115	U
OFF-SO-BK10-0002	CALCIUM	195	U
OFF-SO-BK03-0002	CALCIUM	238	U
OFF-SO-BK07-0002	CALCIUM	257	U
OFF-SO-BK08-0002	CALCIUM	303	U
OFF-SO-BK06-0002	CALCIUM	310	U
OFF-SO-BK15-0002	CALCIUM	331	UJ
OFF-SO-BK14-0002	CALCIUM	341	UJ
OFF-SO-BK13-0002	CALCIUM	405	UJ
OFF-SO-BK04-0002	CALCIUM	412	U
OFF-SO-BK16-0002	CALCIUM	615	J
OFF-SO-BK05-0002	CALCIUM	653	U
OFF-SO-BK02-0002	CALCIUM	686	U
OFF-SO-BK12-0002	CALCIUM	690	J
OFF-SO-BK17-0002	CALCIUM	807	J
OFF-SO-BK01-0002	CALCIUM	906	
OFF-SO-BK11-0002	CALCIUM	1060	
OFF-SO-BK09-0002	CHROMIUM	4.3	
OFF-SO-BK13-0002	CHROMIUM	5.9	
OFF-SO-BK08-0002	CHROMIUM	7	
OFF-SO-BK10-0002	CHROMIUM	7.5	
OFF-SO-BK14-0002	CHROMIUM	8.5	
OFF-SO-BK07-0002	CHROMIUM	8.7	
OFF-SO-BK05-0002	CHROMIUM	9.4	
OFF-SO-BK15-0002	CHROMIUM	9.7	
OFF-SO-BK06-0002	CHROMIUM	10	
OFF-SO-BK12-0002	CHROMIUM	10.1	
OFF-SO-BK11-0002	CHROMIUM	10.2	
OFF-SO-BK01-0002	CHROMIUM	11.6	
OFF-SO-BK17-0002	CHROMIUM	13.8	
OFF-SO-BK03-0002	CHROMIUM	14.2	
OFF-SO-BK16-0002	CHROMIUM	14.3	
OFF-SO-BK04-0002	CHROMIUM	18.4	

TABLE B-21
DATA FOR AREAS C AND D SURFACE SOIL
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

SAMPLE I.D.	ANALYTE	CONCENTRATION	QUALIFIER
OFF-SO-BK02-0002	CHROMIUM	19.2	
OFF-SO-BK08-0002	COBALT	3.2	
OFF-SO-BK13-0002	COBALT	3.3	
OFF-SO-BK10-0002	COBALT	3.6	
OFF-SO-BK09-0002	COBALT	4	
OFF-SO-BK05-0002	COBALT	4.5	
OFF-SO-BK07-0002	COBALT	4.8	
OFF-SO-BK12-0002	COBALT	4.8	
OFF-SO-BK06-0002	COBALT	5.2	
OFF-SO-BK03-0002	COBALT	5.3	
OFF-SO-BK14-0002	COBALT	5.8	
OFF-SO-BK15-0002	COBALT	5.8	
OFF-SO-BK16-0002	COBALT	6.1	
OFF-SO-BK04-0002	COBALT	6.5	
OFF-SO-BK11-0002	COBALT	6.8	
OFF-SO-BK01-0002	COBALT	6.9	B
OFF-SO-BK17-0002	COBALT	7.3	
OFF-SO-BK02-0002	COBALT	9.6	
OFF-SO-BK09-0002	COPPER	3.5	
OFF-SO-BK13-0002	COPPER	4.1	U
OFF-SO-BK14-0002	COPPER	5.8	U
OFF-SO-BK06-0002	COPPER	6.5	
OFF-SO-BK05-0002	COPPER	7.2	
OFF-SO-BK10-0002	COPPER	7.3	
OFF-SO-BK12-0002	COPPER	7.4	U
OFF-SO-BK15-0002	COPPER	8.1	U
OFF-SO-BK07-0002	COPPER	9.3	
OFF-SO-BK16-0002	COPPER	9.9	U
OFF-SO-BK01-0002	COPPER	10.3	
OFF-SO-BK17-0002	COPPER	10.4	U
OFF-SO-BK03-0002	COPPER	10.9	
OFF-SO-BK04-0002	COPPER	11.8	
OFF-SO-BK11-0002	COPPER	12.2	
OFF-SO-BK02-0002	COPPER	13.1	
OFF-SO-BK08-0002	COPPER	33.9	
OFF-SO-BK09-0002	IRON	5540	J
OFF-SO-BK08-0002	IRON	8140	J
OFF-SO-BK13-0002	IRON	8740	
OFF-SO-BK10-0002	IRON	9840	J
OFF-SO-BK06-0002	IRON	11600	J
OFF-SO-BK05-0002	IRON	11700	J
OFF-SO-BK07-0002	IRON	11800	J
OFF-SO-BK14-0002	IRON	11900	
OFF-SO-BK03-0002	IRON	12100	J
OFF-SO-BK12-0002	IRON	12300	

TABLE B-21
DATA FOR AREAS C AND D SURFACE SOIL
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

SAMPLE I.D.	ANALYTE	CONCENTRATION	QUALIFIER
OFF-SO-BK04-0002	IRON	12700	J
OFF-SO-BK15-0002	IRON	14000	
OFF-SO-BK11-0002	IRON	16000	J
OFF-SO-BK01-0002	IRON	16200	J
OFF-SO-BK16-0002	IRON	16200	
OFF-SO-BK17-0002	IRON	21500	
OFF-SO-BK02-0002	IRON	22900	J
OFF-SO-BK09-0002	LEAD	6.1	
OFF-SO-BK14-0002	LEAD	8.4	
OFF-SO-BK06-0002	LEAD	15.2	
OFF-SO-BK13-0002	LEAD	16	
OFF-SO-BK15-0002	LEAD	16.2	
OFF-SO-BK12-0002	LEAD	18.7	
OFF-SO-BK17-0002	LEAD	25.5	
OFF-SO-BK16-0002	LEAD	28	
OFF-SO-BK08-0002	LEAD	28.8	
OFF-SO-BK07-0002	LEAD	30.2	
OFF-SO-BK05-0002	LEAD	30.4	
OFF-SO-BK01-0002	LEAD	30.5	
OFF-SO-BK02-0002	LEAD	31.5	
OFF-SO-BK04-0002	LEAD	36.3	
OFF-SO-BK03-0002	LEAD	48.3	
OFF-SO-BK11-0002	LEAD	49.7	
OFF-SO-BK10-0002	LEAD	798	
OFF-SO-BK09-0002	MAGNESIUM	725	
OFF-SO-BK08-0002	MAGNESIUM	837	
OFF-SO-BK13-0002	MAGNESIUM	837	
OFF-SO-BK10-0002	MAGNESIUM	1110	
OFF-SO-BK15-0002	MAGNESIUM	1110	
OFF-SO-BK06-0002	MAGNESIUM	1130	
OFF-SO-BK07-0002	MAGNESIUM	1130	
OFF-SO-BK14-0002	MAGNESIUM	1180	
OFF-SO-BK03-0002	MAGNESIUM	1200	
OFF-SO-BK12-0002	MAGNESIUM	1200	
OFF-SO-BK05-0002	MAGNESIUM	1300	
OFF-SO-BK04-0002	MAGNESIUM	1390	
OFF-SO-BK11-0002	MAGNESIUM	1640	
OFF-SO-BK16-0002	MAGNESIUM	1720	
OFF-SO-BK01-0002	MAGNESIUM	1900	
OFF-SO-BK02-0002	MAGNESIUM	1960	
OFF-SO-BK17-0002	MAGNESIUM	2260	
OFF-SO-BK12-0002	MANGANESE	156	
OFF-SO-BK10-0002	MANGANESE	172	
OFF-SO-BK03-0002	MANGANESE	198	
OFF-SO-BK09-0002	MANGANESE	200	

TABLE B-21
DATA FOR AREAS C AND D SURFACE SOIL
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

SAMPLE I.D.	ANALYTE	CONCENTRATION	QUALIFIER
OFF-SO-BK14-0002	MANGANESE	203	
OFF-SO-BK16-0002	MANGANESE	203	
OFF-SO-BK13-0002	MANGANESE	209	
OFF-SO-BK17-0002	MANGANESE	220	
OFF-SO-BK15-0002	MANGANESE	237	
OFF-SO-BK06-0002	MANGANESE	242	
OFF-SO-BK11-0002	MANGANESE	247	
OFF-SO-BK05-0002	MANGANESE	255	
OFF-SO-BK04-0002	MANGANESE	262	
OFF-SO-BK01-0002	MANGANESE	274	
OFF-SO-BK08-0002	MANGANESE	286	
OFF-SO-BK02-0002	MANGANESE	372	
OFF-SO-BK07-0002	MANGANESE	420	
OFF-SO-BK09-0002	MERCURY	0.02	U
OFF-SO-BK01-0002	MERCURY	0.03	U
OFF-SO-BK12-0002	MERCURY	0.03	J
OFF-SO-BK06-0002	MERCURY	0.04	J
OFF-SO-BK13-0002	MERCURY	0.04	J
OFF-SO-BK14-0002	MERCURY	0.04	
OFF-SO-BK05-0002	MERCURY	0.05	
OFF-SO-BK10-0002	MERCURY	0.05	
OFF-SO-BK08-0002	MERCURY	0.06	
OFF-SO-BK11-0002	MERCURY	0.06	
OFF-SO-BK15-0002	MERCURY	0.06	
OFF-SO-BK16-0002	MERCURY	0.07	
OFF-SO-BK17-0002	MERCURY	0.08	
OFF-SO-BK04-0002	MERCURY	0.11	
OFF-SO-BK02-0002	MERCURY	0.12	
OFF-SO-BK07-0002	MERCURY	0.12	
OFF-SO-BK03-0002	MERCURY	0.14	
OFF-SO-BK09-0002	NICKEL	5.6	J
OFF-SO-BK08-0002	NICKEL	6.9	J
OFF-SO-BK13-0002	NICKEL	7.1	
OFF-SO-BK10-0002	NICKEL	7.3	J
OFF-SO-BK05-0002	NICKEL	8.8	J
OFF-SO-BK03-0002	NICKEL	9.4	J
OFF-SO-BK07-0002	NICKEL	9.4	J
OFF-SO-BK06-0002	NICKEL	9.7	J
OFF-SO-BK12-0002	NICKEL	10.1	
OFF-SO-BK14-0002	NICKEL	10.3	
OFF-SO-BK15-0002	NICKEL	10.4	
OFF-SO-BK04-0002	NICKEL	11.6	J
OFF-SO-BK11-0002	NICKEL	11.9	J
OFF-SO-BK01-0002	NICKEL	12.1	J
OFF-SO-BK16-0002	NICKEL	12.7	

TABLE B-21
DATA FOR AREAS C AND D SURFACE SOIL
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

SAMPLE I.D.	ANALYTE	CONCENTRATION	QUALIFIER
OFF-SO-BK17-0002	NICKEL	16.6	
OFF-SO-BK02-0002	NICKEL	18.5	J
OFF-SO-BK09-0002	POTASSIUM	169	U
OFF-SO-BK08-0002	POTASSIUM	177	
OFF-SO-BK17-0002	POTASSIUM	184	U
OFF-SO-BK15-0002	POTASSIUM	186	U
OFF-SO-BK10-0002	POTASSIUM	187	U
OFF-SO-BK14-0002	POTASSIUM	192	U
OFF-SO-BK03-0002	POTASSIUM	197	U
OFF-SO-BK01-0002	POTASSIUM	204	UJ
OFF-SO-BK05-0002	POTASSIUM	216	U
OFF-SO-BK02-0002	POTASSIUM	230	UJ
OFF-SO-BK07-0002	POTASSIUM	236	
OFF-SO-BK13-0002	POTASSIUM	241	U
OFF-SO-BK04-0002	POTASSIUM	253	
OFF-SO-BK06-0002	POTASSIUM	254	
OFF-SO-BK16-0002	POTASSIUM	261	U
OFF-SO-BK12-0002	POTASSIUM	273	U
OFF-SO-BK11-0002	POTASSIUM	312	J
OFF-SO-BK13-0002	SELENIUM	0.42	UJ
OFF-SO-BK15-0002	SELENIUM	0.42	UJ
OFF-SO-BK01-0002	SELENIUM	0.44	U
OFF-SO-BK11-0002	SELENIUM	0.44	U
OFF-SO-BK12-0002	SELENIUM	0.44	UJ
OFF-SO-BK14-0002	SELENIUM	0.44	UJ
OFF-SO-BK17-0002	SELENIUM	0.45	UJ
OFF-SO-BK08-0002	SELENIUM	0.47	U
OFF-SO-BK16-0002	SELENIUM	0.48	UJ
OFF-SO-BK09-0002	SELENIUM	0.49	UJ
OFF-SO-BK04-0002	SELENIUM	0.54	UJ
OFF-SO-BK06-0002	SELENIUM	0.7	UJ
OFF-SO-BK10-0002	SELENIUM	0.71	UJ
OFF-SO-BK05-0002	SELENIUM	0.78	UJ
OFF-SO-BK02-0002	SELENIUM	0.79	UJ
OFF-SO-BK07-0002	SELENIUM	0.79	UJ
OFF-SO-BK03-0002	SELENIUM	0.81	UJ
OFF-SO-BK09-0002	SILVER	1.7	UJ
OFF-SO-BK08-0002	SILVER	2.5	UJ
OFF-SO-BK13-0002	SILVER	2.7	UJ
OFF-SO-BK05-0002	SILVER	3.3	UJ
OFF-SO-BK10-0002	SILVER	3.3	UJ
OFF-SO-BK03-0002	SILVER	3.4	UJ
OFF-SO-BK12-0002	SILVER	3.4	UJ
OFF-SO-BK04-0002	SILVER	3.6	UJ
OFF-SO-BK06-0002	SILVER	3.6	UJ

TABLE B-21
DATA FOR AREAS C AND D SURFACE SOIL
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

SAMPLE I.D.	ANALYTE	CONCENTRATION	QUALIFIER
OFF-SO-BK07-0002	SILVER	3.6	UJ
OFF-SO-BK14-0002	SILVER	3.9	UJ
OFF-SO-BK01-0002	SILVER	4	UJ
OFF-SO-BK15-0002	SILVER	4	UJ
OFF-SO-BK16-0002	SILVER	4.3	UJ
OFF-SO-BK11-0002	SILVER	4.8	UJ
OFF-SO-BK02-0002	SILVER	5.5	UJ
OFF-SO-BK17-0002	SILVER	5.9	U
OFF-SO-BK09-0002	SODIUM	6.9	U
OFF-SO-BK10-0002	SODIUM	16.3	U
OFF-SO-BK08-0002	SODIUM	18	U
OFF-SO-BK03-0002	SODIUM	20.3	U
OFF-SO-BK06-0002	SODIUM	21.3	U
OFF-SO-BK07-0002	SODIUM	23	U
OFF-SO-BK05-0002	SODIUM	29.4	U
OFF-SO-BK04-0002	SODIUM	35.7	U
OFF-SO-BK02-0002	SODIUM	44.7	UJ
OFF-SO-BK11-0002	SODIUM	46	UJ
OFF-SO-BK01-0002	SODIUM	54.2	UJ
OFF-SO-BK15-0002	SODIUM	56.1	UJ
OFF-SO-BK14-0002	SODIUM	59.1	UJ
OFF-SO-BK13-0002	SODIUM	74	UJ
OFF-SO-BK17-0002	SODIUM	79	UJ
OFF-SO-BK16-0002	SODIUM	105	UJ
OFF-SO-BK12-0002	SODIUM	154	UJ
OFF-SO-BK02-0002	THALLIUM	0	R
OFF-SO-BK11-0002	THALLIUM	0	R
OFF-SO-BK16-0002	THALLIUM	0	R
OFF-SO-BK17-0002	THALLIUM	0	R
OFF-SO-BK06-0002	THALLIUM	0.34	U
OFF-SO-BK13-0002	THALLIUM	0.34	U
OFF-SO-BK15-0002	THALLIUM	0.34	U
OFF-SO-BK01-0002	THALLIUM	0.35	U
OFF-SO-BK03-0002	THALLIUM	0.35	U
OFF-SO-BK09-0002	THALLIUM	0.35	U
OFF-SO-BK10-0002	THALLIUM	0.35	U
OFF-SO-BK04-0002	THALLIUM	0.36	U
OFF-SO-BK07-0002	THALLIUM	0.36	U
OFF-SO-BK05-0002	THALLIUM	0.37	U
OFF-SO-BK08-0002	THALLIUM	0.37	U
OFF-SO-BK12-0002	THALLIUM	0.43	UJ
OFF-SO-BK14-0002	THALLIUM	0.44	UJ
OFF-SO-BK09-0002	VANADIUM	7.4	
OFF-SO-BK10-0002	VANADIUM	10.6	
OFF-SO-BK13-0002	VANADIUM	10.7	

TABLE B-21
DATA FOR AREAS C AND D SURFACE SOIL
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

SAMPLE I.D.	ANALYTE	CONCENTRATION	QUALIFIER
OFF-SO-BK14-0002	VANADIUM	12.7	
OFF-SO-BK15-0002	VANADIUM	13.3	
OFF-SO-BK07-0002	VANADIUM	14.3	
OFF-SO-BK06-0002	VANADIUM	14.7	
OFF-SO-BK08-0002	VANADIUM	15.2	
OFF-SO-BK03-0002	VANADIUM	15.7	
OFF-SO-BK12-0002	VANADIUM	15.7	
OFF-SO-BK05-0002	VANADIUM	16.2	
OFF-SO-BK11-0002	VANADIUM	16.3	
OFF-SO-BK01-0002	VANADIUM	16.5	
OFF-SO-BK16-0002	VANADIUM	18.4	
OFF-SO-BK04-0002	VANADIUM	18.8	
OFF-SO-BK17-0002	VANADIUM	22.1	
OFF-SO-BK02-0002	VANADIUM	23.4	
OFF-SO-BK09-0002	ZINC	14.6	J
OFF-SO-BK13-0002	ZINC	24.3	
OFF-SO-BK14-0002	ZINC	26.9	
OFF-SO-BK10-0002	ZINC	28.6	J
OFF-SO-BK12-0002	ZINC	28.9	
OFF-SO-BK06-0002	ZINC	29	J
OFF-SO-BK15-0002	ZINC	32.1	
OFF-SO-BK05-0002	ZINC	33.6	J
OFF-SO-BK01-0002	ZINC	33.9	J
OFF-SO-BK03-0002	ZINC	34	J
OFF-SO-BK07-0002	ZINC	36.2	J
OFF-SO-BK04-0002	ZINC	40.8	J
OFF-SO-BK16-0002	ZINC	41.8	
OFF-SO-BK11-0002	ZINC	46.9	J
OFF-SO-BK17-0002	ZINC	52.5	
OFF-SO-BK02-0002	ZINC	52.9	J
OFF-SO-BK08-0002	ZINC	225	J

TABLE B-22
DATA FOR AREAS C AND D SUBSURFACE SOIL
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

SAMPLE I.D.	ANALYTE	CONCENTRATION	QUALIFIER
OFF-SO-BK13-0406	ALUMINUM	7930	
OFF-SO-BK06-0406	ALUMINUM	8040	
OFF-SO-DUP02	ALUMINUM	9040	
OFF-SO-BK08-0406	ALUMINUM	9210	
OFF-SO-BK04-0406	ALUMINUM	9890	
OFF-SO-DUP01	ALUMINUM	10000	
OFF-SO-BK02-0406	ALUMINUM	10200	
OFF-SO-BK14-0406	ALUMINUM	10600	
OFF-SO-BK07-0406	ALUMINUM	10700	
OFF-SO-BK05-0406	ALUMINUM	10800	
OFF-SO-BK16-0406	ALUMINUM	11100	
OFF-SO-BK11-0406	ALUMINUM	11500	
OFF-SO-BK09-0406	ALUMINUM	11600	
OFF-SO-BK12-0406	ALUMINUM	12900	
OFF-SO-BK01-0406	ALUMINUM	14200	
OFF-SO-BK03-0406	ALUMINUM	14300	
OFF-SO-BK17-0203	ALUMINUM	14900	
OFF-SO-BK15-0406	ALUMINUM	15700	
OFF-SO-DUP03	ALUMINUM	16100	
OFF-SO-BK15-0406	ANTIMONY	0.25	UJ
OFF-SO-BK02-0406	ANTIMONY	0.28	UJ
OFF-SO-BK17-0203	ANTIMONY	0.28	UJ
OFF-SO-DUP02	ANTIMONY	0.28	UJ
OFF-SO-DUP01	ANTIMONY	0.29	UJ
OFF-SO-DUP03	ANTIMONY	0.29	UJ
OFF-SO-BK03-0406	ANTIMONY	0.3	UJ
OFF-SO-BK05-0406	ANTIMONY	0.3	UJ
OFF-SO-BK08-0406	ANTIMONY	0.3	UJ
OFF-SO-BK01-0406	ANTIMONY	0.31	UJ
OFF-SO-BK04-0406	ANTIMONY	0.31	UJ
OFF-SO-BK06-0406	ANTIMONY	0.31	UJ
OFF-SO-BK11-0406	ANTIMONY	0.31	UJ
OFF-SO-BK14-0406	ANTIMONY	0.31	UJ
OFF-SO-BK09-0406	ANTIMONY	0.32	UJ
OFF-SO-BK12-0406	ANTIMONY	0.32	UJ
OFF-SO-BK13-0406	ANTIMONY	0.32	UJ
OFF-SO-BK16-0406	ANTIMONY	0.32	UJ
OFF-SO-BK07-0406	ANTIMONY	0.42	J
OFF-SO-BK15-0406	ARSENIC	0.39	UJ
OFF-SO-DUP03	ARSENIC	0.51	J
OFF-SO-BK17-0203	ARSENIC	0.78	J
OFF-SO-BK09-0406	ARSENIC	2.7	J
OFF-SO-BK13-0406	ARSENIC	3	J
OFF-SO-BK16-0406	ARSENIC	3.2	J
OFF-SO-BK08-0406	ARSENIC	3.7	J

TABLE B-22
DATA FOR AREAS C AND D SUBSURFACE SOIL
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

SAMPLE I.D.	ANALYTE	CONCENTRATION	QUALIFIER
OFF-SO-BK12-0406	ARSENIC	4.5	J
OFF-SO-BK05-0406	ARSENIC	4.7	J
OFF-SO-BK06-0406	ARSENIC	4.7	J
OFF-SO-BK14-0406	ARSENIC	4.7	J
OFF-SO-DUP02	ARSENIC	4.7	J
OFF-SO-BK04-0406	ARSENIC	4.8	J
OFF-SO-BK11-0406	ARSENIC	4.8	J
OFF-SO-BK07-0406	ARSENIC	5.7	J
OFF-SO-BK03-0406	ARSENIC	17.9	J
OFF-SO-DUP01	ARSENIC	21.7	J
OFF-SO-BK02-0406	ARSENIC	35.5	J
OFF-SO-BK01-0406	ARSENIC	84.9	J
OFF-SO-BK15-0406	BARIUM	8.4	J
OFF-SO-BK17-0203	BARIUM	8.7	J
OFF-SO-DUP03	BARIUM	9.2	J
OFF-SO-BK03-0406	BARIUM	10.8	
OFF-SO-BK02-0406	BARIUM	11.6	
OFF-SO-BK04-0406	BARIUM	13.6	
OFF-SO-BK13-0406	BARIUM	13.8	J
OFF-SO-DUP01	BARIUM	14	J
OFF-SO-BK06-0406	BARIUM	14.4	
OFF-SO-BK11-0406	BARIUM	15	J
OFF-SO-BK01-0406	BARIUM	15.3	
OFF-SO-BK16-0406	BARIUM	15.3	J
OFF-SO-BK05-0406	BARIUM	16.1	
OFF-SO-DUP02	BARIUM	16.1	J
OFF-SO-BK14-0406	BARIUM	16.6	J
OFF-SO-BK09-0406	BARIUM	18	
OFF-SO-BK12-0406	BARIUM	18.4	J
OFF-SO-BK08-0406	BARIUM	19.1	
OFF-SO-BK07-0406	BARIUM	21.4	
OFF-SO-BK17-0203	BERYLLIUM	0.21	
OFF-SO-BK11-0406	BERYLLIUM	0.23	
OFF-SO-BK13-0406	BERYLLIUM	0.24	
OFF-SO-BK15-0406	BERYLLIUM	0.28	
OFF-SO-BK16-0406	BERYLLIUM	0.32	
OFF-SO-DUP03	BERYLLIUM	0.32	
OFF-SO-DUP02	BERYLLIUM	0.33	
OFF-SO-DUP01	BERYLLIUM	0.35	
OFF-SO-BK14-0406	BERYLLIUM	0.43	
OFF-SO-BK08-0406	BERYLLIUM	0.44	U
OFF-SO-BK02-0406	BERYLLIUM	0.46	U
OFF-SO-BK09-0406	BERYLLIUM	0.47	U
OFF-SO-BK07-0406	BERYLLIUM	0.48	U
OFF-SO-BK12-0406	BERYLLIUM	0.48	

TABLE B-22
DATA FOR AREAS C AND D SUBSURFACE SOIL
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

SAMPLE I.D.	ANALYTE	CONCENTRATION	QUALIFIER
OFF-SO-BK05-0406	BERYLLIUM	0.49	U
OFF-SO-BK04-0406	BERYLLIUM	0.51	U
OFF-SO-BK06-0406	BERYLLIUM	0.51	U
OFF-SO-BK03-0406	BERYLLIUM	0.52	U
OFF-SO-BK01-0406	BERYLLIUM	1.1	
OFF-SO-BK02-0406	CADMIUM	0.04	UJ
OFF-SO-BK04-0406	CADMIUM	0.05	UJ
OFF-SO-BK05-0406	CADMIUM	0.05	UJ
OFF-SO-BK06-0406	CADMIUM	0.05	UJ
OFF-SO-BK08-0406	CADMIUM	0.05	UJ
OFF-SO-BK09-0406	CADMIUM	0.05	UJ
OFF-SO-BK13-0406	CADMIUM	0.05	U
OFF-SO-BK03-0406	CADMIUM	0.09	UJ
OFF-SO-BK07-0406	CADMIUM	0.1	UJ
OFF-SO-BK15-0406	CADMIUM	0.16	U
OFF-SO-BK17-0203	CADMIUM	0.17	U
OFF-SO-DUP02	CADMIUM	0.17	U
OFF-SO-DUP01	CADMIUM	0.18	U
OFF-SO-DUP03	CADMIUM	0.18	U
OFF-SO-BK01-0406	CADMIUM	0.19	UJ
OFF-SO-BK11-0406	CADMIUM	0.19	U
OFF-SO-BK14-0406	CADMIUM	0.19	U
OFF-SO-BK12-0406	CADMIUM	0.2	U
OFF-SO-BK16-0406	CADMIUM	0.2	U
OFF-SO-BK06-0406	CALCIUM	95	U
OFF-SO-BK04-0406	CALCIUM	143	U
OFF-SO-BK07-0406	CALCIUM	166	U
OFF-SO-BK09-0406	CALCIUM	167	U
OFF-SO-BK16-0406	CALCIUM	186	UJ
OFF-SO-BK05-0406	CALCIUM	260	U
OFF-SO-DUP02	CALCIUM	265	UJ
OFF-SO-BK14-0406	CALCIUM	362	UJ
OFF-SO-DUP01	CALCIUM	367	UJ
OFF-SO-BK08-0406	CALCIUM	374	U
OFF-SO-BK12-0406	CALCIUM	409	UJ
OFF-SO-BK01-0406	CALCIUM	461	U
OFF-SO-BK13-0406	CALCIUM	471	UJ
OFF-SO-BK03-0406	CALCIUM	491	U
OFF-SO-BK02-0406	CALCIUM	692	U
OFF-SO-BK15-0406	CALCIUM	852	J
OFF-SO-BK11-0406	CALCIUM	868	J
OFF-SO-DUP03	CALCIUM	1010	J
OFF-SO-BK17-0203	CALCIUM	1240	J
OFF-SO-BK13-0406	CHROMIUM	10.9	
OFF-SO-BK08-0406	CHROMIUM	11.1	

TABLE B-22
DATA FOR AREAS C AND D SUBSURFACE SOIL
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

SAMPLE I.D.	ANALYTE	CONCENTRATION	QUALIFIER
OFF-SO-BK02-0406	CHROMIUM	11.7	
OFF-SO-BK03-0406	CHROMIUM	13.4	
OFF-SO-BK06-0406	CHROMIUM	14.2	
OFF-SO-BK04-0406	CHROMIUM	15.4	
OFF-SO-DUP01	CHROMIUM	15.6	
OFF-SO-BK05-0406	CHROMIUM	15.9	
OFF-SO-BK11-0406	CHROMIUM	16.2	
OFF-SO-DUP02	CHROMIUM	16.8	
OFF-SO-BK09-0406	CHROMIUM	17.8	
OFF-SO-BK16-0406	CHROMIUM	17.8	
OFF-SO-BK14-0406	CHROMIUM	18.9	
OFF-SO-BK01-0406	CHROMIUM	19.1	
OFF-SO-DUP03	CHROMIUM	19.3	
OFF-SO-BK17-0203	CHROMIUM	19.5	
OFF-SO-BK07-0406	CHROMIUM	19.8	
OFF-SO-BK12-0406	CHROMIUM	25.5	
OFF-SO-BK15-0406	CHROMIUM	26.3	
OFF-SO-BK13-0406	COBALT	9.8	
OFF-SO-BK17-0203	COBALT	10.4	
OFF-SO-BK08-0406	COBALT	10.6	
OFF-SO-DUP01	COBALT	12.3	
OFF-SO-BK06-0406	COBALT	12.6	
OFF-SO-BK04-0406	COBALT	13	
OFF-SO-BK15-0406	COBALT	14.1	
OFF-SO-BK16-0406	COBALT	14.4	
OFF-SO-DUP02	COBALT	14.4	
OFF-SO-BK05-0406	COBALT	14.5	
OFF-SO-DUP03	COBALT	15	
OFF-SO-BK03-0406	COBALT	16.4	
OFF-SO-BK02-0406	COBALT	16.6	
OFF-SO-BK11-0406	COBALT	16.6	
OFF-SO-BK14-0406	COBALT	16.6	
OFF-SO-BK09-0406	COBALT	16.7	
OFF-SO-BK07-0406	COBALT	17	
OFF-SO-BK12-0406	COBALT	17.5	
OFF-SO-BK01-0406	COBALT	29.2	
OFF-SO-BK17-0203	COPPER	10.1	U
OFF-SO-BK13-0406	COPPER	14.3	U
OFF-SO-BK08-0406	COPPER	14.9	
OFF-SO-BK11-0406	COPPER	16.8	U
OFF-SO-BK15-0406	COPPER	17.2	U
OFF-SO-BK02-0406	COPPER	17.5	
OFF-SO-BK06-0406	COPPER	17.9	
OFF-SO-BK05-0406	COPPER	20.3	
OFF-SO-DUP03	COPPER	20.4	U

TABLE B-22
DATA FOR AREAS C AND D SUBSURFACE SOIL
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

SAMPLE I.D.	ANALYTE	CONCENTRATION	QUALIFIER
OFF-SO-DUP02	COPPER	20.5	U
OFF-SO-BK03-0406	COPPER	20.7	
OFF-SO-DUP01	COPPER	20.8	U
OFF-SO-BK16-0406	COPPER	22.5	U
OFF-SO-BK09-0406	COPPER	24.4	
OFF-SO-BK12-0406	COPPER	25.4	
OFF-SO-BK14-0406	COPPER	25.4	
OFF-SO-BK04-0406	COPPER	25.5	
OFF-SO-BK07-0406	COPPER	27.3	
OFF-SO-BK01-0406	COPPER	32.9	
OFF-SO-BK13-0406	IRON	19500	
OFF-SO-BK08-0406	IRON	21200	J
OFF-SO-BK06-0406	IRON	27200	J
OFF-SO-BK04-0406	IRON	29500	J
OFF-SO-BK05-0406	IRON	30500	J
OFF-SO-BK02-0406	IRON	31600	J
OFF-SO-DUP02	IRON	32100	
OFF-SO-BK09-0406	IRON	32500	J
OFF-SO-BK16-0406	IRON	32800	
OFF-SO-BK17-0203	IRON	33500	
OFF-SO-BK11-0406	IRON	33600	
OFF-SO-DUP01	IRON	33900	
OFF-SO-BK15-0406	IRON	35900	
OFF-SO-BK07-0406	IRON	36500	J
OFF-SO-BK14-0406	IRON	36600	
OFF-SO-DUP03	IRON	36800	
OFF-SO-BK12-0406	IRON	38500	
OFF-SO-BK03-0406	IRON	40700	J
OFF-SO-BK01-0406	IRON	67300	J
OFF-SO-BK13-0406	LEAD	6.6	
OFF-SO-BK08-0406	LEAD	7	
OFF-SO-BK06-0406	LEAD	8.9	
OFF-SO-BK09-0406	LEAD	9.5	
OFF-SO-BK02-0406	LEAD	9.7	
OFF-SO-DUP02	LEAD	9.7	
OFF-SO-BK17-0203	LEAD	9.9	
OFF-SO-DUP01	LEAD	10	
OFF-SO-BK16-0406	LEAD	10.1	
OFF-SO-BK04-0406	LEAD	10.3	
OFF-SO-BK01-0406	LEAD	11.4	
OFF-SO-BK03-0406	LEAD	11.6	
OFF-SO-BK15-0406	LEAD	11.6	
OFF-SO-BK05-0406	LEAD	12.2	
OFF-SO-BK14-0406	LEAD	12.6	
OFF-SO-BK12-0406	LEAD	12.8	

TABLE B-22
DATA FOR AREAS C AND D SUBSURFACE SOIL
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

SAMPLE I.D.	ANALYTE	CONCENTRATION	QUALIFIER
OFF-SO-DUP03	LEAD	14	
OFF-SO-BK07-0406	LEAD	14.1	
OFF-SO-BK11-0406	LEAD	16.1	
OFF-SO-BK06-0406	MAGNESIUM	2280	
OFF-SO-BK13-0406	MAGNESIUM	2340	
OFF-SO-DUP02	MAGNESIUM	2540	
OFF-SO-DUP01	MAGNESIUM	2790	
OFF-SO-BK04-0406	MAGNESIUM	2900	
OFF-SO-BK02-0406	MAGNESIUM	2990	
OFF-SO-BK08-0406	MAGNESIUM	2990	
OFF-SO-BK01-0406	MAGNESIUM	3210	
OFF-SO-BK07-0406	MAGNESIUM	3400	
OFF-SO-BK11-0406	MAGNESIUM	3520	
OFF-SO-BK05-0406	MAGNESIUM	3540	
OFF-SO-BK14-0406	MAGNESIUM	3560	
OFF-SO-BK09-0406	MAGNESIUM	3680	
OFF-SO-BK16-0406	MAGNESIUM	3810	
OFF-SO-BK12-0406	MAGNESIUM	4010	
OFF-SO-BK17-0203	MAGNESIUM	4570	
OFF-SO-BK15-0406	MAGNESIUM	5080	
OFF-SO-DUP03	MAGNESIUM	5160	
OFF-SO-BK03-0406	MAGNESIUM	5270	
OFF-SO-BK17-0203	MANGANESE	141	J
OFF-SO-BK15-0406	MANGANESE	192	
OFF-SO-DUP03	MANGANESE	219	
OFF-SO-BK02-0406	MANGANESE	253	
OFF-SO-DUP01	MANGANESE	315	
OFF-SO-BK04-0406	MANGANESE	318	
OFF-SO-BK13-0406	MANGANESE	340	
OFF-SO-BK03-0406	MANGANESE	359	
OFF-SO-BK06-0406	MANGANESE	359	
OFF-SO-BK08-0406	MANGANESE	371	
OFF-SO-BK16-0406	MANGANESE	386	
OFF-SO-DUP02	MANGANESE	414	
OFF-SO-BK05-0406	MANGANESE	420	
OFF-SO-BK09-0406	MANGANESE	423	
OFF-SO-BK01-0406	MANGANESE	441	
OFF-SO-BK12-0406	MANGANESE	449	
OFF-SO-BK14-0406	MANGANESE	503	
OFF-SO-BK07-0406	MANGANESE	561	
OFF-SO-BK11-0406	MANGANESE	992	
OFF-SO-BK13-0406	MERCURY	0.01	U
OFF-SO-BK01-0406	MERCURY	0.02	U
OFF-SO-BK02-0406	MERCURY	0.02	U
OFF-SO-BK04-0406	MERCURY	0.02	U

TABLE B-22
DATA FOR AREAS C AND D SUBSURFACE SOIL
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

SAMPLE I.D.	ANALYTE	CONCENTRATION	QUALIFIER
OFF-SO-BK05-0406	MERCURY	0.02	U
OFF-SO-BK06-0406	MERCURY	0.02	U
OFF-SO-BK07-0406	MERCURY	0.02	U
OFF-SO-BK09-0406	MERCURY	0.02	U
OFF-SO-BK12-0406	MERCURY	0.02	U
OFF-SO-BK14-0406	MERCURY	0.02	U
OFF-SO-BK17-0203	MERCURY	0.02	U
OFF-SO-DUP02	MERCURY	0.02	U
OFF-SO-BK03-0406	MERCURY	0.03	U
OFF-SO-BK08-0406	MERCURY	0.03	U
OFF-SO-BK11-0406	MERCURY	0.03	U
OFF-SO-BK15-0406	MERCURY	0.03	U
OFF-SO-BK16-0406	MERCURY	0.03	U
OFF-SO-DUP01	MERCURY	0.03	U
OFF-SO-DUP03	MERCURY	0.03	U
OFF-SO-BK13-0406	NICKEL	16.3	
OFF-SO-BK08-0406	NICKEL	16.7	J
OFF-SO-BK06-0406	NICKEL	19.6	J
OFF-SO-BK04-0406	NICKEL	21.4	J
OFF-SO-BK17-0203	NICKEL	22.5	
OFF-SO-DUP01	NICKEL	22.6	
OFF-SO-BK05-0406	NICKEL	22.9	J
OFF-SO-DUP02	NICKEL	24.4	
OFF-SO-BK16-0406	NICKEL	24.6	
OFF-SO-BK02-0406	NICKEL	24.8	J
OFF-SO-BK11-0406	NICKEL	25.1	
OFF-SO-BK07-0406	NICKEL	26.2	J
OFF-SO-BK14-0406	NICKEL	26.6	
OFF-SO-BK09-0406	NICKEL	28.1	J
OFF-SO-BK12-0406	NICKEL	29.1	
OFF-SO-BK03-0406	NICKEL	30.2	J
OFF-SO-DUP03	NICKEL	31.5	
OFF-SO-BK15-0406	NICKEL	32	
OFF-SO-BK01-0406	NICKEL	48.9	J
OFF-SO-BK02-0406	POTASSIUM	212	UJ
OFF-SO-BK15-0406	POTASSIUM	237	U
OFF-SO-BK17-0203	POTASSIUM	241	U
OFF-SO-DUP03	POTASSIUM	275	U
OFF-SO-BK01-0406	POTASSIUM	311	J
OFF-SO-BK11-0406	POTASSIUM	330	
OFF-SO-BK13-0406	POTASSIUM	337	
OFF-SO-BK03-0406	POTASSIUM	354	J
OFF-SO-BK08-0406	POTASSIUM	358	J
OFF-SO-BK06-0406	POTASSIUM	369	J
OFF-SO-DUP01	POTASSIUM	378	

TABLE B-22
DATA FOR AREAS C AND D SUBSURFACE SOIL
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

SAMPLE I.D.	ANALYTE	CONCENTRATION	QUALIFIER
OFF-SO-BK04-0406	POTASSIUM	382	J
OFF-SO-BK12-0406	POTASSIUM	399	
OFF-SO-BK14-0406	POTASSIUM	409	
OFF-SO-DUP02	POTASSIUM	411	
OFF-SO-BK16-0406	POTASSIUM	416	
OFF-SO-BK05-0406	POTASSIUM	484	J
OFF-SO-BK09-0406	POTASSIUM	498	J
OFF-SO-BK07-0406	POTASSIUM	539	J
OFF-SO-BK02-0406	SELENIUM	0.41	UJ
OFF-SO-BK05-0406	SELENIUM	0.42	U
OFF-SO-BK11-0406	SELENIUM	0.42	UJ
OFF-SO-BK01-0406	SELENIUM	0.43	U
OFF-SO-BK04-0406	SELENIUM	0.43	U
OFF-SO-BK09-0406	SELENIUM	0.43	U
OFF-SO-BK07-0406	SELENIUM	0.44	U
OFF-SO-BK13-0406	SELENIUM	0.44	UJ
OFF-SO-BK08-0406	SELENIUM	0.56	UJ
OFF-SO-BK06-0406	SELENIUM	0.73	UJ
OFF-SO-BK03-0406	SELENIUM	0.82	U
OFF-SO-BK15-0406	SELENIUM	1.4	UJ
OFF-SO-BK17-0203	SELENIUM	1.5	UJ
OFF-SO-DUP02	SELENIUM	1.5	UJ
OFF-SO-DUP01	SELENIUM	1.6	UJ
OFF-SO-DUP03	SELENIUM	1.6	UJ
OFF-SO-BK12-0406	SELENIUM	1.7	UJ
OFF-SO-BK14-0406	SELENIUM	1.7	UJ
OFF-SO-BK16-0406	SELENIUM	1.7	UJ
OFF-SO-BK13-0406	SILVER	5.2	U
OFF-SO-BK08-0406	SILVER	5.8	UJ
OFF-SO-BK06-0406	SILVER	7.3	J
OFF-SO-BK04-0406	SILVER	7.7	J
OFF-SO-BK02-0406	SILVER	8	J
OFF-SO-BK05-0406	SILVER	8	J
OFF-SO-BK16-0406	SILVER	8.2	U
OFF-SO-DUP02	SILVER	8.2	U
OFF-SO-BK17-0203	SILVER	8.3	U
OFF-SO-BK11-0406	SILVER	8.5	
OFF-SO-BK15-0406	SILVER	8.6	
OFF-SO-BK09-0406	SILVER	8.7	J
OFF-SO-DUP01	SILVER	8.7	
OFF-SO-DUP03	SILVER	9.2	
OFF-SO-BK07-0406	SILVER	9.5	J
OFF-SO-BK14-0406	SILVER	9.6	
OFF-SO-BK12-0406	SILVER	9.7	
OFF-SO-BK03-0406	SILVER	10.1	J

TABLE B-22
DATA FOR AREAS C AND D SUBSURFACE SOIL
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

SAMPLE I.D.	ANALYTE	CONCENTRATION	QUALIFIER
OFF-SO-BK01-0406	SILVER	16.7	J
OFF-SO-BK06-0406	SODIUM	8	UJ
OFF-SO-BK09-0406	SODIUM	17.9	UJ
OFF-SO-BK08-0406	SODIUM	18.5	UJ
OFF-SO-BK07-0406	SODIUM	20.8	UJ
OFF-SO-BK02-0406	SODIUM	24.1	UJ
OFF-SO-BK04-0406	SODIUM	24.1	UJ
OFF-SO-BK05-0406	SODIUM	25.2	UJ
OFF-SO-BK03-0406	SODIUM	26	UJ
OFF-SO-BK01-0406	SODIUM	43.9	UJ
OFF-SO-DUP01	SODIUM	46.9	UJ
OFF-SO-DUP02	SODIUM	52.3	UJ
OFF-SO-BK14-0406	SODIUM	53.4	UJ
OFF-SO-BK15-0406	SODIUM	53.9	UJ
OFF-SO-DUP03	SODIUM	61.7	UJ
OFF-SO-BK16-0406	SODIUM	66.4	UJ
OFF-SO-BK13-0406	SODIUM	69.5	UJ
OFF-SO-BK17-0203	SODIUM	69.9	UJ
OFF-SO-BK11-0406	SODIUM	113	UJ
OFF-SO-BK12-0406	SODIUM	221	UJ
OFF-SO-BK01-0406	THALLIUM	0	R
OFF-SO-BK11-0406	THALLIUM	0	R
OFF-SO-BK12-0406	THALLIUM	0	R
OFF-SO-BK13-0406	THALLIUM	0	R
OFF-SO-BK14-0406	THALLIUM	0	R
OFF-SO-BK15-0406	THALLIUM	0	R
OFF-SO-BK16-0406	THALLIUM	0	R
OFF-SO-BK17-0203	THALLIUM	0	R
OFF-SO-DUP01	THALLIUM	0	R
OFF-SO-DUP02	THALLIUM	0	R
OFF-SO-DUP03	THALLIUM	0	R
OFF-SO-BK02-0406	THALLIUM	0.31	U
OFF-SO-BK08-0406	THALLIUM	0.32	U
OFF-SO-BK03-0406	THALLIUM	0.33	U
OFF-SO-BK05-0406	THALLIUM	0.33	U
OFF-SO-BK04-0406	THALLIUM	0.34	U
OFF-SO-BK06-0406	THALLIUM	0.34	U
OFF-SO-BK09-0406	THALLIUM	0.34	U
OFF-SO-BK07-0406	THALLIUM	0.35	U
OFF-SO-BK13-0406	VANADIUM	14.6	
OFF-SO-BK08-0406	VANADIUM	17.7	
OFF-SO-BK06-0406	VANADIUM	18.3	
OFF-SO-BK09-0406	VANADIUM	18.5	
OFF-SO-BK02-0406	VANADIUM	18.9	
OFF-SO-BK04-0406	VANADIUM	19.5	

TABLE B-22
DATA FOR AREAS C AND D SUBSURFACE SOIL
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

SAMPLE I.D.	ANALYTE	CONCENTRATION	QUALIFIER
OFF-SO-BK16-0406	VANADIUM	19.6	
OFF-SO-BK15-0406	VANADIUM	19.9	
OFF-SO-BK11-0406	VANADIUM	20	
OFF-SO-BK03-0406	VANADIUM	20.1	
OFF-SO-DUP03	VANADIUM	20.3	
OFF-SO-DUP01	VANADIUM	21.1	
OFF-SO-DUP02	VANADIUM	21.3	
OFF-SO-BK05-0406	VANADIUM	22	
OFF-SO-BK07-0406	VANADIUM	22.3	
OFF-SO-BK14-0406	VANADIUM	23.9	
OFF-SO-BK17-0203	VANADIUM	24.4	
OFF-SO-BK12-0406	VANADIUM	25.4	
OFF-SO-BK01-0406	VANADIUM	28.7	
OFF-SO-BK13-0406	ZINC	37.7	
OFF-SO-BK08-0406	ZINC	40	J
OFF-SO-BK17-0203	ZINC	48.8	
OFF-SO-BK06-0406	ZINC	52	J
OFF-SO-BK04-0406	ZINC	52.9	J
OFF-SO-BK05-0406	ZINC	55.4	J
OFF-SO-BK15-0406	ZINC	57.2	
OFF-SO-DUP02	ZINC	58.4	
OFF-SO-DUP03	ZINC	58.6	
OFF-SO-BK16-0406	ZINC	59.4	
OFF-SO-DUP01	ZINC	60.5	
OFF-SO-BK09-0406	ZINC	61.5	J
OFF-SO-BK11-0406	ZINC	62.6	
OFF-SO-BK02-0406	ZINC	63.9	J
OFF-SO-BK14-0406	ZINC	65.5	
OFF-SO-BK07-0406	ZINC	67.9	J
OFF-SO-BK03-0406	ZINC	68.1	J
OFF-SO-BK01-0406	ZINC	159	J
OFF-SO-BK12-0406	ZINC	175	

TABLE B-23
DATA FOR AREA I SURFACE SOIL
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

SAMPLE I.D.	ANALYTE	CONCENTRATION	QUALIFIER
OFF-SO-BK19-0002	ALUMINUM	9940	
OFF-SO-DUP04	ALUMINUM	10400	
OFF-SO-BK20-0002	ALUMINUM	10500	
OFF-SO-BK18-0002	ALUMINUM	11500	
OFF-SO-BK20-0002	ANTIMONY	0.28	UJ
OFF-SO-DUP04	ANTIMONY	0.29	UJ
OFF-SO-BK19-0002	ANTIMONY	0.32	UJ
OFF-SO-BK18-0002	ANTIMONY	0.34	UJ
OFF-SO-BK19-0002	ARSENIC	3.3	
OFF-SO-BK18-0002	ARSENIC	4.3	J
OFF-SO-DUP04	ARSENIC	5.5	J
OFF-SO-BK20-0002	ARSENIC	6.2	J
OFF-SO-BK19-0002	BARIUM	23	
OFF-SO-DUP04	BARIUM	26.8	J
OFF-SO-BK20-0002	BARIUM	27.5	J
OFF-SO-BK18-0002	BARIUM	39.2	J
OFF-SO-BK19-0002	BERYLLIUM	0.48	
OFF-SO-BK20-0002	BERYLLIUM	0.57	
OFF-SO-DUP04	BERYLLIUM	0.6	
OFF-SO-BK18-0002	BERYLLIUM	0.69	
OFF-SO-BK20-0002	CADMIUM	0.04	U
OFF-SO-BK18-0002	CADMIUM	0.05	U
OFF-SO-BK19-0002	CADMIUM	0.05	U
OFF-SO-DUP04	CADMIUM	0.05	U
OFF-SO-BK19-0002	CALCIUM	268	UJ
OFF-SO-BK20-0002	CALCIUM	297	UJ
OFF-SO-DUP04	CALCIUM	304	UJ
OFF-SO-BK18-0002	CALCIUM	358	UJ
OFF-SO-BK19-0002	CHROMIUM	7.5	
OFF-SO-DUP04	CHROMIUM	12.1	
OFF-SO-BK18-0002	CHROMIUM	12.8	
OFF-SO-BK20-0002	CHROMIUM	13.4	
OFF-SO-BK19-0002	COBALT	3.7	
OFF-SO-DUP04	COBALT	5.8	
OFF-SO-BK20-0002	COBALT	6.1	
OFF-SO-BK18-0002	COBALT	9.1	
OFF-SO-BK19-0002	COPPER	6.1	U
OFF-SO-DUP04	COPPER	8	U
OFF-SO-BK20-0002	COPPER	8.5	U
OFF-SO-BK18-0002	COPPER	13.7	U
OFF-SO-BK19-0002	IRON	11000	
OFF-SO-DUP04	IRON	14500	
OFF-SO-BK20-0002	IRON	15300	
OFF-SO-BK18-0002	IRON	20600	
OFF-SO-BK19-0002	LEAD	23.5	

TABLE B-23
DATA FOR AREA I SURFACE SOIL
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

SAMPLE I.D.	ANALYTE	CONCENTRATION	QUALIFIER
OFF-SO-BK18-0002	LEAD	24	
OFF-SO-DUP04	LEAD	32.5	
OFF-SO-BK20-0002	LEAD	35.2	
OFF-SO-BK19-0002	MAGNESIUM	928	
OFF-SO-DUP04	MAGNESIUM	1280	
OFF-SO-BK20-0002	MAGNESIUM	1320	
OFF-SO-BK18-0002	MAGNESIUM	1780	
OFF-SO-BK19-0002	MANGANESE	236	
OFF-SO-BK18-0002	MANGANESE	447	
OFF-SO-DUP04	MANGANESE	470	
OFF-SO-BK20-0002	MANGANESE	492	
OFF-SO-BK18-0002	MERCURY	0.04	J
OFF-SO-DUP04	MERCURY	0.04	J
OFF-SO-BK20-0002	MERCURY	0.06	
OFF-SO-BK19-0002	MERCURY	0.07	
OFF-SO-BK19-0002	NICKEL	8.5	
OFF-SO-DUP04	NICKEL	11.7	
OFF-SO-BK20-0002	NICKEL	11.9	
OFF-SO-BK18-0002	NICKEL	16.9	
OFF-SO-DUP04	POTASSIUM	207	U
OFF-SO-BK20-0002	POTASSIUM	209	U
OFF-SO-BK19-0002	POTASSIUM	221	U
OFF-SO-BK18-0002	POTASSIUM	302	U
OFF-SO-BK20-0002	SELENIUM	0.38	UJ
OFF-SO-DUP04	SELENIUM	0.4	UJ
OFF-SO-BK19-0002	SELENIUM	0.44	UJ
OFF-SO-BK18-0002	SELENIUM	0.46	UJ
OFF-SO-BK19-0002	SILVER	3.4	UJ
OFF-SO-BK20-0002	SILVER	4.1	U
OFF-SO-DUP04	SILVER	4.2	U
OFF-SO-BK18-0002	SILVER	5.6	U
OFF-SO-DUP04	SODIUM	43	UJ
OFF-SO-BK18-0002	SODIUM	48.6	UJ
OFF-SO-BK20-0002	SODIUM	52.9	UJ
OFF-SO-BK19-0002	SODIUM	56	UJ
OFF-SO-BK20-0002	THALLIUM	0	R
OFF-SO-DUP04	THALLIUM	0	R
OFF-SO-BK19-0002	THALLIUM	0.35	U
OFF-SO-BK18-0002	THALLIUM	0.37	U
OFF-SO-BK20-0002	VANADIUM	17.5	
OFF-SO-BK19-0002	VANADIUM	17.6	
OFF-SO-DUP04	VANADIUM	17.6	
OFF-SO-BK18-0002	VANADIUM	21.2	
OFF-SO-BK19-0002	ZINC	33	
OFF-SO-DUP04	ZINC	34.5	

TABLE B-23
DATA FOR AREA I SURFACE SOIL
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

SAMPLE I.D.	ANALYTE	CONCENTRATION	QUALIFIER
OFF-SO-BK20-0002	ZINC	35.9	
OFF-SO-BK18-0002	ZINC	69.4	

TABLE B-24
DATA FOR AREA I SUBSURFACE SOIL
OFFTA SITE BACKGROUND SOIL INVESTIGATION
NAVAL STATION NEWPORT, NEWPORT, RHODE ISLAND

SAMPLE I.D.	ANALYTE	CONCENTRATION	QUALIFIER
OFF-SO-BK18-0406	ALUMINUM	11300	
OFF-SO-BK18-0406	ANTIMONY	0.33	UJ
OFF-SO-BK18-0406	ARSENIC	15.9	J
OFF-SO-BK18-0406	BARIUM	30	J
OFF-SO-BK18-0406	BERYLLIUM	0.49	
OFF-SO-BK18-0406	CADMIUM	0.2	U
OFF-SO-BK18-0406	CALCIUM	454	UJ
OFF-SO-BK18-0406	CHROMIUM	15.8	
OFF-SO-BK18-0406	COBALT	22.4	
OFF-SO-BK18-0406	COPPER	27.9	
OFF-SO-BK18-0406	IRON	34800	
OFF-SO-BK18-0406	LEAD	13.6	
OFF-SO-BK18-0406	MAGNESIUM	3610	
OFF-SO-BK18-0406	MANGANESE	366	
OFF-SO-BK18-0406	MERCURY	0.02	U
OFF-SO-BK18-0406	NICKEL	30.2	
OFF-SO-BK18-0406	POTASSIUM	366	
OFF-SO-BK18-0406	SELENIUM	1.8	UJ
OFF-SO-BK18-0406	SILVER	9	
OFF-SO-BK18-0406	SODIUM	53	UJ
OFF-SO-BK18-0406	THALLIUM	0	R
OFF-SO-BK18-0406	VANADIUM	18.2	
OFF-SO-BK18-0406	ZINC	66.9	