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ADDITIONAL INVESTIGATIONS REPORT
OPERABLE UNITS 1, 6, AND 7

NAVAL STATION ROOSEVELT ROADS
CEIBA, PUERTO RICO

TEXT
VOLUME I OF II

CONTRACT TASK ORDER 0277

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LIST OF ACRONYMS AND ABBREVIATIONS

AOC	Area of Concern
ATSDR	Agency for Toxic Substances and Disease Registry
Baker	Baker Environmental, Inc.
bgs	below ground surface
BTEX	Benzene, toluene, ethylbenzene, xylene
CDI	Chronic Daily Intake
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CMS	Corrective Measures Study
COC	Chemical of Concern
COPCs	Chemicals of Potential Concern
CRAVE	Carcinogen Risk Assessment Verification Endeavor
CRQL	Contract Required Detection Limit
CSF	Carcinogenic Slope Factors
DAD	Dermaly Absorbed Doses
DoN	Department of the Navy
DRMO	Defense Reutilization and Marketing Office
DRO	diesel range organics
Eh	Oxidation Reduction Potential
EPA	Environmental Protection Agency
GRO	gasoline range organics
HEA	Health and Environmental Assessment
HEAST	Health Effects Assessment Summary Table
HHRA	Human Health Risk Assessment
HI	Hazard Index
HSWA	Hazardous and Solid Waste Amendments
HQ	Hazard Quotient
HxCDD	Hexachlorodibenzo-p-dioxin
HxCDF	Hexachlorodibenzofuran
ICM	Interim Corrective Measure
ILCR	Incremental Lifetime Cancer Risk
IR	Installation Restoration
IRIS	Integrated Risk Information System
LANTDIV	Atlantic Division, Naval Facilities Engineering Command
MCLs	maximum contaminant levels
MI	mobility index

LIST OF ACRONYMS AND ABBREVIATIONS
(Continued)

NCEA	National Center for Environmental Assessment
NSRR	Naval Station Roosevelt Roads
OU	Operable Unit
PAH	polyaromatic hydrocarbons
PCB	polychlorinated biphenyls
PCDD	Polychlorinated Dibenzo-p-dioxins
PCDF	Polychlorinated Dibenzofuran
PeCDD	Pentachlorodibenzo-p-dioxin
PeCDF	Pentachlorodibenzofuran
PVC	polyvinyl chloride
QA/QC	quality assurance/quality control
RA	Risk Assessment
RAGS	Risk Assessment Guidance for Superfund
RBCs	Risk Based Concentrations
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RfC	Reference Doses
RfD	Standard Reference Doses
RFI	RCRA Facility Investigation
RME	Reasonable Maximum Exposure
RPD	relative percent difference
SCCRBS	Selecting Exposure Routes and Contaminants of Concern by Risk-Based Screening
SOP	standard operating procedures
SQL	Sample Quantitation Limit
SVOCs	Semivolatile Organic Compounds
SWMU	Solid Waste Management Unit
2,3,7,8-TCDD	2,3,7,8-Tetrachlorodibenzo-p-dioxin
TCDF	Tetradichlorodibenzofuran
TEC	Toxic Equivalent Concentration
TEF	Toxic Equivalent Factor
TPH	total petroleum hydrocarbons
UCL	Upper Confidence Limit
USEPA	United States Environmental Protection Agency
UST	underground storage tank
VOC	volatile organic compounds
WOE	Weight of Evidence

1.0 INTRODUCTION

This document presents the results from the additional investigations for the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) at certain SWMUs within Operable Units (OU) 1, 6, and 7 from Naval Station Roosevelt Roads, Ceiba, Puerto Rico. The initial work at these sites was the performance of first phase RFIs designed to assess whether a release had occurred from the SWMUs. These investigations were reported on in a draft RFI report submitted in July 1996. A number of the areas investigated were found to require some additional confirmatory sampling or further extensive site characterization. This additional work was undertaken in the fall of 1997 using an approved RFI workplan addendum. This report has been prepared by Baker Environmental, Inc. (Baker) under contract to the Atlantic Division, Naval Facilities Engineering Command (LANTDIV), Contract Number N62470-89-D-4814.

On October 20, 1994, a Final RCRA Part B Permit was issued by the United States Environmental Protection Agency (USEPA) Region II to Naval Station Roosevelt Roads (NSRR). This permit contains requirements for RFI activities at 24 solid waste management units (SWMUs) and 3 areas of concern (AOC). Prior to 1993, environmental activities at NSRR, exclusive of underground storage tanks (USTs), were conducted in compliance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) regulations under the Department of the Navy's (DoN's) Installation Restoration (IR) Program. The RCRA Part B Permit, issued for the Defense Reutilization and Marketing Office (DRMO) at NSRR, included provisions for corrective action under the Hazardous and Solid Waste Amendments (HSWA) provisions of RCRA.

The various SWMUs and AOCs at Roosevelt Roads have been grouped together into Operable Units based on similarity of investigation scope, geography, or similarity of contaminants potentially released (Figure 1-1). This report pertains to certain SWMUs and AOCs within OU's 1, 6, and 7 which included:

- SWMU 6 -Building 145 Storage Area / AOC B -Former Building 25 Site
- SWMU 10 -Substation 2 -Building 90
- SWMU 13 -Pest Control Shop
- SWMU 26 -Building 544 Area
- SWMU 31 -Public Works Yard

- SWMU 46 -Pole Storage Yard Covered Pad
- AOC C -Transformer Storage Pad
- AOC D -Station Landfill

1.1 Purpose and Organization

It is the intent of this document to provide full details of the investigations performed recently. Conclusions regarding the analytical results as well as recommendations for the sites are also presented.

Data from previous work at these sites has only been used and discussed as needed. There will be a full summary-type report for OU's 1, 6, and 7 once the final disposition of each area has been determined in accordance with comments received from the EPA.

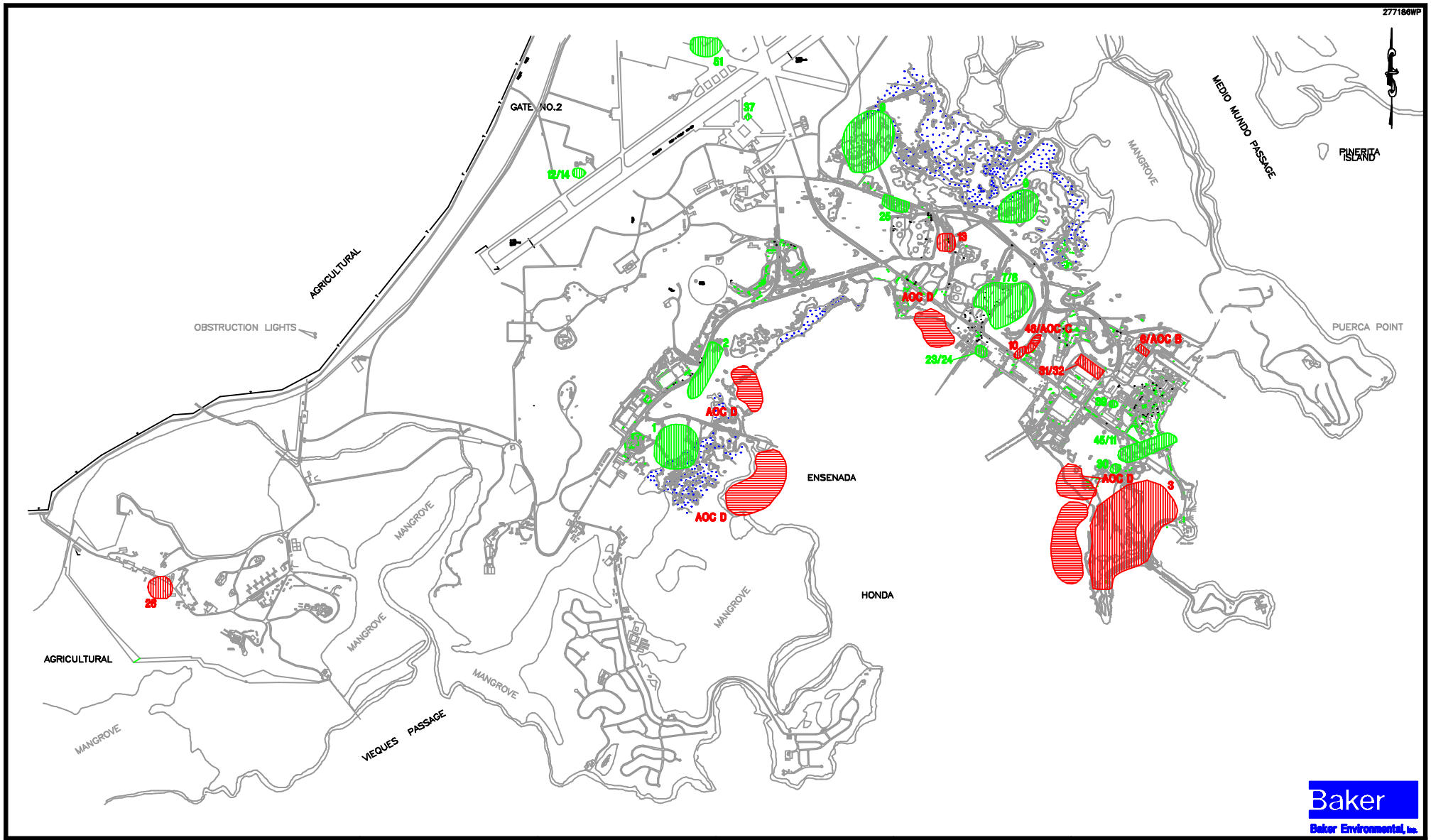
SWMU 30, which requires further site characterization, was originally included in OU 1; however; it now has been separated. A workplan for the additional investigations at SWMU 30 has been submitted and approved. Field work and subsequent reporting pends funding.

The report is divided into five sections. Section 1.0 of this document includes this introduction and the objectives of this RFI Report. Section 2.0 describes the nature and extent of contaminants detected in the environmental samples from each media sampled. Section 3.0 presents the human health risk assessment for each SWMU, Section 4.0 presents conclusions and recommendations and the references utilized in this report are provided in Section 5.0.

1.2 Objectives

The objective of this report is to present and evaluate the applicable data collected during the RFI field investigations at OU's 1, 6, and 7. The evaluation consists of comparing the data to set standards and performing a human health risk assessment to determine if any contaminants detected on-site are detrimental to human health posing an adverse risk to possible receptors. This report will assist in determining if no further action is warranted at any of the sites investigated or further action should be taken to assist in mitigating any present or future risks.

FIGURES



LEGEND

1 – SWMUs

AOC D – AOCs

3 – AREA WHICH THIS INVESTIGATION PERTAINS TO

SOURCE: LANTDIV, FEB. 1992/1997

2500 0 1250 2500

1 inch = 2500 ft.

FIGURE 1–1
SWMU/AOC LOCATION MAP
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

2.0 INVESTIGATIONS AND RESULTS

This section of the text presents the rationale of the work performed at each site and the background sampling location, along with the investigations performed, and the results of the investigations.

2.1 Background Database

2.1.1 Rationale

A background investigation was conducted during the OU 2 field activities in March 1996 and included the installation of four background monitoring wells, BGMW01 through BGMW04 located north of Gate 2 between the entrances to the Crash Crew Area and Air Operations (Figure 2-1). The background wells were installed in undisturbed, wooded areas along the east side of the realigned Boxer Drive. The location of the background monitoring wells was described in the approved RFI work plans (Baker, 1995) as near the perimeter fence north of Gate 2. It was not possible to locate the wells along the west side of Boxer Drive since the ground had been disturbed during the road realignment; therefore, the wells were positioned in an area east of the road to ensure that they were on undisturbed soil. The area of the background wells is heavily wooded and has historically been used as a buffer zone between the station's northeast perimeter fence and the air field.

The background investigations were completely described in the EPA approved Revised Draft, RFI Report for Operable Unit 2 (SWMU 7/8) submitted in June 1997 (Baker, 1997a) and in the OU 1, 6 and 7 RFI Report addendum also submitted in 1997 (Baker, 1997b).

Surface soil, subsurface soil, and groundwater samples were collected from each location in a manner consistent with those collected at OUs 1, 6 and 7. Each background sample media, designation, depth and analytical parameter is outlined in Table 2-1. All of the background samples were analyzed for the full appendix IX parameter list. The background data was compared with the concentrations reported from SWMUs 6, 10, 13, 31, 46, and AOC C for assessment of potential contamination and determining chemicals of potential concern (COPCs) for use in the risk assessment.

It should be noted that separate background samples were collected from the vicinity of SWMU 26 for this site due to it's location being removed from the other sites being investigated. The results from these site-specific background samples are discussed in Section 2.5.

2.1.2 Results

The samples collected from the background area along Boxer Drive included four surface soil samples, eight subsurface soil samples, and four groundwater samples. Compounds detected in the background samples are shown in Tables 2-2 through 2-7.

2.1.2.1 Surface Soil

Table 2-2 presents those organic compounds detected in the surface soil samples collected from the four background monitoring wells. There were no volatile organic compounds (VOCs), pesticides/ polychlorinated biphenyls (PCBs), dioxins, or chlorinated herbicides detected in this sample set, however, three semivolatile organic compounds (SVOCs) (butylbenzylphthalate, bis(2-ethylhexyl) phthalate, and fluoranthene) were detected in sample BGMW01-00. These concentrations did not exceed their respective risk based concentrations (RBCs) (residential or industrial).

Of the inorganic compounds detected in the surface soil samples, (Table 2-3) only the compounds arsenic and beryllium exceeded the residential RBC for soil (430 µg/kg and 150 µg/kg, respectively). A review of Table 2-3 shows that exceedences occurred in samples BGMW01-00, BGMW03-00, and BGMW04-00. Arsenic concentrations in excess of the residential RBC ranged from 1,200 µg/kg at BGMW01-00 to 1,800 µg/kg at BGMW04-00. Beryllium concentrations in excess of the screening criteria ranged from 210 µg/kg at BGMW04-00 to 360 µg/kg at BGMW01-00. Further review shows that these concentrations are below the industrial RBCs for soil.

2.1.2.2 Subsurface Soil

Trace concentrations of organic compounds (VOCs, SVOCs, dioxins, and chlorinated herbicides) were detected in the background subsurface soil sample set as shown in Table 2-4. Detected compounds included xylene, di-n-butyl phthalate, total HxCDD, and 2,4,5-T. Of these compounds only one, total HxCDD, exceeded the residential RBC for soil of 0.043 µg/kg in sample

BGMW03-03 with a concentration of 0.31 J µg/kg. This concentration was below the industrial soil RBC of 0.38 µg/kg. No other compound in the sample set exceeded either the residential or industrial RBC for soil.

A comparison of background subsurface soil inorganic concentrations to the residential RBCs show that two compounds, arsenic and beryllium, exceeded the screening criteria (Table 2-5). Arsenic concentrations exceeded the screening criteria in all of the samples except BGMW01-06 (nondetect). Concentrations ranged from 710 J µg/kg at BGMW02-05 to 2,400 J µg/kg at BGMW03-03. Concentrations of beryllium exceeding the residential RBC ranged from 250 µg/kg at BGMW03-04 to 740 µg/kg at BGMW02-08. All inorganic concentrations in this sample set were below their respective industrial RBCs for soil.

2.1.2.3 Groundwater

One VOC, acetophenone (1 J µg/L), was detected in the background groundwater sample BGMW03 (Table 2-6) which exceeds the tap water RBC. Two SVOCs in sample BGMW03 were detected in this sample set and include bis(2-ethylhexyl)phthalate and dimethyl phthalate with concentrations of 7 J µg/L and 3 J µg/L, respectively. One SVOC, dimethyl phthalate (1 J µg/L), was detected in sample BGMW02. The concentration for bis(2-ethylhexyl)phthalate in sample BGMW03 exceeded the maximum contaminant level (MCL) of 6 µg/L and Tap Water RBC of 4.8 µg/L. All other organic concentrations were below their respective RBC and MCL concentrations. No pesticides/PCBs, dioxins, or chlorinated herbicides were detected in the background groundwater samples.

Table 2-7 presents those inorganic compounds detected in the background groundwater samples for both the total and dissolved fractions. From the total fraction, beryllium concentrations of 2 µg/L in BGMW01 and 2.3 µg/L in BGMW04 exceeded the Tap Water RBC of 0.016 µg/L but was below the MCL of 4 µg/L. Cadmium in BGMW01 (7.5 µg/L) was the only sample to exceed its MCL (5 µg/L) in this sample. Vanadium in sample BGMW04 exceeded the Tap Water RBC of 260 µg/L with a concentration of 549 µg/L. Currently, there is no MCL for this element. There were no dissolved inorganic concentrations that exceeded either the Tap Water RBCs or MCLs.

2.2 SWMU 6/AOC B

2.2.1 Rationale

The original approved RFI workplan (Baker, 1995) contained provisions for three monitoring wells at SWMU 6/AOC B. During the course of the original investigation, an old IR program well (from IR Site 10) was found in the approximate location intended for the new well. This being the case, and the well appearing serviceable, it was determined that a representative sample could be obtained. Subsequently, no information regarding the construction of the well could be found which negated the utility of the well. The original OU 1,6, and 7 RFI report was submitted with the results from only the two new wells. EPA commented on this fact in their review of the report. Based on this comment, the Navy proposed to replace the existing well with a new one. The existing IR program well was to be abandoned by overdrilling and backfilling.

2.2.2 Investigations Performed

One new monitoring well was installed at SWMU 6/AOC B at the location shown on Figure 2-2 during the second phase of the RFI investigation to replace the existing monitoring well at the site. The borings were made with 3.25 inch (nominal) diameter augers. Soil samples were obtained on 2-foot centers utilizing 3 inch diameter split spoons. This sampling was for stratigraphic description, groundwater occurrence purposes, and the collection of subsurface soil samples for laboratory analysis. Once the boring was complete, a two inch diameter poly vinyl chloride (PVC) riser and screen were installed. The well was equipped with a 10-foot screen which extended approximately eight feet into the uppermost water bearing unit. Test boring and well construction records are provided in Appendix A. The original monitoring well which was replaced was abandoned following the installation and sampling of the replacement well.

Two subsurface soil samples (BMW02-03 and BMW02-04) were collected during the installation of the monitoring well at AOC B as presented in Table 2-8. The samples were submitted for laboratory analysis of full appendix IX list and total petroleum hydrocarbons (TPH), diesel range organics (DRO) and gasoline range organics (GRO). Chain-of-custody forms are presented in Appendix B.

The new monitoring well was developed and a groundwater sample (BGW02) was obtained for laboratory analysis of full appendix IX list and TPH, DRO and GRO as shown in Table 2-8. Well development records are provided in Appendix C.

One round of groundwater elevations were obtained during the second phase of the RFI investigation from the three monitoring wells at AOC B to obtain an understanding of groundwater flow at the site. The groundwater elevations and potentiometric surface map are presented on Figure 2-2. The groundwater at this site flows to the west southwest at an extremely low gradient. There is only a 0.03 feet difference in groundwater elevations at the site which range is within potential survey and groundwater elevation measuring accuracy both of which strive to be within 0.01 feet. In general, the groundwater appears to be relatively immobile. It is likely that during periods of high precipitation a minor mounding occurs which will direct flow to the southeast and southwest towards the surface water bodies. In any case, the movement would be extremely slow which would provide significant time for natural attenuation of organic and inorganic constituents.

2.2.3 Results

The samples collected from SWMU 6/AOC B during the investigation included 2 subsurface soil samples from the second phase and 3 groundwater samples from both phases of the RFI investigation. Compounds detected in the SMWU 6/AOCB samples obtained during the investigation are shown in Tables 2-8 through 2-13. A graphical presentation of those compounds detected at concentrations in excess of the screening values are shown on Figures 2-3 and 2-4. A complete set of the analytical data is presented in Appendix D.

2.2.3.1 Subsurface Soils

A total of two subsurface soil samples were collected from SWMU 6/AOC B during the second phase of the investigation. No VOCs, pesticides/PCBs, dioxins, chlorinated herbicides, or TPH, DRO and GRO were detected in the subsurface soil samples.

Two SVOCs were detected in the subsurface soil samples. 2-sec-butyl-4,6-dinitrophenol was detected in both samples at concentrations of 740 µg/kg (BMW02-03) and 720 µg/kg (BMW02-04) which are below their respective screening criteria. Methapyrilene was detected in BMW02-03 at a

concentration of 930 µg/kg. It should be noted that there are no RBCs established for this constituent as indicated in Table 2-9.

Fourteen different inorganic compounds were detected in the subsurface soil samples as shown in Table 2-10. Only antimony, chromium, and silver were detected above the screening criteria as presented on Figure 2-3. Antimony was detected at a concentration of 180 J µg/kg (BMW02-03) and chromium was detected at a concentration of 270,000 µg/kg (BMW02-04) both of which exceeded their respective background concentrations. It should be noted that antimony was not detected in the background subsurface soils. Silver was detected in both samples in excess of the background concentrations with concentrations ranging from 190 J µg/kg to 200 J µg/kg. None of the detected inorganics were in excess of the residential or industrial RBCs.

2.2.3.2 Groundwater

A total of three groundwater samples were obtained between both phases of the investigation at SWMU 6/AOC B. Two samples (ACBMW01 and ACBMW03) were collected during the initial phase while the third groundwater sample (BGW02) was obtained during the second phase of the RFI investigation.

No VOCs, pesticides/PCBs, dioxins, chlorinated herbicides, or TPH, DRO and GRO were detected in the groundwater samples. Only one SVOC, benzoic acid was detected in one of the groundwater samples (BGW02) at a concentration of 2 J µg/L as shown in Table 2-11. It should be noted that this concentration is below the tap water RBC and currently there is no federal MCL for benzoic acid.

A total of twelve different inorganics were detected in the total fraction of the groundwater samples obtained from SWMU 6/AOC B. Eight of which were in excess of at least one of the two screening criteria as shown in Table 2-12. Arsenic, beryllium, copper, and vanadium were detected at concentrations above the tap water RBC. Barium, beryllium, chromium, copper, lead, and nickel concentrations were above the federal primary MCLs as indicated an Figure 2-4.

A total of nine different inorganics were detected in the dissolved fraction of the groundwater samples. Two of which were in excess of at least one of the two screening criteria as shown in Table

2-13. Beryllium was detected in excess of the tap water RBC but below the federal primary MCL in sample ACBMW01 at a concentration of 1.9 µg/L, while lead was in excess of the federal primary MCL of 15 µg/L in sample ACBMW03 at a concentration of 175 J µg/L. Currently there is not a tap water RBC for lead. None of the other detected constituents were above the screening criteria.

2.3 SWMU 10

2.3.1 Rationale

The soils in the area immediately adjacent to the substation were found to contain significant concentrations of PCBs. An Interim Corrective Measure (ICM) was performed at the site which consisted of contaminated soil removal. The ICM close-out report was provided to the EPA. Groundwater sampling was not a part of the initial investigations or the ICM. Based on the presence of a significant concentration of PCBs in the soil, the potential for groundwater to be impacted was apparent and, therefore, a groundwater sampling effort was included in the OU 1, 6, and 7 Phase I RFI. The sampling effort was not successful due to site subsurface conditions. Because the initial sampling program did not result in obtaining sufficient groundwater information, a new sampling program was devised.

Previous investigations at the site using Hydropunch® technology failed to retrieve sufficient groundwater for analysis. These investigations did, however, identify a water containing layer six inches to one foot thick at the approximate base of the soil column. Since this represents the first occurrence of groundwater below the spill zone, it represents the water most likely to show any effect from PCBs in the soil. It was thought that, by using a relatively large diameter well and not developing or purging the well prior to sampling, sufficient water could be obtained to run the appropriate analyses. This is especially the case if a composite sample over time is taken. While this is not the ideal case, the results should be acceptable since it is really the PCB results which are desired and this analyte is least affected by the composite sampling technique. This approach was approved by the EPA by their acceptance of the workplan for additional investigations (Baker, 1997c).

The locations for the groundwater sampling points have been carefully selected to capture groundwater exiting the site. Groundwater flow is expected to be controlled by topography. The area is bordered to the north and west by very steep slopes. Any groundwater flow is expected to be to the south and southeast based on this topography; therefore, this is where the temporary wells were located.

The intent of this investigation was to assess whether PCBs have migrated to the groundwater from the soil.

2.3.2 Investigations Performed

Three temporary monitoring wells were installed at the site at the locations shown on Figure 2-5 during the second phase of the RFI investigation. The borings were made with six inch (nominal) diameter augers. Four inch PVC riser and screen were lowered into the hole with the screen length sufficient to span across the water bearing zone. The hole was not backfilled; however, a watertight bentonite seal was installed at the collar of the well to prevent the inflow of any precipitation. After sampling, the PVC well and bentonite collar were removed and the hole was grouted from the bottom up using a cement/bentonite grout mixture. Test boring and well construction records are provided in Appendix A.

A sample of groundwater was extracted from each temporary well. No purging or development was performed because of the relatively small amount of groundwater infiltration. Each sample was analyzed for VOCs, SVOCs, and PCBs as indicated in Table 2-14. The order of sample collection was PCBs first, VOCs second, and SVOCs last. Upon verification of successful sample analysis, the casings were removed from the temporary wells and the borings were backfilled with a mixture of drill cuttings and bentonite. Chain-of-custody forms are presented in Appendix B.

2.3.3 Results

No VOCs, SVOCs, or PCBs were detected in the three groundwater samples collected from SWMU 10 during the second phase of the RFI investigation. A complete set of the analytical data is provided in Appendix D.

2.4 SWMU 13

2.4.1 Rationale

SWMU 13 has been subjected to three previous investigations each of which has further defined conditions at the site. It has been determined that there are no unacceptable risks posed by the surface soils at the site and, therefore, no additional characterization was required for this media. There is unacceptable risk posed by the sediments in the drainage ditch, especially in terms of the potential ecological receptors. Finally, although groundwater was sampled in the very early investigations, there was no detailed understanding of groundwater flow at the site nor was it adequately demonstrated that groundwater is unaffected. Based on these conditions, additional investigations were performed at the site addressing groundwater and sediments.

2.4.2 Investigations Performed

2.4.2.1 Sediment Investigation

A total of eleven sediment samples were obtained from ten sample locations as shown on Figure 2-6. All of the samples were analyzed for VOCs, SVOCs, pesticides, and TOC as indicated on Table 2-15. Chain-of-custody forms are presented in Appendix B.

Deep sediment samples were to be taken at four locations within the drainage swale along Forrestal Drive at SWMU 13 to provide information about the depth of contamination. Deep sediment samples were not accessible at three of the four proposed locations due to the swale being lined with concrete. Therefore, only one location 13SD06 was sampled. Two deep sediment samples were collected from this location. Sediment sample 13SD06-01 was collected from 1-1/2 to 2 feet below ground surface (bgs) and 13SD06-0 was obtained from 2-1/2 to 3 feet bgs using hand auger.

A total of nine shallow sediment samples were collected at SWMU 13. Three of the shallow sediment samples (13SD07, 13SD08, and 13SD09-00) were taken from the three deep sample locations which were abandoned along with the other six shallow sediment samples. A single surface sediment sample (13SD10) was taken from the drainage ditch at the furthest possible point north of the site as shown on Figure 2-5. This location serves as a background point for sediment

data comparisons to downstream drainage samples from SWMU 13. Four shallow sediment samples (13SD11, 13SD12, 13SD13, and 13SD14) were collected from the sidewalls of the drainage ditch to assess the extent of contamination away from the centerline of the drainageway as provided for in the work plan.

The last shallow sediment sample was obtained at the outfall of the drainage system which entered into the headwall at the southern end of the site to see if contamination has migrated away from SWMU 13 through the drainage system. Figure 2-6 shows the location of 13SD15 which was collected from the outfall of the drainage system.

2.4.2.2 Groundwater Investigations

There are three existing monitoring wells (18GW01, 18GW02, and 18GW03) at the site which were installed during the confirmation study. The condition of the wells were assessed and, found to be useable, therefore, the wells were redeveloped and sampled as a part of this investigation.

Four new wells (13GW04 through 13GW07) were installed at the locations shown on Figure 2-6. Soil samples were obtained on 5-foot centers or less, as deemed appropriate by the field geologist. This sampling was only for stratigraphic description and groundwater occurrence purposes; no samples were retained for laboratory analysis. Once the boring was complete, a 2-inch diameter, PVC well was installed. The well was equipped with a 10-foot screen which extended approximately eight feet into the uppermost water bearing unit.

The new monitoring wells were developed and a groundwater sample was obtained for laboratory analysis of VOCs and SVOCs and pesticides as indicated in Table 2-15. Chain-of-custody forms are presented in Appendix B.

A total of seven groundwater samples were obtained from SWMU 13. Three samples (18GW01, 18GW02, and 18GW03) were collected from the existing monitoring wells while the remaining four samples (13GW04 through 13GW07) were from the newly installed monitoring wells.

One complete set of water level measurements were obtained from all of the wells when they were in equilibrium (e.g., a suitable period of time after sampling). A groundwater elevation contour map

for the site is presented on Figure 2-6. Anticipated groundwater flow at the site was to the south towards Ensenada Honda. While this is generally the case, anomalously high groundwater levels were seen in two of the wells, 13-MW06 and 18GW03 [Note: the 18GW series wells refer to Installation Restoration Site 18 which was the designation of this area prior to its being included in the permit as a SWMU] which are located relatively close to Forrestal Drive in the southern portion of the site.

There is no known hydrogeologic explanation for the anomalous readings. In all the wells, recent water level measurements and survey data has confirmed that the readings were not in error and do represent a natural anomaly. Two possible explanations are offered for the indicated findings:

1) The higher groundwater elevations may be related to the depth of the wells and the possibility that they intercepted a lower aquifer lense which is under partial artesian conditions, or

2) There is a natural slope break in the area of the two wells. The slope near 18GW01 is relatively steep. This slope transitions to flat in the general area of 13SD01. Slope rapidly increases south of 13-MW05. The higher groundwater elevations may be the result of ponding in the subsurface prior to the southern topographic slope break.

While the answer to this anomalous condition is not known with certainty, the discussion is really moot considering the lack of contaminants in groundwater as discussed in the "Results" sections which follow (Section 2.4.3.2).

2.4.3 Results

The samples collected from SWMU 13 during the investigation included five sediment samples from the first phase of the investigation, 11 sediment samples from the second phase of the investigation, two subsurface soil samples from the second phase for bulk density testing only and seven groundwater samples from the second phase of the RFI investigation. Compounds detected in the SMWU 13 samples obtained during the investigation are shown in Tables 2-16 through 2-19. A graphical presentation of those compounds detected at concentrations in excess of the screening

values are shown on Figure 2-7. A complete set of the analytical data is presented in Appendix D.

2.4.3.1 Sediment

A total of eleven sediment samples were collected from SWMU 13 during the second phase of the RFI investigation.

One VOC (2-chloro-1,3-butadiene) was detected in one sample (13SD08) at a concentration of 180J µg/L. This value was below the respective screening criteria. Eleven different SVOCs were detected in six of the eleven sediment samples, the majority of which being polyaromatic hydrocarbons (PAHs) as presented in Table 2-16. Only one of the SVOCs, benzo(a)pyrene was detected in excess of the residential RBCs in two of the sediment samples (13SD07 and 13SD09-00) as shown on Figure 2-7.

Six pesticides were detected from the sediment samples obtained from SWMU 13. Detections of pesticides occurred in all of the samples except for the background sample (13-SD10). All six of the pesticides detected (4,4'-DDD, 4,4'-DDE, 4,4'-DDT, alpha-chlordane, dieldrin, and gamma-chlordane) exceeded the residential RBCs in at least two of the samples and in as many as seven of the samples as shown on Table 2-16. The industrial RBCs were exceeded for 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, and dieldrin. Exceedences of the screening criteria are presented on Figure 2-7. The sediment sample obtained from the outfall of the drainage swale (13SD15) had the fewest detections of pesticides and at minor concentrations compared to the samples collected upstream. No PCBs were detected in the sediment samples from SWMU 13.

It should be noted that no VOCs, SVOCs, or pesticides/PCBs were detected from the background sediment sample (13SD10).

A total of five sediment samples were collected from SWMU 13 during the initial phase of the RFI investigation.

Two VOCs (2-butanone and acetone) were detected in two samples (13SD03 and 13-SD04) as shown in Table 2-17. These values are below the respective screening criteria. Eleven different SVOCs were detected in four of the five sediment samples, the majority of which being PAHs as

presented in Table 2-17. Only one of the SVOCs, benzo(a)pyrene was detected in excess of the residential RBCs in two of the sediment samples (13SD02 and 13SD05).

Three pesticides were detected from the sediment samples obtained from SWMU 13. Detections of pesticides occurred in all of the samples. All three of the pesticides detected (4,4'-DDD, 4,4'-DDE, and 4,4'-DDT) exceeded the residential RBCs in at least three of the samples as shown on Table 2-17. The industrial RBCs were exceeded for 4,4'-DDD, and 4,4'-DDT. No PCBs, dioxins, or chlorinated herbicides were detected in the sediment samples from SWMU 13.

A total of thirteen different inorganic compounds were detected in the five sediment samples. Only arsenic was detected above the residential RBC for soil in all five of the samples. Cadmium, lead, mercury, tin, and zinc were detected in excess of the 2 x average detected background soil concentrations as indicated in Table 2-18.

2.4.3.2 Groundwater

A total of seven groundwater samples were collected from SWMU 13 during the second phase of the RFI investigation.

No VOCs, SVOCs, or PCBs were detected in the groundwater samples. The only positive detection was the pesticide 4,4'-DDD from groundwater sample 13GW04 at a concentration of 0.054 J µg/L as indicated in Table 2-19. This value is below the tap water RBC value of 0.28 µg/L. It should be noted that a federal primary MCL has not been established for this constituent.

2.5 SWMU 26

2.5.1 Rationale

Building 544, demolished in 1990, housed a vehicle maintenance operation for at least a portion of its existence. The RCRA Facility Assessment (RFA) conducted in 1988 found approximately 25 drums at the rear of the building, some of which were seen to contain engine lubricating oil. The drums were removed in 1990 and the soil underlying the area where the drums were stored was moved approximately 20 feet and stockpiled.

A soil gas survey was conducted in the area where the drums were stored and where the soils are stockpiled. This survey did not detect significant levels of volatile organics. Surface soil samples taken at the site indicated the presence of arsenic and beryllium at some points above the residential RBC and a variety of semivolatile constituents at low levels.

The Building 544 Area is located within the "Bundy" portion of the station. Bundy is a primary location for bachelor's quarters and, therefore, it is possible that the Building 544 Area could be used for base housing expansion at some point in the future. This fact, plus the EPA comments on the Draft OU 1, 6 and 7 RFI Report, led to the conclusion that additional investigations were required at the site.

The data from the second phase of the RFI investigation was combined with that from the first phase. A full Human-Health Risk Assessment (HHRA) was performed using all the data (Section 3.0). Arsenic and beryllium, was carried through the risk assessment; however, any risk posed by concentrations of these species which were statistically within background levels were discounted.

The sampling density selected resulted in samples being obtained on 30-foot centers at the most and, in many cases, much less (when considering the initial sampling points also). This provided sufficient areal coverage and data quantity to characterize the surface and subsurface soils.

The presence of arsenic and beryllium above residential RBCs was noted by the EPA in their comments. While this is not disputed, the concentrations are likely the result of background conditions (based on work performed at other areas of the station) and do not represent a release from the SWMU. This area is relatively remote from other SWMUs and the area where background information was obtained; therefore, site-specific background data was developed utilizing three sampling locations (26SS13 through 26SS15) as indicated on Figure 2-8.

2.5.2 Investigations Performed

A total of 10 sampling locations were selected to comprise the additional investigations (see Figure 2-8). Seven of the locations are within the SWMU and three are well outside the SWMU area and served as background sampling points.

Surface soil samples were obtained at each location from the soil just below the root zone in accordance with the appropriate standard operating procedures (SOP) as contained in the original approved RFI Work Plans (Baker, 1995) as presented on Table 2-20. A boring was advanced at each location with a hand auger to a depth of approximately three feet. The soil from approximately two and one-half to three feet was retained and submitted for laboratory analysis for arsenic, beryllium, VOCs, SVOCs, and PCBs. Chain-of-custody records are provided in Appendix C.

2.5.3 Results

The samples collected from SWMU 26 during the investigation included five surface soil samples from the first phase of the investigation, ten surface soil samples from the second phase of the investigation, and ten subsurface soil samples from the second phase of the RFI investigation. Compounds detected in the SMWU 26 samples obtained during the investigation are shown in Tables 2-21 through 2-28. A graphical presentation of those compounds detected at concentrations in excess of the screening values are shown on Figure 2-9. A complete set of the analytical data is presented in Appendix D.

2.5.3.1 Surface Soil

A total of fifteen surface soil samples were collected during the RFI investigations for SWMU 26. Five samples (26SS01 through 26SS05) were collected during the initial phase of the investigation. Ten samples (26SS06 through 26SS15) were obtained during the second phase, three of which are the site specific background samples (26SS13 through 26SS15) as presented on Figure 2-8.

One VOC (2-hexanone) was detected in surface soil sample 26SS06 at a concentration of 11µg/kg. This constituent was not detected in the background samples and was below residential RBC. Thirteen different SVOCs were detected in the twelve surface soil samples. None of the detections were in excess of the RBCs, although five of the constituents (Di-n-octylphthalate, fluoranthene, pentachlorophenol, phenanthrene, and pyrene) were detected in excess of background concentrations in four different samples (25SS05, 26SS10 through 26SS12) as presented in Table 2-21.

Fourteen different inorganic compounds were detected in the surface soil samples as shown in

Table 2-22. Arsenic and beryllium were the only constituents which were detected above any of the screening criteria as shown on Figure 2-9. Arsenic was detected above the residential RBC in 11 of the 12 samples ranging in concentration from 660 J µg/L (26SS12) to 1,500 J µg/L (26SS09). None of the detected concentrations of arsenic were above two times the average detected background concentrations. Beryllium was detected in excess of the residential RBC in nine of the twelve samples ranging in concentration from 170 µg/L (26SS01) to 1,700 µg/L (26SS08 and 26SS12). The industrial RBC for beryllium was also exceeded in three of the samples ranging in concentration from 1,600 µg/l (26SS11) to 1,700 µg/L (26SS08 and 26SS12). None of the detected inorganic compounds were in excess of two times the average detected background concentrations.

Background Surface Soil

Three surface soil samples were collected from remote areas of SWMU 26 and analyzed for VOCs, SVOCs, PCBs, arsenic, and beryllium to obtain background reference data for this site. No VOCs or PCBs were detected in background surface soil samples. Ten different SVOCs were detected as presented in Table 2-23. Benzo(a)pyrene was the only SVOC detected above the residential RBC at a concentration of 99 J µg/L from sample 26SS14 as shown on Figure 2-9. Arsenic and beryllium were detected above the residential RBCs at all three sampling locations as indicated in Table 2-24. None of the detected constituents from the background samples were detected above the industrial RBCs.

2.5.3.2 Subsurface Soil

A total of ten subsurface soil samples (26SB06 through 26SB15) were collected during the second phase of the RFI investigations for SWMU 26. All of the sampling locations correspond with the identical surface soil sample numbering scheme (i.e. 26SS07 is the location for 26SB07). Three of the samples (26SB13 through 26SB15) are the site specific background subsurface soil samples.

Only one VOC (2-hexanone) was detected in the subsurface soil samples from 26SB10 at a concentration of 17 J µg/L which was not detected in the background samples as presented in Table 2-25. Diethylphthalate was the only SVOC detected in two samples ranging in concentration from 55 J µg/L (26SB07) to 160 J µg/L (26SB12). None of the detected organic compounds were

in excess of the RBC values.

Arsenic was detected in three of the seven samples at concentrations in excess of the residential RBC as indicated in Table 2-26. Beryllium was detected in all of the samples in excess of the residential RBC. The industrial RBC for beryllium was exceeded in four of the seven samples as shown in Table 2-26. Two times the average detected background concentration for beryllium was exceeded in three of the samples as shown on Figure 2-9.

Background Subsurface Soil

Three subsurface soil samples were collected from remote areas of SWMU 26 and analyzed for VOCs, SVOCs, PCBs, arsenic, and beryllium to obtain background reference data for this site. No VOCs or PCBs were detected in background subsurface soil samples. Ten different SVOCs were detected as presented in Table 2-27. Benzo(a)pyrene was the only SVOC detected above the residential RBC at a concentration of 160 J µg/L from sample 26SB15 as shown on Figure 2-9. Arsenic and beryllium were detected above the residential RBCs at all three sampling locations as indicated in Table 2-28. None of the detected constituents from the background samples were detected above the industrial RBCs.

2.6 SWMUs 31 and 32

2.6.1 Rationale

The area is comprised of open parking/storage areas adjacent to Building 31 which houses the Station's Public Works Department. SWMU 31 was used for the management of waste vehicle oils and SWMU 32 contained numerous scrap batteries during the initial RFA. Neither area is presently utilized for waste management activities.

The draft Phase I report indicated that there was no unacceptable risk posed by the areas for continued industrial use. It is the Navy's intent to place a land-use restriction on the site limiting it perpetually to industrial uses. However, A.T. Kearney comments regarding the risk assessment for dioxin caused this to be recalculated with the result being that a slight risk to on-site workers was posed by the low level of dioxin present. It should be noted that no dioxin waste was managed at

the site nor did waste burning take place. The result of the recalculated human health risk indicated the need to perform additional sampling at the site.

2.6.2 Investigations Performed

A total of 12 surface soil samples were collected during the RFI investigations at SWMU 31 as presented on Table 2-29. Four surface soil samples (31SS01 through 31SS04) were collected during the initial phase of the RFI investigation while eight additional surface soil samples (31SS05 through 31SS12) were obtained during the second phase of the investigation to further characterize the dioxins in the surface soil at this site.

The twelve surface soil samples were collected from the locations shown on Figure 2-10. The samples were obtained from the zone 3 to 9 inches below the ground surface utilizing hand augers and were analyzed for dioxins only. Chain-of-custody forms are presented in Appendix B.

The depth of sampling selected was designed to avoid the large gravel pieces that work their way to the surface when repeatedly traversed by vehicles (31SS05 through 31SS08) and to obtain samples below the flexible pavement (31SS09 through 31SS12). Sampling at this depth allowed the collection of a more representative soil sample.

The area of sampling includes the possible location of "previous uncontrolled storage," and the area immediately adjacent. It should be noted that dioxins were not found at SWMU 31 and 32 and was only detected at an unquantifiable level in sample 31SS02 and at measurable levels in sample 31SS04 which were both taken in the "uncontrolled storage" area. Samples taken between these locations did not contain detectable dioxin. Therefore, sampling was concentrated in the area where previous detection of dioxins occurred.

The risk assessment indicated a slight risk to on-site workers was driven by the single sample taken at 31SS04. The data gathered in this additional sampling will be combined with that from the previous round and a new risk will be calculated (Section 3.0).

2.6.3 Results

The samples collected from SWMU 31/32 during the investigation included four surface soil samples from the first phase of the investigation, and eight surface soil samples from the second phase of the investigation. Compounds detected in the SMWU 31/32 samples obtained during the investigation are shown in Table 2-29. A graphical presentation of those compounds detected at concentrations in excess of the screening values are shown on Figure 2-11. A complete set of the analytical data is presented in Appendix D.

Dioxins were detected in all but four of the twelve samples submitted for analysis as presented in Table 2-30. The industrial RBCs were exceeded in all but two of the detections, while the residential RBCs were exceeded in all but one of the detections due to the fact that no standards are available for total PeCDD.

2.7 SWMU 46

2.7.1 Rationale

The site was originally listed as a SWMU based on the presence of electrical equipment and scrap on the pad during the initial RFA. The reinspection conducted in 1993 found the pad to be empty, however, it was kept as a SWMU because of its former use. Since that time, the pad has been upgraded with spill control measures and is being used for an under 90-day storage facility by the base operations support contractor.

Initial investigations at the site indicated relatively low levels of some semivolatiles, arsenic and Aroclor-1260. The arsenic is likely naturally occurring based on knowledge of background conditions. PCB is the major constituent of concern even though the concentrations are relatively low, ranging from a maximum of 3.6 ppm to non-detect in the samples. This notwithstanding, the EPA has requested full characterization of the surface and subsurface soils in the area of the pad.

The scope of the investigation was designed to fully characterize the surface and subsurface soils at the site as requested by the EPA. Having samples both close to and away from the pad allowed an assessment of contamination extent to be made and identify any hot spots immediately adjacent to

the pad. Also, the number of samples obtained allowed a full human health risk assessment to be calculated. It is the Navy's intent to place a "land-use restriction" on the site limiting it perpetually to industrial uses.

The analytical parameters selected were based on the findings of the initial investigation. Only those suites of analytes in which positive detections were seen were repeated in these additional investigations.

The data from both phases of the investigation were combined to form a unified database. This database will be utilized to perform a full human-health risk assessment. Both residential and industrial health risks will be assessed (see Section 3.0); however, the site will be restricted to industrial land use in perpetuity by the Navy.

2.7.2 Investigations Performed

Eighteen additional surface soil samples (46SS10 through 46SS24 and ACSS39 through ACSS41) were obtained during the second phase of the investigation at the locations shown on Figure 2-12. It should be noted that the three samples (ACSS39 through ACSS41) collected from the formerly designated "contaminated soil area" were inadvertently labeled in the field for AOC C when they actually belong with SWMU 46. Sampling methodology was in accordance with the applicable SOP as provided in the Final RFI work plans. Combined with the nine surface soil samples (46SS01 through 46SS09) from the initial phase of the investigation, the total number of surface soil samples collected from SWMU 46 is 27 as presented on Table 2-31.

Thirteen subsurface soil samples (46SB01 through 46SB13) were collected from SWMU 46 during the second phase of the investigation as shown on Figure 2-12. Emphasis was placed on obtaining subsurface samples near the pad. At each location, a hand auger was advanced to a depth of three feet below ground surface. The sample portion from two and one-half to three feet was analyzed for SVOCs, PCBs, arsenic, and beryllium.

All of the samples obtained during the second phase were subjected to laboratory analysis for SVOCs, PCBs, arsenic and beryllium. Chain-of-custody forms are presented in Appendix B.

2.7.3 Results

The samples collected from SWMU 46 during the investigation included nine surface soil samples from the first phase of the investigation, eighteen surface soil samples from the second phase of the investigation, four subsurface soil samples from the first phase of the investigation, and thirteen subsurface soil samples from the second phase of the investigation. Compounds detected in the SMWU 46 samples obtained during the investigation are shown in Tables 2-32 through 2-35. A graphical presentation of the aroclor 1260 detected concentrations is shown on Figure 2-13. A complete set of the analytical data is presented in Appendix D.

Only the SVOC, PCB, arsenic, and beryllium results are discussed in this section since they are the constituents of concern as described previously.

2.7.3.1 Surface Soils

A total of 27 surface soil samples were collected during both phases of the investigation at SWMU 46.

There were no significant detections of volatile organic compounds.

The semivolatiles detected above residential RBCs were:

- Benzo(a)anthracene (in 1 of 27 samples)
- Benzo(a)pyrene (in 17 of 27 samples)
- Benzo(a)fluoranthene (in 5 of 27 samples)
- Dibenzo(a,h)anthracene (in 4 of 27 samples)
- Ideno(1,2,3-cd)pyrene (in 1 of 27 samples

A number of other SVOCs were also detected sporadically but at levels below their residential RBC as shown in Table 2-32.

Benzo(a)pyrene (in 2 samples) and dibenzo(a,h)anthracene (one sample) exceeded the industrial RBC in surface soils.

The PCB Aroclor 1260 exceeded residential RBCs in 19 of the 27 samples and exceeded industrial RBCs in 7 of the samples. Concentrations ranged from 390 - 35,000 µg/kg.

Arsenic and beryllium again led the inorganic constituents exceeding criteria. Lead and cadmium also appeared at levels above comparison criteria although in a lesser number of samples than arsenic and beryllium as indicated in Table 2-33. It is possible that the levels seen are related to the relative lack of groundwater movement within the soils derived from igneous rocks. It is less likely that the inorganics are related to site operations since no operations using these metals/metaloids or waste containing these constituents at significant levels are not indicated from historical site usage.

2.7.3.2 Subsurface Soils

There were no exceedences of comparison criteria for any volatiles, semivolatiles or PCBs in the subsurface soil samples as shown in Table 2-34.

Arsenic (in 10 of 17 samples) and beryllium (in 13 of 15 samples) exceeded their respective residential RBCs as presented in Table 2-35. There were no exceedences of industrial RBCs.

2.8 AOC C

2.8.1 Rationale

AOC C was originally included in the corrective action provisions of the RCRA permit based on the fact that numerous transformers and other electrical equipment were being stored on the pads prior to off-site disposal. There were oily stains noted both on and off the pads.

An initial investigation was performed which included 12 surface soil samples. PCBs were found in six of the 12 samples with the highest concentration of 5,200 ppm in one sample at the western end of the northernmost pad (see Figure 2-14).

During maintenance activities at the site, in preparation for the 1996 hurricane season, the soils in the vicinity of the pads was inadvertently stripped to a depth of up to approximately one foot and stockpiled nearby. This stockpile was rigorously characterized and, with the consent of the EPA,

the pile was disposed in the base landfill. This action was taken based on the fact that the highest level of PCBs seen in the pile was 8.6 ppm.

The soils originally characterized in the OU 1, 6 and 7 investigations have been removed from the site; therefore, a recharacterization of the site is necessary. In addition, the EPA has indicated that, since there were significant concentrations of contaminants seen in the surface soil before it was removed, both the surface and subsurface soils need to be fully characterized.

2.8.2 Investigations Performed

Twenty-six surface soil samples (Table 2-36) were collected at the locations shown on Figure 2-14. It should be noted that 12 of the sample locations generally coincide with the points originally sampled. Sampling methodology were in accordance with the applicable SOP contained in the Final RFI Work Plans (Baker, 1995).

Fourteen subsurface soil samples (Table 2-36) were obtained using a hand auger at the locations shown on Figure 2-14. In each boring, cuttings from the zone between two and one-half and three feet were retained for laboratory analysis. Should an insufficient volume of soil be available from this zone, the boring was to be advanced an additional six inches to provide an acceptable quantity of sample.

Each sample was analyzed for volatile and semivolatile organics, PCBs and Appendix IX metals.

Rationale

The areal distribution of sampling points was designed to provide adequate coverage to detect releases and fully characterize the soil both near the pads and in the general area which could reasonably be expected to be affected by releases from the storage pads. It should be noted that subsurface samples were concentrated in the immediate vicinity of the pads as this is considered to be the area where extensive or repeated releases could have occurred which may have driven contamination deeper into the soil zone.

The analytical suites selected provide for analysis of all the constituents detected in the first round

of sampling.

Data Use

The analytical data was used to assess the areal and vertical extent of contamination, if any. A human-health risk assessment was performed on the data for both the residential and industrial land-use scenarios. The residential scenario will only be provided for information since it is the Navy's intent to place a "land-use restriction" on this property that will relegate it to industrial use in perpetuity.

2.8.3 Results

The samples collected from AOC C during the investigation included 26 surface soil samples and 14 subsurface soil samples. Compounds detected in the AOC C samples obtained during the investigation are shown in Tables 2-37 through 2-40. A graphical presentation of the Aroclor 1260 detected concentrations is shown on Figure 2-13. A complete set of the analytical data is presented in Appendix D.

2.8.3.1 Surface Soils

No volatile organic compounds were detected in surface soils at AOC C at concentrations exceeding the industrial or residential RBCs.

The following semivolatile organic compounds were detected at concentrations exceeding their applicable residential RBCs:

- Benzo(a)anthracene (in 4 of 26 samples)
- Benzo(a)pyrene (in 16 of 26 samples)
- Benzo(b)fluoranthene (in 8 of 26 samples)
- Dibenzo(a,h)anthracene (in 7 of 26 samples)
- Ideno(1,2,3-cd)pyrene (in 2 of 26 samples)

Only benzo(a)pyrene (in 16 of 26 samples) exceeded its industrial RBC.

Aroclor 1260 was found in 19 of the 26 samples above the residential RBC. Seven of the PCB concentrations also exceeded the industrial RBC with a maximum detected concentration of 30,000 µg/kg as presented in Table 2-37.

Arsenic and beryllium were the only inorganics which exceeded the residential RBCs. Arsenic, found at levels above RBCs in 24 of 26 samples, ranged in concentration from 100J - 40,500J µg/kg. Beryllium, found at levels above RBCs in 9 of 26 samples, ranged in concentration from 150J - 270J µg/kg. Arsenic exceeded industrial RBCs in 12 of 26 samples as shown in Table 2-38.

There is no explanation of the inorganic concentrations detected at the site related to present or past site operations or waste management practices. The pattern of high levels of arsenic and beryllium is ubiquitous in the general area of Ensenada Honda and is likely results from long-term leaching of soils derived from volcanic rocks.

2.8.3.2 Subsurface Soils

No volatile or semivolatile organics were detected in the subsurface soil at levels exceeding the applicable residential RBCs. Also, no PCBs were seen at levels above the residential RBCs as indicated in Table 2-39.

The inorganics analyzed in the subsurface soils indicated that there were no concentrations of any inorganic above the applicable residential RBC as shown in Table 2-40.

2.9 AOC D

AOC D is comprised of the sediments offshore from certain SWMUs. The sediments are primarily within Ensenada Honda.

2.9.1. Rationale

During the initial work at OU1, 6 and 7, the sediments comprising AOC D were sampled. Two locations on the eastern side of the base landfill were not sampled at that time since there was extensive filling in the area related to construction activities at the CPO Hut. This filling covered

the sediments such that a representative sample could not be obtained. EPA commented on there being a gap in the data as a result of these "missing" samples. Two years has passed since the original sampling and, therefore, the Navy agreed to obtain samples from the two locations.

2.9.2 Investigations Performed

Two sediment samples (Table 2-41) were obtained from the locations shown on Figure 2-15. These locations correspond to those provided for in the original approved RFI workplans and that were not sampled previously. Sampling was performed in accordance with the applicable SOP form the workplans (Baker, 1995).

2.9.3 Results

There were no detections of volatiles, semi-volatiles, pesticides, PCBs, herbicides, or dioxins in the two additional samples (3SD16 and 3SD17) as presented in Table 2-42. There were no exceedences of any screening criteria for inorganics in either sample as shown in Table 2-43. The exceedences of the screening criteria for the complete sediment data set for AOC D are presented on Figure 2-16. This figure is provided to update the entire AOC D data set. A complete set of the analytical data is presented in Appendix D.

No significant concentration of any constituent of concern was indicated in the data. Given this, the risk assessment was not performed since, by the addition of two samples with no exceedences of criteria, the risk could only be lessened.

2.10 Quality Assurance/Quality Control Sample Results

QA/QC sampling efforts consisted of collecting equipment rinsate samples, field blank samples, and trip blanks. Table 2-44 through 2-48 present the detected constituents in the QA/QC samples. The complete set of the analytical results from the QA/QC sampling is presented in Appendix E.

2.10.1 SWMU 6/AOC B -QA/QC Sample Results

Two trip blank samples were associated with the samples from SWMU 6/AOC B and were analyzed for VOCs. Methylene chloride (a ubiquitos laboratory artifact) was the only constituent detected in one (BTB02) of the two samples at a concentration of 10 µg/L as presented in Table 2-44.

2.10.2 SWMU 10 -QA/QC Sample Results

One equipment rinsate sample (10ER01) and one trip blank sample (10TB01) were associated with the samples obtained from SWMU 10 as presented in Table 2-45. The equipment rinsate sample was obtained from a disposable bailer by pouring lab grade deionized water through the bailer. No VOCs were detected in the trip blank sample. Methylene chloride was the only VOC detected in the equipment rinsate sample (10ER01) at a concentration of 6 µg/L. Bis(2-ethylhexyl)phthalate (also a ubiquitous laboratory artifact) was the only SVOC detected in the equipment rinsate sample at a concentration of 140 µg/L. No PCBs were detected in the equipment rinsate sample.

2.10.3 SWMU 13 -QA/QC Sample Results

Three equipment rinsate samples were collected from SWMU 13 and analyzed for VOCs, SVOCs, and pesticides/PCBs. Two of the samples 13ER01 and 13ER02 were rinsates from disposable bailers while 13ER02 is from a stainless steel spoon. Four trip blank samples were associated with the samples and were analyzed for VOCs.

2.10.3.1 Equipment Rinsate Samples

Two VOCs (acetone and methylene chloride) were detected in the equipment rinsate samples as indicated in Table 2-46. Both of these constituents are common laboratory artifacts. Bis(2-ethylhexyl)phthalate was the only SVOC detected in all three of the samples at concentrations ranging from 11 to 130 µg/L. No pesticides/PCBs were detected in the equipment rinsate samples.

2.10.3.2 Trip Blank Samples

Acetone (another common laboratory artifact) was the only VOC detected in one of the four samples at a concentration of 11 J µg/l as shown in Table 2-46.

2.10.4 SWMU 26 -QA/QC Sample Results

One equipment rinsate sample and one trip blank sample were submitted for laboratory analysis in association with the samples obtained from SWMU 26. The equipment rinsate sample (26ER01) was obtained from a stainless steel bucket auger pouring lab grade deionized water through the sampling equipment. No constituents were detected in either of the samples.

2.10.5 SWMU 31 -QA/QC Sample Results

One equipment rinsate sample was submitted for laboratory analysis of dioxins in association with the samples obtained from SWMU 31. The equipment rinsate sample (26ER01) was obtained from a stainless steel bucket auger pouring lab grade deionized water through the sampling equipment. No dioxins were detected in the sample.

2.10.6 SWMU 46 -QA/QC Sample Results

One equipment rinsate sample was submitted for laboratory analysis of SVOCs, PCBs, arsenic, and beryllium in association with the samples obtained from SWMU 46. The equipment rinsate sample was collected by pouring lab grade deionized water over an aluminum pie pan. No SVOCs, PCBs, arsenic, or beryllium were detected in the sample.

2.10.7 AOC C -QA/QC Sample Results

Two equipment rinsate samples were collected from AOC C and analyzed for VOCs, SVOCs, PCBs, TPH and inorganics. ACER01 was collected from a stainless steel spoon utilizing lab grade deionized water while ACER02 was collected from a stainless steel bucket auger. Three trip blank samples were associated with the samples and were analyzed for VOCs.

2.10.7.1 Equipment Rinsate Samples

No VOCs, PCBs, or TPH constituents were detected in the two equipment rinsate samples. Bis(2-ethylhexyl)phthalate was the only SVOC detected in one of the samples at a concentration of 46 µg/L as indicated in Table 2-47. Six different inorganic compounds were detected in the equipment rinsate samples as presented in Table 2-47.

2.10.7.2 Trip Blank Samples

No VOCs were detected in the three trip blank samples.

2.10.8 AOC D -QA/QC Sample Results

One equipment rinsate sample was collected from AOC D and analyzed for full Appendix IX list explosives, asbestos, and TPH. 3ER01 was obtained by pouring lab grade deionized water over a stainless steel spoon. Two trip blank samples were associated with the samples and were analyzed for VOCs.

2.10.7.1 Equipment Rinsate Samples

No VOCs, pesticides/PCBs, dioxins, chlorinated herbicides, explosives, or asbestos were detected in equipment rinsate sample 3ER01. One SVOC (Bis(2-ethylhexyl)phthalate), and two inorganics (chromium and zinc) were the only constituents detected in the equipment rinsate sample associated with AOC D as presented in Table 2-48.

2.10.7.2 Trip Blank Samples

No VOCs were detected in the two trip blank samples.

2.10.7.3 Field Blank Samples

One field blank sample (FB01) was obtained from the Station water supply and analyzed for full appendix IX list, explosives, asbestos and TPH DRO and GRO. The water was collected at the

pump house located at the Tow Way Fuel Farm. No pesticides/PCBs, dioxins, chlorinated herbicides, explosives, or asbestos were detected in the sample. Three VOCs, SVOCs, and four inorganics were detected in the sample as presented in Table 2-48.

TABLES

TABLE 2-1

SUMMARY OF SAMPLING AND ANALYTICAL PROGRAM
BACKGROUND
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Location	Sample Media	Sample Designation	Sample Depth (ft bgs)	Sample Date	Analytical Parameters
Background	Surface Soil	BGMW01-00	0.0-1.0	4/4/96	Appendix IX List
		BGMW02-00	0.0-1.0	4/4/96	Appendix IX List
		BGMW03-00	0.0-1.0	4/4/96	Appendix IX List
		BGMW04-00	0.0-1.0	4/4/96	Appendix IX List
	Subsurface Soil	BGMW01-04	8.0-10.0	4/23/96	Appendix IX List
		BGMW01-06	12.0-14.0	4/23/96	Appendix IX List
		BGMW02-05	10.0-12.0	4/22/96	Appendix IX List
		BGMW02-08	16.0-18.0	4/22/96	Appendix IX List
		BGMW03-03	6.0-8.0	4/12/96	Appendix IX List
		BGMW03-04	8.0-10.0	4/12/96	Appendix IX List
		BGMW04-02	4.0-6.0	4/24/96	Appendix IX List
		BGMW04-04	8.0-10.0	4/24/96	Appendix IX List
	Groundwater	BGMW01	NA	4/27/96	Appendix IX List
		BGMW02	NA	4/27/96	Appendix IX List
		BGMW03	NA	4/16/96	Appendix IX List
		BGMW04	NA	4/27/96	Appendix IX List

Notes: Refer to Table 3-5 for a listing of Appendix IX Parameters
NA - Not Applicable

TABLE 2-2

SUMMARY OF ORGANIC DETECTIONS IN BACKGROUND SURFACE SOILS
OU 1/6/7
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range	EPA Region III Industrial RBCs (ug/kg)	**EPA Region III Residential RBCs** (ug/kg)	BGMW01-00 04/04/96 0.00-1.00	BGMW02-00 04/04/96 0.00-1.00	BGMW03-00 04/04/96 0.00-1.00	BGMW04-00 04/04/96 0.00-1.00
Volatiles (ug/kg)						
Semivolatiles (ug/kg)						
Butylbenzylphthalate	410,000,000	16,000,000	62 J	380 U	400 U	380 U
Bis(2-ethylhexyl)phthalate	410,000	46,000	92 J	380 U	400 U	380 U
Fluoranthene	82,000,000	3,100,000	46 J	380 U	400 U	380 U
Pesticides/PCBs (ug/kg)						
Dioxins (ug/kg)						
Chlorinated Herbicides (ug/kg)						

Data Qualifiers:

U - Not Detected. The associated number indicates the approximate sample concentration necessary to be detected.

J - Analyte present. Reported value may not be accurate or precise

TABLE 2-2 (continued)

SUMMARY OF ORGANIC DETECTIONS IN BACKGROUND SURFACE SOILS
OU 1/6/7
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range	EPA Region III Industrial RBCs (ug/kg)	**EPA Region III Residential RBCs** (ug/kg)	Number Exceeding EPA Region III Industrial RBCs	Range Exceeding EPA Region III Industrial RBCs	Number Exceeding EPA Region III Residential RBCs	Range Exceeding EPA Region III Residential RBCs	Location Maximum Detect
Volatiles (ug/kg)							
Semivolatiles (ug/kg)							
Butylbenzylphthalate	410,000,000	16,000,000	0/4		0/4		BGMW01-00
Bis(2-ethylhexyl)phthalate	410,000	46,000	0/4		0/4		BGMW01-00
Fluoranthene	82,000,000	3,100,000	0/4		0/4		BGMW01-00
Pesticides/PCBs (ug/kg)							
Dioxins (ug/kg)							
Chlorinated Herbicides (ug/kg)							

Data Qualifiers:

U - Not Detected. The associated number indicates the approximate sample concentration necessary to be detected.

J - Analyte present. Reported value may not be accurate or precise

TABLE 2-3

SUMMARY OF INORGANIC DETECTIONS IN BACKGROUND SURFACE SOILS
OU 1/6/7
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range	EPA Region III Industrial RBCs (ug/kg)	**EPA Region III Residential RBCs** (ug/kg)	BGMW01-00 04/04/96 0.00-1.00	BGMW02-00 04/04/96 0.00-1.00	BGMW03-00 04/04/96 0.00-1.00	BGMW04-00 04/04/96 0.00-1.00
Inorganics (ug/kg)						
Arsenic, Total	3,800	430	**1,200**	350 J	**1,500**	**1,800**
Barium, Total	140,000,000	5,500,000	169,000	94,100	35,600	63,700
Beryllium, Total	1,300	150	**360**	100 U	**280**	**210**
Chromium, Total	NE	NE	44,100 J	11,000 J	33,600 J	29,900 J
Cobalt, Total	120,000,000	4,700,000	30,200	27,000	9,500	21,200
Copper, Total	82,000,000	3,100,000	98,500	250,000	57,000	62,900
Lead, Total	NE	400,000 *	9,600	2,400	6,600	11,900
Mercury, Total	610,000	23,000	60	40 U	70	70
Nickel, Total	41,000,000	1,600,000	10,900	7,800	5,800	8,600
Selenium, Total	10,000,000	390,000	560 J	130 UJ	1,200 J	1,100 J
Thallium, Total	NE	NE	100 J	80 U	90 UJ	90 UJ
Tin, Total	1,000,000,000	47,000,000	1,300 U	1,200 U	1,400	2,200
Vanadium, Total	14,000,000	550,000	227,000	123,000	189,000	170,000
Zinc, Total	610,000,000	23,000,000	106,000 J	66,200 J	34,200 J	43,900 J

Data Qualifiers:

U - Not Detected. The associated number indicates the approximate sample concentration necessary to be detected.

UJ - Not detected, quantitation limit may be inaccurate or imprecise.

J - Analyte present. Reported value may not be accurate or precise

Notes:

* - Residential action level for lead in soils.

NE - Not Established.

TABLE 2-3 (continued)

SUMMARY OF INORGANIC DETECTIONS IN BACKGROUND SURFACE SOILS
OU 1/6/7
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range	EPA Region III Industrial RBCs (ug/kg)	**EPA Region III Residential RBCs** (ug/kg)	Number Exceeding EPA Region III Industrial RBCs	Range Exceeding EPA Region III Industrial RBCs	Number Exceeding EPA Region III Residential RBCs	Range Exceeding EPA Region III Residential RBCs	Location Maximum Detect
Inorganics (ug/kg)							
Arsenic, Total	3,800	430	0/4		3/4	1,200-1,800	BGMW04-00
Barium, Total	140,000,000	5,500,000	0/4		0/4		BGMW01-00
Beryllium, Total	1,300	150	0/4		3/4	210-360	BGMW01-00
Chromium, Total	NE	NE	NE		NE		BGMW01-00
Cobalt, Total	120,000,000	4,700,000	0/4		0/4		BGMW01-00
Copper, Total	82,000,000	3,100,000	0/4		0/4		BGMW02-00
Lead, Total	NE	400,000 *	NE		0/4		BGMW04-00
Mercury, Total	610,000	23,000	0/4		0/4		BGMW03-00, BGMW04-00
Nickel, Total	41,000,000	1,600,000	0/4		0/4		BGMW01-00
Selenium, Total	10,000,000	390,000	0/4		0/4		BGMW03-00
Thallium, Total	NE	NE	NE		NE		BGMW01-00
Tin, Total	1,000,000,000	47,000,000	0/4		0/4		BGMW04-00
Vanadium, Total	14,000,000	550,000	0/4		0/4		BGMW01-00
Zinc, Total	610,000,000	23,000,000	0/4		0/4		BGMW01-00

Data Qualifiers:

U - Not Detected. The associated number indicates the approximate sample concentration necessary to be detected.

UJ - Not detected, quantitation limit may be inaccurate or imprecise.

J - Analyte present. Reported value may not be accurate or precise

Notes:

* - Residential action level for lead in soils.

NE - Not Established.

TABLE 2-4

SUMMARY OF ORGANIC DETECTIONS IN BACKGROUND SUBSURFACE SOILS
OU 1/6/7
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range	EPA Region III Industrial RBCs (ug/kg)	**EPA Region III Residential RBCs** (ug/kg)	BGMW01-04 04/23/96 8.00-10.00	BGMW01-06 04/23/96 12.00-14.00	BGMW02-05 04/22/96 12.00-14.00	BGMW02-08 04/22/96 16.00-18.00
Volatiles (ug/kg)						
Xylene (total)	1,000,000,000	160,000,000	2 J	3 J	8 U	7 U
Semivolatiles (ug/kg)						
Di-n-butylphthalate	200,000,000	7,800,000	440 U	490 U	320 J	470 U
Pesticides/PCBs (ug/kg)						
Dioxins (ug/kg)						
Total HxCDD	0.38	0.043	0.14 U	0.23 U	0.3 U	0.13 U
Chlorinated Herbicides (ug/kg)						
2,4,5-T	20,000,000	780,000	44 U	27 J	53 U	47 U

Data Qualifiers:

U - Not Detected. The associated number indicates the approximate sample concentration necessary to be detected.

J - Analyte present. Reported value may not be accurate or precise

TABLE 2-4 (continued)

SUMMARY OF ORGANIC DETECTIONS IN BACKGROUND SUBSURFACE SOILS
OU 1/6/7
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range	EPA Region III Industrial RBCs (ug/kg)	**EPA Region III Residential RBCs** (ug/kg)	BGMW03-03 04/12/96 6.00-8.00	BGMW03-04 04/12/96 8.00-10.00	BGMW04-02 04/24/96 4.00-6.00	BGMW04-04 04/24/96 8.00-10.00
Volatiles (ug/kg)						
Xylene (total)	1,000,000,000	160,000,000	7 U	2 J	6 U	7 U
Semivolatiles (ug/kg)						
Di-n-butylphthalate	200,000,000	7,800,000	460 U	440 U	420 U	420 U
Pesticides/PCBs (ug/kg)						
Dioxins (ug/kg)						
Total HxCDD	0.38	0.043	**0.31 J**	0.26 U	0.35 U	0.42 U
Chlorinated Herbicides (ug/kg)						
2,4,5-T	20,000,000	780,000	46 U	45 U	42 U	45 U

Data Qualifiers:

U - Not Detected. The associated number indicates the approximate sample concentration necessary to be detected.

J - Analyte present. Reported value may not be accurate or precise

TABLE 2-4 (continued)

SUMMARY OF ORGANIC DETECTIONS IN BACKGROUND SUBSURFACE SOILS
OU 1/6/7
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range	EPA Region III Industrial RBCs (ug/kg)	**EPA Region III Residential RBCs** (ug/kg)	Number Exceeding EPA Region III Industrial RBCs	Range Exceeding EPA Region III Industrial RBCs	Number Exceeding EPA Region III Residential RBCs	Range Exceeding EPA Region III Residential RBCs	Location Maximum Detect
Volatiles (ug/kg)							
Xylene (total)	1,000,000,000	160,000,000	0/8		0/8		BGMW01-06
Semivolatiles (ug/kg)							
Di-n-butylphthalate	200,000,000	7,800,000	0/8		0/8		BGMW02-05
Pesticides/PCBs (ug/kg)							
Dioxins (ug/kg)							
Total HxCDD	0.38	0.043	0/8		1/8	.31 J	BGMW03-03
Chlorinated Herbicides (ug/kg)							
2,4,5-T	20,000,000	780,000	0/8		0/8		BGMW01-06

Data Qualifiers:

U - Not Detected. The associated number indicates the approximate sample concentration necessary to be detected.

J - Analyte present. Reported value may not be accurate or precise

TABLE 2-5

SUMMARY OF INORGANIC DETECTIONS IN BACKGROUND SUBSURFACE SOILS
OU 1/6/7
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range	EPA Region III Industrial RBCs (ug/kg)	**EPA Region III Residential RBCs** (ug/kg)	BGMW01-04 04/23/96 8.00-10.00	BGMW01-06 04/23/96 12.00-14.00	BGMW02-05 04/22/96 12.00-14.00	BGMW02-08 04/22/96 16.00-18.00
Inorganics (ug/kg)						
Arsenic, Total	3,800	430	**1,700**	220 UJ	**710 J**	**1,000**
Barium, Total	140,000,000	5,500,000	13,000 J	243,000 J	178,000 J	178,000 J
Beryllium, Total	1,300	150	**290**	**700**	**370**	**740**
Cadmium, Total	1,000,000	39,000	460	440	400 U	620
Chromium, Total	NE	NE	101,000 J	84,100 J	148,000 J	29,100 J
Cobalt, Total	120,000,000	4,700,000	3,700	14,000	15,700	42,400
Copper, Total	82,000,000	3,100,000	65,300	120,000	144,000	131,000
Lead, Total	NE	400,000 *	4,800	4,900	3,300	2,600
Mercury, Total	610,000	23,000	50 U	60 U	60 U	50 U
Nickel, Total	41,000,000	1,600,000	7,200	39,900	35,600	23,000
Selenium, Total	10,000,000	390,000	220 J	170 UJ	190 UJ	160 UJ
Tin, Total	1,000,000,000	47,000,000	1,400 UJ	3,100 J	1,900 UJ	3,400 J
Vanadium, Total	14,000,000	550,000	206,000	256,000	373,000	232,000
Zinc, Total	610,000,000	23,000,000	24,100 J	64,600 J	55,700 J	98,500 J

Data Qualifiers:

U - Not Detected. The associated number indicates the approximate sample concentration necessary to be detected.
UJ - Not detected, quantitation limit may be inaccurate or imprecise.
J - Analyte present. Reported value may not be accurate or precise.
R - Unreliable result. Analyte may or may not be present in the sample. Supporting data necessarry to confirm result.

Notes:

* - Residential action level for lead in soils.
NE - Not Established.

TABLE 2-5 (continued)

SUMMARY OF INORGANIC DETECTIONS IN BACKGROUND SUBSURFACE SOILS
OU 1/6/7
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range	EPA Region III Industrial RBCs (ug/kg)	**EPA Region III Residential RBCs** (ug/kg)	BGMW03-03 04/12/96 6.00-8.00	BGMW03-04 04/12/96 8.00-10.00	BGMW04-02 04/24/96 4.00-6.00	BGMW04-04 04/24/96 8.00-10.00
Inorganics (ug/kg)						
Arsenic, Total	3,800	430	**2,400 J**	**760 J**	**720**	**790**
Barium, Total	140,000,000	5,500,000	9,700	3,500	246,000 J	17,300 J
Beryllium, Total	1,300	150	150	**250**	**330**	130
Cadmium, Total	1,000,000	39,000	330 UJ	330 UJ	480	430
Chromium, Total	NE	NE	58,900 R	63,600 R	34,700 J	10,900 J
Cobalt, Total	120,000,000	4,700,000	2,000	4,300	33,800	4,100
Copper, Total	82,000,000	3,100,000	72,900 R	94,500 R	107,000	37,600
Lead, Total	NE	400,000 *	4,100 J	3,400 J	5,000	6,600
Mercury, Total	610,000	23,000	60 UJ	170 J	60 U	60 U
Nickel, Total	41,000,000	1,600,000	3,700	5,800	10,200	2,200
Selenium, Total	10,000,000	390,000	1,200 J	300 UJ	370 J	160 UJ
Tin, Total	1,000,000,000	47,000,000	1,500 UJ	1,500 UJ	1,400 UJ	1,500 J
Vanadium, Total	14,000,000	550,000	204,000	260,000	234,000	83,900
Zinc, Total	610,000,000	23,000,000	14,000 J	23,000 J	56,200 J	18,400 J

Data Qualifiers:

U - Not Detected. The associated number indicates the approximate sample concentration necessary to be detected.
UJ - Not detected, quantitation limit may be inaccurate or imprecise.
J - Analyte present. Reported value may not be accurate or precise.
R - Unreliable result. Analyte may or may not be present in the sample. Supporting data necessarry to confirm result.

Notes:

* - Residential action level for lead in soils.
NE - Not Established.

TABLE 2-5 (continued)

SUMMARY OF INORGANIC DETECTIONS IN BACKGROUND SUBSURFACE SOILS
OU 1/6/7
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range	EPA Region III Industrial RBCs (ug/kg)	**EPA Region III Residential RBCs** (ug/kg)	Number Exceeding EPA Region III Industrial RBCs	Range Exceeding EPA Region III Industrial RBCs	Number Exceeding EPA Region III Residential RBCs	Range Exceeding EPA Region III Residential RBCs	Location Maximum Detect
Inorganics (ug/kg)							
Arsenic, Total	3,800	430	0/8		7/8	710 J - 2,400 J	BGMW03-03
Barium, Total	140,000,000	5,500,000	0/8		0/8		BGMW04-02
Beryllium, Total	1,300	150	0/8		6/8	250-740	BGMW02-08
Cadmium, Total	1,000,000	39,000	0/8		0/8		BGMW02-08
Chromium, Total	NE	NE	NE		NE		BGMW02-05
Cobalt, Total	120,000,000	4,700,000	0/8		0/8		BGMW02-08
Copper, Total	82,000,000	3,100,000	0/8		0/8		BGMW02-05
Lead, Total	NE	400,000 *	NE		0/8		BGMW04-04
Mercury, Total	610,000	23,000	0/8		0/8		BGMW03-04
Nickel, Total	41,000,000	1,600,000	0/8		0/8		BGMW01-06
Selenium, Total	10,000,000	390,000	0/8		0/8		BGMW03-03
Tin, Total	1,000,000,000	47,000,000	0/8		0/8		BGMW02-08
Vanadium, Total	14,000,000	550,000	0/8		0/8		BGMW02-05
Zinc, Total	610,000,000	23,000,000	0/8		0/8		BGMW02-08

Data Qualifiers:

U - Not Detected. The associated number indicates the approximate sample concentration necessary to be detected.
UJ - Not detected, quantitation limit may be inaccurate or imprecise.
J - Analyte present. Reported value may not be accurate or precise.
R - Unreliable result. Analyte may or may not be present in the sample. Supporting data necessarry to confirm result.

Notes:

* - Residential action level for lead in soils.
NE - Not Established.

TABLE 2-6

SUMMARY OF ORGANIC DETECTIONS IN BACKGROUND GROUNDWATER
OU 1/6/7
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date	Federal MCL (ug/l)	**EPA Region III Tap Water RBC** (ug/l)	BGMW01 04/27/96	BGMW02 04/27/96	BGMW03 04/16/96	BGMW04 04/27/96
Volatiles (ug/l)						
Acetophenone	NE	0.042	11 U	10 U	**1 J**	10 U
Semivolatiles (ug/l)						
Bis(2-ethylhexyl)phthalate	6	4.8	11 U	10 U	**7 J**	10 U
Dimethylphthalate	NE	37,000	11 U	1 J	3 J	10 U
Pesticides/PCBs (ug/l)						
Dioxins (ug/kg)						
Chlorinated Herbicides (ug/kg)						

Data Qualifiers:

U - Not Detected. The associated number indicates the approximate sample concentration necessary to be detected.

J - Analyte present. Reported value may not be accurate or precise

Notes:

NE - Not Established.

TABLE 2-6 (continued)

SUMMARY OF ORGANIC DETECTIONS IN BACKGROUND GROUNDWATER
OU 1/6/7
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date	Federal MCL (ug/l)	**EPA Region III Tap Water RBC** (ug/l)	Number Exceeding Federal MCL	Range Exceeding Federal MCL	**Number Exceeding EPA Region III Tap Water RBC**	**Range Exceeding EPA Region III Tap Water RBC**	Location Maximum Detect
Volatiles (ug/l)							
Acetophenone	NE	0.042	NE		1/4		BGMW03
Semivolatiles (ug/l)							
Bis(2-ethylhexyl)phthalate	6	4.8	1/4	7 J	1/4	7 J	BGMW03
Dimethylphthalate	NE	37,000	NE		0/4		BGMW03
Pesticides/PCBs (ug/l)							
Dioxins (ug/kg)							
Chlorinated Herbicides (ug/kg)							

Data Qualifiers:

U - Not Detected. The associated number indicates the approximate sample concentration necessary to be detected.

J - Analyte present. Reported value may not be accurate or precise

Notes:

NE - Not Established.

TABLE 2-7

SUMMARY OF TOTAL AND DISSOLVED INORGANIC DETECTIONS IN BACKGROUND GROUNDWATER
OU 1/6/7
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date	Federal MCL (ug/l)	EPA Region III **Tap Water RBC** (ug/l)	BGMW01 04/27/96	BGMW02 04/27/96	BGMW03 04/16/96	BGMW04 04/27/96
Total Inorganics (ug/l)						
Arsenic, Total	50	11	1.8 U	1.8 U	1.7 J	3.6
Barium, Total	2,000	2,600	275	212	313	612
Beryllium, Total	4	0.016	**2**	1.1 U	1.1 U	**2.3**
Cadmium, Total	5	18	7.5	2.9 U	2.9 U	2.9 U
Chromium, Total	100	180	54.1	3.1 R	29.4	92
Cobalt, Total	NE	2,200	91.8	54.3	55.4	83.4
Copper, Total	1,300	130,000	120	24	102	352
Lead, Total	15	NE	4.3 J	0.9 UJ	2.5 J	7 J
Nickel, Total	100	730	73.7	40	26.4	39.4
Selenium, Total	50	180	2.8 UJ	1.4 UJ	1.4 UJ	3.1 J
Vanadium, Total	NE	260	159	26.8	103	**549**
Zinc, Total	NE	11,000	178	95.7	128	320
Dissolved Inorganics (ug/l)						
Barium, Soluble	2,000	2,600	82	148	121	126
Chromium, Soluble	100	180	2.6 U	2.6 U	3.7	2.6 U
Cobalt, Soluble	NE	2,200	59.4	44.4	11.5	3.9 U
Copper, Soluble	1,300	130,000	32	2.2 U	2.2 U	2.2 U
Nickel, Soluble	100	730	34.1	35.6	11.1 U	11.1 U
Vanadium, Soluble	NE	260	2.6 U	2.6 U	2.6 U	8.1
Zinc, Soluble	NE	11,000	82.6	60.6	4.4 J	3.8

Data Qualifiers:

U - Not Detected. The associated number indicates the approximate sample concentration necessary to be detected.
UJ - Not detected, quantitation limit may be inaccurate or imprecise.
J - Analyte present. Reported value may not be accurate or precise.
R - Unreliable result. Analyte may or may not be present in the sample. Supporting data necessary to confirm result.

Notes:

NE - Not Established.

TABLE 2-7 (continued)

SUMMARY OF TOTAL AND DISSOLVED INORGANIC DETECTIONS IN BACKGROUND GROUNDWATER
OU 1/6/7
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date	Federal MCL (ug/l)	**EPA Region III Tap Water RBC** (ug/l)	Number Exceeding Federal MCL	Range Exceeding Federal MCL	**Number Exceeding EPA Region III Tap Water RBC**	**Range Exceeding EPA Region III Tap Water RBC**	Location Maximum Detect
Total Inorganics (ug/l)							
Arsenic, Total	50	11	0/4		0/4		BGMW04
Barium, Total	2,000	2,600	0/4		0/4		BGMW04
Beryllium, Total	4	0.016	0/4		2/4	2 - 2.3	BGMW04
Cadmium, Total	5	18	1/4	7.5	0/4		BGMW01
Chromium, Total	100	180	0/4		0/4		BGMW04
Cobalt, Total	NE	2,200	NE		0/4		BGMW01
Copper, Total	1,300	130,000	0/4		0/4		BGMW04
Lead, Total	15	NE	0/4		NE		BGMW04
Nickel, Total	100	730	0/4		0/4		BGMW01
Selenium, Total	50	180	0/4		0/4		BGMW04
Vanadium, Total	NE	260	NE		1/4	549	BGMW04
Zinc, Total	NE	11,000	NE		0/4		BGMW04
Dissolved Inorganics (ug/l)							
Barium, Soluble	2,000	2,600	0/4		0/4		BGMW02
Chromium, Soluble	100	180	0/4		0/4		BGMW03
Cobalt, Soluble	NE	2,200	NE		0/4		BGMW01
Copper, Soluble	1,300	130,000	0/4		0/4		BGMW01
Nickel, Soluble	100	730	0/4		0/4		BGMW02
Vanadium, Soluble	NE	260	NE		0/4		BGMW04
Zinc, Soluble	NE	11,000	NE		0/4		BGMW01

Data Qualifiers:

U - Not Detected. The associated number indicates the approximate sample concentration necessary to be detected.
UJ - Not detected, quantitation limit may be inaccurate or imprecise.
J - Analyte present. Reported value may not be accurate or precise.
R - Unreliable result. Analyte may or may not be present in the sample. Supporting data necessary to confirm result.

Notes:

NE - Not Established.

TABLE 2-8

SUMMARY OF SAMPLING AND ANALYTICAL PROGRAM
SWMU 6 (BUILDING 145 STORAGE AREA)/AOC B (FORMER SITE OF BUILDING 25
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample Media	Sample ID	Sample Depth (ft bgs)	Sample Date	Analytical Parameters
Subsurface Soil	B-MW02-03	4.00-6.00	9/20/97	Appendix IX List, TPH
	B-MW02-04	6.00-8.00	9/20/97	Appendix IX List, TPH
Groundwater	ACBMW01	- -	3/30/96	Appendix IX List, TPH
	ACBMW03	- -	3/30/96	Appendix IX List, TPH
	B-GW02	- -	9/30/97	Appendix IX List, TPH

TABLE 2-9

SUMMARY OF ORGANIC DETECTIONS IN SUBSURFACE SOIL
SWMU 06/AOC B (FORMER BUILDING 25 SITE)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	EPA Region III Industrial Soil RBCs (ug/kg)	**EPA Region III Residential Soil RBCs** (ug/kg)	BMW02-03 09/20/97 4.00-6.00	BMW02-04 09/20/97 6.00-8.00
Volatiles (ug/kg)				
Semivolatiles (ug/kg)				
2-sec-butyl-4,6-dinitrophenol	2,000,000	78,000	740	720
Methapyrilene	NE	NE	930	890 UJ
Pesticides/PCBs (ug/kg)				
Dioxins (ug/kg)				
Chlorinated Herbicides (ug/kg)				
TPH (ug/kg)				

Data Qualifiers:
UJ - Not detected, quantitation limit may be inaccurate or imprecise

Notes:
NE - Not established.

TABLE 2-9

SUMMARY OF ORGANIC DETECTIONS IN SUBSURFACE SOIL
SWMU 06/AOC B (FORMER BUILDING 25 SITE)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	EPA Region III Industrial Soil RBCs (ug/kg)	**EPA Region III Residential Soil RBCs** (ug/kg)	Number Exceeding Industrial Soil RBCs	Range Exceeding Industrial Soil RBCs	**Number Exceeding Residential Soil RBCs**	**Range Exceeding Residential Soil RBCs**	Location Maximum Detect
Volatiles (ug/kg)							
Semivolatiles (ug/kg)							
2-sec-butyl-4,6-dinitrophenol	2,000,000	78,000	0/2		0/2		BMW02-03
Methapyrilene	NE	NE	NE		NE		BMW02-03
Pesticides/PCBs (ug/kg)							
Dioxins (ug/kg)							
Chlorinated Herbicides (ug/kg)							
TPH (ug/kg)							

Data Qualifiers:
UJ - Not detected, quantitation limit may be inaccurate or imprecise

Notes:
NE - Not established.

TABLE 2-10

SUMMARY OF INORGANIC DETECTIONS IN SUBSURFACE SOIL
SWMU 06/AOC B (FORMER BUILDING 25 SITE)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	2 x Average Detected Background (ug/kg)	**EPA Region III Industrial Soil RBCs** (ug/kg)	EPA Region III Residential Soil RBCs (ug/kg)	BMW02-03 09/20/97 4.00-6.00	BMW02-04 09/20/97 6.00-8.00
Inorganics (ug/kg)					
Antimony, Total	0	820,000	31,000	180 J	160 U
Barium, Total	222,125	140,000,000	5,500,000	79,400	73,700
Beryllium, Total	740	1,300	150	140 J	130 J
Cadmium, Total	740	1,000,000	39,000	530	630
Chromium, Total	132,575	10,000,000	390,000	9,200	270,000
Cobalt, Total	30,000	120,000,000	4,700,000	18,900	14,800
Copper, Total	193,075	82,000,000	3,100,000	96,900	110,000
Lead, Total	8,675	NE	400,000 *	1,300	1,600
Nickel, Total	31,900	41,000,000	1,600,000	9,500	14,000
Selenium, Total	570	10,000,000	390,000	470	190 U
Silver, Total	0	10,000,000	390,000	200 J	190 J
Tin, Total	2,963	1,000,000,000	47,000,000	2,200 J	2,300 J
Vanadium, Total	462,225	14,000,000	550,000	145,000	114,000
Zinc, Total	88,625	610,000,000	23,000,000	84,800	52,600

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.

Notes:
NE - Not established.
* - Residential action level for lead in soils.

TABLE 2-10

SUMMARY OF INORGANIC DETECTIONS IN SUBSURFACE SOIL
SWMU 06/AOC B (FORMER BUILDING 25 SITE)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	2 x Average Detected Background (ug/kg)	**EPA Region III Industrial Soil RBCs** (ug/kg)	EPA Region III Residential Soil RBCs (ug/kg)	Number Exceeding 2 x Average Detected Background	Range Exceeding 2 x Average Detected Background	**Number Exceeding Industrial Soil RBCs**	**Range Exceeding Industrial Soil RBCs**	Number Exceeding Residential Soil RBCs	Range Exceeding Residential Soil RBCs	Location Maximum Detect
Inorganics (ug/kg)										
Antimony, Total	0	820,000	31,000	1/2	180	0/2		0/2		BMW02-03
Barium, Total	222,125	140,000,000	5,500,000	0/2		0/2		0/2		BMW02-03
Beryllium, Total	740	1,300	150	0/2		0/2		0/2		BMW02-03
Cadmium, Total	740	1,000,000	39,000	0/2		0/2		0/2		BMW02-04
Chromium, Total	132,575	10,000,000	390,000	0/2	270,000	0/2		0/2		BMW02-04
Cobalt, Total	30,000	120,000,000	4,700,000	0/2		0/2		0/2		BMW02-03
Copper, Total	193,075	82,000,000	3,100,000	0/2		0/2		0/2		BMW02-04
Lead, Total	8,675	NE	400,000 *	0/2		NE		0/2		BMW02-04
Nickel, Total	31,900	41,000,000	1,600,000	0/2		0/2		0/2		BMW02-04
Selenium, Total	570	10,000,000	390,000	0/2		0/2		0/2		BMW02-03
Silver, Total	0	10,000,000	390,000	2/2	190-540	0/2		0/2		BMW02-03
Tin, Total	2,963	1,000,000,000	47,000,000	0/2		0/2		0/2		BMW02-04
Vanadium, Total	462,225	14,000,000	550,000	0/2		0/2		0/2		BMW02-03
Zinc, Total	88,625	610,000,000	23,000,000	0/2		0/2		0/2		BMW02-03

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.

Notes:
NE - Not established.
* - Residential action level for lead in soils.

TABLE 2-11

SUMMARY OF ORGANIC DETECTIONS IN GROUNDWATER
SWMU 06/AOC B (FORMER BUILDING 25 SITE)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date	Federal MCL (ug/l)	**EPA Region III Tap Water RBCs** (ug/l)	ACBMW01 03/30/96	ACBMW03 03/30/96	BGW02 09/30/97
Volatiles (ug/l)					
Semivolatiles (ug/l)					
Benzoic acid	NE	150,000	50 U	50 U	2 J
Pestcides/PCBs (ug/l)					
Dioxins (ug/l)					
Chlorinated Herbicides (ug/l)					
TPH (ug/l)					

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associated number indicates the approximate sample concentration necessary to be detected.

Notes:
NE - Not established.

TABLE 2-11 (continued)

SUMMARY OF ORGANIC DETECTIONS IN GROUNDWATER
SWMU 06/AOC B (FORMER BUILDING 25 SITE)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date	Federal MCL (ug/l)	**EPA Region III Tap Water RBCs** (ug/l)	Number Exceeding Federal MCL	Range Exceeding Federal MCL	**Number Exceeding Tap Water RBCs**	**Range Exceeding Tap Water RBCs**	Location Maximum Detect
Volatiles (ug/l)							
Semivolatiles (ug/l)							
Benzoic acid	NE	150,000	NE		0/3		BGW02
Pestcides/PCBs (ug/l)							
Dioxins (ug/l)							
Chlorinated Herbicides (ug/l)							
TPH (ug/l)							

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associated number indicates the approximate sample concentration necessary to be detected.

Notes:
NE - Not established.

TABLE 2-12

SUMMARY OF TOTAL INORGANIC DETECTIONS IN GROUNDWATER
SWMU 06/AOC B (FORMER BUILDING 25 SITE)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date	Federal Primary MCL (ug/l)	**EPA Region III Tap Water RBC** (ug/l)	ACBMW01 03/30/96	ACBMW03 03/30/96	BGW02 09/30/97
Inorganics (ug/l)					
Arsenic, Total	50	0.045	**5.8 J**	**3.6**	2.5 U
Barium, Total	2,000	2,600	2,210	342	921
Beryllium, Total	4	0.016	**5.9**	1.1 U	**1.1 J**
Chromium, Total	100	180	168	34.4	25.9
Cobalt, Total	NE	2,200	162	73.9	60.9
Copper, Total	1,300	1,500	**2,480**	429	414 J
Lead, Total	15	NE	6.5 J	19.1 J	5.6
Mercury, Total	2	11	0.19	0.23	0.1 U
Nickel, Total	100	730	199	25.4	32.7 J
Tin, Total	NE	22,000	13.5 U	13.5 U	6.5 J
Vanadium, Total	NE	260	**790**	**326**	**269**
Zinc, Total	NE	11,000	2,020	275	239

Data Qualifiers:

J - Analyte present. Reported value may not be accurate or precise.

U - Not detected. The associated number indicates the approximate sample concentration necessary to be detected.

Notes:

NE - Not established.

TABLE 2-12 (continued)

SUMMARY OF TOTAL INORGANIC DETECTIONS IN GROUNDWATER
SWMU 06/AOC B (FORMER BUILDING 25 SITE)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date	Federal Primary MCL (ug/l)	**EPA Region III Tap Water RBC** (ug/l)	Number Exceeding Federal Primary MCL	Range Exceeding Federal Primary MCL	**Number Exceeding EPA Region III Tap Water RBC**	**Range Exceeding EPA Region III Tap Water RBC**	Location Maximum Detect
Inorganics (ug/l)							
Arsenic, Total	50	0.045	0/3		2/3	3.6-5.8J	ACBMW01
Barium, Total	2,000	2,600	1/3	2,210	0/3		ACBMW01
Beryllium, Total	4	0.016	1/3	5.9	2/3	1.1J-5.9	ACBMW01
Chromium, Total	100	180	1/3	168	0/3		ACBMW01
Cobalt, Total	NE	2,200	NE		0/3		ACBMW01
Copper, Total	1,300	1,500	1/3	2,480	1/3	2,480	ACBMW01
Lead, Total	15	NE	1/3	19.1J	NE		ACBMW03
Mercury, Total	2	11	0/3		0/3		ACBMW03
Nickel, Total	100	730	1/3	199	0/3		ACBMW01
Tin, Total	NE	22,000	NE		0/3		BGW02
Vanadium, Total	NE	260	NE		3/3	269-790	ACBMW01
Zinc, Total	NE	11,000	NE		0/3		ACBMW01

Data Qualifiers:

J - Analyte present. Reported value may not be accurate or precise.

U - Not detected. The associated number indicates the approximate sample concentration necessary to be detected.

Notes:

NE - Not established.

TABLE 2-13

SUMMARY OF DISSOLVED INORGANIC DETECTIONS IN GROUNDWATER
SWMU 06/AOC B (FORMER BUILDING 25 SITE)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date	Federal Primary MCL (ug/l)	**EPA Region III Tap Water RBC** (ug/l)	ACBMW01 03/30/96	ACBMW03 03/30/96	BGW02 09/30/97
Inorganics (ug/l)					
Barium, Soluble	2,000	2,600	333	61.8	454
Beryllium, Soluble	4	0.016	**1.9**	1.1 U	0.3 U
Chromium, Soluble	100	180	2.6 U	2.6 U	1.9 J
Cobalt, Soluble	NE	2,200	3.9 U	3.9 U	3.6 J
Copper, Soluble	1,300	1,500	10.6	3.6	1.3 U
Lead, Soluble	15	NE	1.2 UJ	17.5 J	1.5 U
Tin, Soluble	NE	22,000	13.5 U	13.5 U	4 J
Vanadium, Soluble	NE	260	7	11.2	2.4 J
Zinc, Soluble	NE	11,000	8.9	4.7	4.5 J

Data Qualifiers:

J - Analyte present. Reported value may not be accurate or precise.

U - Not detected. The associated number indicates the approximate sample concentration necessary to be detected.

UJ - Not detected, quantitation limit may be inaccurate or imprecise.

Notes:

NE - Not established.

TABLE 2-13 (continued)

SUMMARY OF DISSOLVED INORGANIC DETECTIONS IN GROUNDWATER
SWMU 06/AOC B (FORMER BUILDING 25 SITE)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date	Federal Primary MCL (ug/l)	**EPA Region III Tap Water RBC** (ug/l)	Number Exceeding Federal Primary MCL	Range Exceeding Federal Primary MCL	**Number Exceeding EPA Region III Tap Water RBC**	**Range Exceeding EPA Region III Tap Water RBC**	Location Maximum Detect
Inorganics (ug/l)							
Barium, Soluble	2,000	2,600	0/3		0/3		BGW02
Beryllium, Soluble	4	0.016	0/3		1/3	1.9	ACBMW01
Chromium, Soluble	100	180	0/3		0/3		BGW02
Cobalt, Soluble	NE	2,200	NE		0/3		BGW02
Copper, Soluble	1,300	1,500	0/3		0/3		ACBMW01
Lead, Soluble	15	NE	1/3	17.5J	NE		ACBMW03
Tin, Soluble	NE	22,000	NE		0/3		BGW02
Vanadium, Soluble	NE	260	NE		0/3		ACBMW03
Zinc, Soluble	NE	11,000	NE		0/3		ACBMW01

Data Qualifiers:

J - Analyte present. Reported value may not be accurate or precise.

U - Not detected. The associated number indicates the approximate sample concentration necessary to be detected.

UJ - Not detected, quantitation limit may be inaccurate or imprecise.

Notes:

NE - Not established.

TABLE 2-14

SUMMARY OF SAMPLING AND ANALYTICAL PROGRAM
SWMU 10 (SUBSTATION 2 - BUILDING 90)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample Media	Sample ID	Sample Date	Analytical Parameters
Groundwater	10-GW01	09/21/97	VOCs, SVOCs, PCBs
	10-GW02	09/21/97	VOCs, SVOCs, PCBs
	10-GW03	09/21/97	VOCs, SVOCs, PCBs

TABLE 2-15

SUMMARY OF SAMPLING AND ANALYTICAL PROGRAM
SWMU 13 (PEST CONTROL SHOP)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample Media	Sample ID	Sample Depth (ft bgs)	Sample Date	Analytical Parameters
Sediment	13SD01	0.00-1.00	10/24/95	Appendix IX List
	13SD02	0.00-1.00	10/24/95	Appendix IX List
	13SD03	0.00-1.00	10/24/95	Appendix IX List
	13SD04	0.00-1.00	10/24/95	Appendix IX List
	13SD05	0.00-1.00	10/24/95	Appendix IX List
	13-SD06-01	18.00-24.00	9/16/97	VOC, SVOC, Pesticides/PCB, TOC
	13-SD06-02	30.00-36.00	9/16/97	VOC, SVOC, Pesticides/PCB, TOC
	13-SD07	0.00-6.00	9/16/97	VOC, SVOC, Pesticides/PCB, TOC
	13-SD08	0.00-6.00	9/16/97	VOC, SVOC, Pesticides/PCB, TOC
	13-SD09-00	0.00-6.00	9/16/97	VOC, SVOC, Pesticides/PCB, TOC
	13-SD10-00	0.00-6.00	9/16/97	VOC, SVOC, Pesticides/PCB, TOC
	13-SD11	0.00-6.00	9/18/97	VOC, SVOC, Pesticides/PCB, TOC
	13-SD12	0.00-6.00	9/18/97	VOC, SVOC, Pesticides/PCB, TOC
	13-SD13	0.00-6.00	9/18/97	VOC, SVOC, Pesticides/PCB, TOC
	13-SD14	0.00-6.00	9/18/97	VOC, SVOC, Pesticides/PCB, TOC
	13-SD15	0.00-6.00	10/01/97	VOC, SVOC, Pesticides/PCB, TOC
Subsurface Soil	13-SB01-03		9/17/97	Bulk Density
	13-SB02-03		9/17/97	Bulk Density
Groundwater	13-GW04	--	10/1/97	VOC, SVOC, Pesticides/PCB
	13-GW05	--	10/01/97	VOC, SVOC, Pesticides/PCB
	13-GW06	--	10/01/97	VOC, SVOC, Pesticides/PCB
	13-GW07	--	10/01/97	VOC, SVOC, Pesticides/PCB
	18-GW01	--	9/18/97	VOC, SVOC, Pesticides/PCB
	18-GW02	--	9/18/97	VOC, SVOC, Pesticides/PCB
	18-GW03	--	9/18/97	VOC, SVOC, Pesticides/PCB

TABLE 2-16

SUMMARY OF ORGANIC DETECTIONS IN SEDIMENT - PHASE II
SWMU 13 (PEST CONTROL SHOP)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID	EPA Region III	**EPA Region III**	13SD06-01	13SD06-02	13SD07	13SD08	13SD09-00	13SD10-00
Sample Date	Industrial	**Residential**	09/16/97	09/16/97	09/16/97	09/16/97	09/16/97	09/16/97
Depth Range (inches bgs)	Soil RBC	**Soil RBC**	18.00-24.00	30.00-36.00	0.00-6.00	0.00-6.00	0.00-6.00	0.00-6.00
	(ug/kg)	(ug/kg)						
Volatiles (ug/kg)								
2-Chloro-1,3-butadiene	41,000,000	1,600,000	150 U	150 U	220 U	180 J	180 U	110 U
Semivolatiles (ug/kg)								
Benzo(a)anthracene	7,800	880	490 U	490 U	87 J	580 U	140 J	370 U
Benzo(a)pyrene	780	88	490 U	490 U	**120 J**	580 U	**290 J**	370 U
Benzo(b)fluoranthene	7,800	880	490 U	490 U	240 J	80 J	760	370 U
Benzo(g,h,i)perylene	61,000,000	2,300,000	490 U	490 U	120 J	580 U	220 J	370 U
Benzo(k)fluoranthene	78,000	8,800	490 U	490 U	740 U	580 U	140 J	370 U
Bis(2-ethylhexyl)phthalate	410,000	46,000	490 U	490 U	740 U	580 U	590 U	370 U
Chrysene	780,000	88,000	490 U	490 U	120 J	580 U	560 J	370 U
Fluoranthene	82,000,000	3,100,000	490 U	490 U	740 U	580 U	220 J	370 U
Indeno(1,2,3-cd)pyrene	7,800	880	490 U	490 U	150 J	580 U	210 J	370 U
Phenanthrene	61,000,000	2,300,000	490 U	490 U	740 U	580 U	590 U	370 U
Pyrene	61,000,000	2,300,000	490 U	490 U	81 J	580 U	270 J	370 U
Pesticides/PCBs (ug/kg)								
4,4'-DDD	24,000	2,700	**40,000**	**7,800**	**50,000**	**23,000**	1,500	89 U
4,4'-DDE	17,000	1,900	1,500	380 J	**21,000**	**5,600**	**4,200**	89 U
4,4'-DDT	17,000	1,900	290	690	**4,200**	**13,000**	1,400 U	89 U
alpha-Chlordane	16,000	1,800	3,000 U	2,900 U	800 J	3,500 U	7,200 U	440 U
Dieldrin	360	40	**970**	**220 J**	**1,400**	**220 J**	**1,800**	89 U
gamma-Chlordane	16,000	1,800	3,000 U	2,900 U	890 J	3,500 U	7,200 U	440 U
Total organic carbon (%)	NE	NE	0.53	0.54	6	3.1	5.5	0.73

Data Qualifiers:

U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.

J - Analyte present. Reported value may not be accurate or precise.

UJ - Not detected, quantitation limit may be inaccurate or imprecise.

Notes:

NE - Not established.

TABLE 2-16

SUMMARY OF ORGANIC DETECTIONS IN SEDIMENT - PHASE II
SWMU 13 (PEST CONTROL SHOP)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID	EPA Region III	**EPA Region III**	13SD11	13SD12	13SD13	13SD14	13SD15
Sample Date	Industrial	**Residential**	09/18/97	09/18/97	09/18/97	09/18/97	10/01/97
Depth Range (inches bgs)	Soil RBC	**Soil RBC**	0.00-6.00	0.00-6.00	0.00-6.00	0.00-6.00	0.00-6.00
	(ug/kg)	(ug/kg)					
Volatiles (ug/kg)							
2-Chloro-1,3-butadiene	41,000,000	1,600,000	120 U	150 U	110 U	130 U	140 U
Semivolatiles (ug/kg)							
Benzo(a)anthracene	7,800	880	400 U	510 U	370 U	430 UJ	480 U
Benzo(a)pyrene	780	88	400 U	510 UJ	370 UJ	430 UJ	480 U
Benzo(b)fluoranthene	7,800	880	56 J	510 UJ	370 UJ	430 UJ	480 UJ
Benzo(g,h,i)perylene	61,000,000	2,300,000	400 U	510 UJ	370 UJ	430 UJ	480 U
Benzo(k)fluoranthene	78,000	8,800	400 U	510 UJ	370 UJ	430 UJ	480 U
Bis(2-ethylhexyl)phthalate	410,000	46,000	140 J	140 J	370 U	430 UJ	480 U
Chrysene	780,000	88,000	400 U	510 U	370 U	47 J	480 U
Fluoranthene	82,000,000	3,100,000	42 J	510 U	370 U	78 J	480 U
Indeno(1,2,3-cd)pyrene	7,800	880	400 U	510 UJ	370 UJ	430 UJ	480 U
Phenanthrene	61,000,000	2,300,000	400 U	510 U	370 U	46 J	480 U
Pyrene	61,000,000	2,300,000	400 U	510 U	370 U	62 J	480 U
Pesticides/PCBs (ug/kg)							
4,4'-DDD	24,000	2,700	**6,800**	**6,400**	**9,400**	800 J	3
4,4'-DDE	17,000	1,900	**14,000**	**5,900**	**17,000**	**3,100**	14 J
4,4'-DDT	17,000	1,900	**18,000**	**7,200**	**34,000**	**4,400**	20
alpha-Chlordane	16,000	1,800	**5,000 J**	**3,200 J**	1,400 J	52 J	58 U
Dieldrin	360	40	4,800 U	2,400 U	1,800 U	1,000 U	12 U
gamma-Chlordane	16,000	1,800	**5,000 J**	**2,800 J**	680 J	48 J	58 U
Total organic carbon (%)	NE	NE	2.4	4.2	0.75	3.3	0.26

Data Qualifiers:

U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.

J - Analyte present. Reported value may not be accurate or precise.

UJ - Not detected, quantitation limit may be inaccurate or imprecise.

Notes:

NE - Not established.

TABLE 2-16

SUMMARY OF ORGANIC DETECTIONS IN SEDIMENT - PHASE II
SWMU 13 (PEST CONTROL SHOP)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (inches bgs)	EPA Region III Industrial Soil RBC (ug/kg)	**EPA Region III Residential Soil RBC** (ug/kg)	Number Exceeding EPA Region III Industrial Soil RBC	Range Exceeding EPA Region III Industrial Soil RBC	**Number Exceeding EPA Region III Residential Soil RBC**	**Range Exceeding EPA Region III Residential Soil RBC**	Location Maximum Detect
Volatiles (ug/kg)							
2-Chloro-1,3-butadiene	41,000,000	1,600,000	0/11		0/11		13SD08
Semivolatiles (ug/kg)							
Benzo(a)anthracene	7,800	880	0/11		0/11		13SD09
Benzo(a)pyrene	780	88	0/11		2/11	130J-290J	13SD09
Benzo(b)fluoranthene	7,800	880	0/11		0/11		13SD09
Benzo(g,h,i)perylene	61,000,000	2,300,000	0/11		0/11		13SD09
Benzo(k)fluoranthene	78,000	8,800	0/11		0/11		13SD09
Bis(2-ethylhexyl)phthalate	410,000	46,000	0/11		0/11		13SD11, 13SD12
Chrysene	780,000	88,000	0/11		0/11		13SD09
Fluoranthene	82,000,000	3,100,000	0/11		0/11		13SD09
Indeno(1,2,3-cd)pyrene	7,800	880	0/11		0/11		13SD09
Phenanthrene	61,000,000	2,300,000	0/11		0/11		13SD14
Pyrene	61,000,000	2,300,000	0/11		0/11		13SD09
Pesticides/PCBs (ug/kg)							
4,4'-DDD	24,000	2,700	2/11	40,000-50,000	7/11	6,400-50,000	13SD07
4,4'-DDE	17,000	1,900	2/11	17,000-21,000	7/11	3,100-21,000	13SD07
4,4'-DDT	17,000	1,900	2/11	18,000-34,000	6/11	4,200-34,000	13SD13
alpha-Chlordane	16,000	1,800	0/11		2/11	3,200J-5,000J	13SD11
Dieldrin	360	40	3/11	970-1,800	5/11	220J-1,800	13SD09
gamma-Chlordane	16,000	1,800	0/11		2/11	2,800J-5,000J	13SD11
Total organic carbon (%)	NE	NE	NE		NE		13SD07

Data Qualifiers:

U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.

J - Analyte present. Reported value may not be accurate or precise.

UJ - Not detected, quantitation limit may be inaccurate or imprecise.

Notes:

NE - Not established.

TABLE 2-17

SUMMARY OF ORGANIC DETECTIONS IN SEDIMENT - PHASE I
SWMU 13 (PEST CONTROL SHOP)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID	EPA Region III	**EPA Region III**	13SD01	13SD02	13SD03	13SD04	13SD05
Sample Date	Industrial	**Residential**	10/24/95	10/24/95	10/24/95	10/24/95	10/24/95
Depth Range (ft bgs)	Soil RBC	**Soil RBC**	0.00-1.00	0.00-1.00	0.00-1.00	0.00-1.00	0.00-1.00
	(ug/kg)	(ug/kg)					
Volatiles (ug/kg)							
2-Butanone	NE	NE	16 U	15 U	27	33 J	25 U
Acetone	200,000,000	7,800,000	36 U	29 U	94	100 J	37 U
Semivolatiles (ug/kg)							
Benzo(a)anthracene	7,800	880	520 U	73 J	560 U	870 U	170 J
Benzo(a)pyrene	780	88	520 U	**91 J**	560 U	870 U	**390 J**
Benzo(b)fluoranthene	7,800	880	520 U	270 J	110 J	180 J	750 J
Benzo(g,h,i)perylene	61,000,000	2,300,000	520 U	500 U	560 U	870 U	370 J
Benzo(k)fluoranthene	78,000	8,800	520 U	110 J	560 U	870 U	390 J
Bis(2-ethylhexyl)phthalate	410,000	46,000	520 U	100 J	73 J	870 U	840 U
Chlorobenzilate	21,000	2,400	520 U	500 U	560 U	640 J	840 U
Chrysene	780,000	88,000	520 U	150 J	78 J	870 U	290 J
Fluoranthene	82,000,000	3,100,000	520 U	120 J	560 U	870 U	190 J
Indeno(1,2,3-cd)pyrene	7,800	880	520 U	79 J	560 U	870 U	370 J
Pyrene	61,000,000	2,300,000	520 U	140 J	58 J	870 U	220 J
Pesticides/PCBs (ug/kg)							
4,4'-DDD	24,000	2,700	130 U	**24,000**	**4,300**	**34,000**	200 U
4,4'-DDE	17,000	1,900	47	**4,100**	**6,300**	**12,000**	93
4,4'-DDT	17,000	1,900	130 U	1,700	**52,000**	700	42
Dioxins (ug/kg)							
Chlorinated Herbicides (ug/kg)							

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.

Notes:
NE - Not Established.

TABLE 2-17

SUMMARY OF ORGANIC DETECTIONS IN SEDIMENT - PHASE I
SWMU 13 (PEST CONTROL SHOP)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	EPA Region III Industrial Soil RBC (ug/kg)	**EPA Region III Residential Soil RBC** (ug/kg)	Number Exceeding EPA Region III Industrial Soil RBC	Range Exceeding EPA Region III Industrial Soil RBC	**Number Exceeding EPA Region III Residential Soil RBC**	**Range Exceeding EPA Region III Residential Soil RBC**	Location Maximum Detect
Volatiles (ug/kg)							
2-Butanone	NE	NE	NE		NE		13SD04
Acetone	200,000,000	7,800,000	0/5		0/5		13SD04
Semivolatiles (ug/kg)							
Benzo(a)anthracene	7,800	880	0/5		0/5		13SD05
Benzo(a)pyrene	780	88	0/5		2/5	91J-390J	13SD05
Benzo(b)fluoranthene	7,800	880	0/5		0/5		13SD05
Benzo(g,h,i)perylene	61,000,000	2,300,000	0/5		0/5		13SD05
Benzo(k)fluoranthene	78,000	8,800	0/5		0/5		13SD05
Bis(2-ethylhexyl)phthalate	410,000	46,000	0/5		0/5		13SD02
Chlorobenzilate	21,000	2,400	0/5		0/5		13SD04
Chrysene	780,000	88,000	0/5		0/5		13SD05
Fluoranthene	82,000,000	3,100,000	0/5		0/5		13SD05
Indeno(1,2,3-cd)pyrene	7,800	880	0/5		0/5		13SD05
Pyrene	61,000,000	2,300,000	0/5		0/5		13SD05
Pesticides/PCBs (ug/kg)							
4,4'-DDD	24,000	2,700	2/5	24,000-34,000	3/5	4,300-34,000	13SD04
4,4'-DDE	17,000	1,900	0/5		3/5	4,100-12,000	13SD04
4,4'-DDT	17,000	1,900	1/5	52,000	0/5		13SD03
Dioxins (ug/kg)							
Chlorinated Herbicides (ug/kg)							

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.

Notes:
NE - Not Established.

TABLE 2-18

SUMMARY OF INORGANIC DETECTIONS IN SEDIMENT - PHASE I
SWMU 13 (PEST CONTROL SHOP)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	2 x Average Detected Background (ug/kg)	**EPA Region III Industrial Soil RBC** (ug/kg)	EPA Region III Residential Soil RBC (ug/kg)	13SD01 10/24/95 0.00-1.00	13SD02 10/24/95 0.00-1.00	13SD03 10/24/95 0.00-1.00	13SD04 10/24/95 0.00-1.00	13SD05 10/24/95 0.00-1.00
Inorganics (ug/kg)								
Arsenic, Total	2,425	3,800	430	2,100 J	1,100 J	1,300 J	1,400 J	840 J
Barium, Total	181,200	140,000,000	5,500,000	43,000	34,300	38,900	69,200 J	62,500 J
Cadmium, Total	0	1,000,000	39,000	260 J	570 J	1,600	700 J	450 UJ
Chromium, Total	59,300	10,000,000	390,000	21,800	15,400	25,400	17,900 J	20,200 J
Cobalt, Total	43,950	120,000,000	4,700,000	21,300	11,500	9,900	14,000 J	26,300 J
Copper, Total	234,200	82,000,000	3,100,000	45,900	39,900	52,900	74,700 J	70,000 J
Lead, Total	15,250	NE	400,000 *	25,800	38,400	121,000	63,500 J	50,500 J
Mercury, Total	110	610,000	2,300	80 U	60 U	420	100 UJ	130 UJ
Nickel, Total	16,550	41,000,000	1,600,000	9,100	8,800	12,900	10,200 J	12,900 J
Selenium, Total	1,462.50	10,000,000	390,000	870 J	210 U	310 U	870 J	1,400 J
Tin, Total	2,425	1,000,000,000	47,000,000	2,900	3,600	6,900	7,900 J	3,900 UJ
Vanadium, Total	354,500	14,000,000	550,000	173,000 J	57,100 J	62,400 J	80,900 J	119,000 J
Zinc, Total	125,150	610,000,000	23,000,000	59,500 J	69,000 J	189,000 J	141,000 J	105,000 J

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.
UJ - Not detected, quantitation limit may be inaccurate or imprecise.

Notes:
NE - Not established.
* - Residential action level for lead in soils.

TABLE 2-18

SUMMARY OF INORGANIC DETECTIONS IN SEDIMENT - PHASE I
SWMU 13 (PEST CONTROL SHOP)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	2 x Average Detected Background (ug/kg)	**EPA Region III Industrial Soil RBC** (ug/kg)	EPA Region III Residential Soil RBC (ug/kg)	Number Exceeding 2 x Average Detected Background	Range Exceeding 2 x Average Detected Background	**Number Exceeding EPA Region III Industrial Soil RBC**	**Range Exceeding EPA Region III Industrial Soil RBC**	Number Exceeding EPA Region III Residential Soil RBC	Range Exceeding EPA Region III Residential Soil RBC	Location Maximum Detect
Inorganics (ug/kg)										
Arsenic, Total	2,425	3,800	430	0/5		0/5		5/5	840J-2,100J	13SD01
Barium, Total	181,200	140,000,000	5,500,000	0/5		0/5		0/5		13SD04
Cadmium, Total	0	1,000,000	39,000	4/5	260J-1,600	0/5		0/5		13SD03
Chromium, Total	59,300	10,000,000	390,000	0/5		0/5		0/5		13SD03
Cobalt, Total	43,950	120,000,000	4,700,000	0/5		0/5		0/5		13SD05
Copper, Total	234,200	82,000,000	3,100,000	0/5		0/5		0/5		13SD04
Lead, Total	15,250	NE	400,000 *	5/5	25,800-121,000	0/5		0/5		13SD03
Mercury, Total	110	610,000	2,300	1/5	420	0/5		0/5		13SD03
Nickel, Total	16,550	41,000,000	1,600,000	0/5		0/5		0/5		13SD03, 13SD05
Selenium, Total	1,462.50	10,000,000	390,000	0/5		0/5		0/5		13SD05
Tin, Total	2,425	1,000,000,000	47,000,000	4/5	2,900-7,900J	0/5		0/5		13SD04
Vanadium, Total	354,500	14,000,000	550,000	0/5		0/5		0/5		13SD01
Zinc, Total	125,150	610,000,000	23,000,000	2/5	141,000J-189,000J	0/5		0/5		13SD03

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.
UJ - Not detected, quantitation limit may be inaccurate or imprecise.

Notes:
NE - Not established.
* - Residential action level for lead in soils.

TABLE 2-19

SUMMARY OF ORGANIC DETECTIONS IN GROUNDWATER
SWMU 13 (PEST CONTROL SHOP)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date	Federal MCL (ug/l)	**EPA Region III Tap Water RBCs (ug/l)**	13GW04 10/01/97	13GW05 10/01/97	13GW06 10/01/97	13GW07 10/01/97	18GW01 09/18/97	18GW02 09/18/97	18GW03 09/18/97
Volatiles (ug/l)									
Semivolatiles (ug/l)									
Pesticides/PCBs (ug/l)									
4,4'-DDD	NE	0.28	0.054 J	0.11 U	0.1 U	0.1 U	0.095 U	0.095 U	0.095 U

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.

Notes:
NE - Not Established.

TABLE 2-19

SUMMARY OF ORGANIC DETECTIONS IN GROUNDWATER
SWMU 13 (PEST CONTROL SHOP)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date	Federal MCL (ug/l)	**EPA Region III Tap Water RBCs (ug/l)**	Number Exceeding Federal MCL	Range Exceeding Federal MCL	**Number Exceeding Tap Water RBCs**	**Range Exceeding Tap Water RBCs**	Location Maximum Detect
Volatiles (ug/l)							
Semivolatiles (ug/l)							
Pesticides/PCBs (ug/l)							
4,4'-DDD	NE	0.28	0/7		0/7		13GW04

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.

Notes:
NE - Not Established.

TABLE 2-20

SUMMARY OF SAMPLING AND ANALYTICAL PROGRAM
SWMU 26 (BUILDING 544 AREA)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample Media	Sample ID	Sample Depth (ft bgs)	Sample Date	Analytical Parameters
Surface Soil	26-SS01	0.00-1.00	10/29/95	Appendix IX List
	26-SS02	0.00-1.00	10/29/95	Appendix IX List
	26-SS03	0.00-1.00	10/29/95	Appendix IX List
	26-SS04	0.00-1.00	10/29/95	Appendix IX List
	26-SS05	0.00-1.00	10/29/95	Appendix IX List
	26-SS06	0.00-5.00	9/20/97	VOCs, SVOCs, PCBs, Arsenic/Beryllium
	26-SS07	0.00-5.00	9/20/97	VOCs, SVOCs, PCBs, Arsenic/Beryllium
	26-SS08	0.00-5.00	9/20/97	VOCs, SVOCs, PCBs, Arsenic/Beryllium
	26-SS09	0.00-5.00	9/20/97	VOCs, SVOCs, PCBs, Arsenic/Beryllium
	26-SS10	0.00-5.00	9/20/97	VOCs, SVOCs, PCBs, Arsenic/Beryllium
	26-SS11	0.00-5.00	9/20/97	VOCs, SVOCs, PCBs, Arsenic/Beryllium
	26-SS12	0.00-5.00	9/20/97	VOCs, SVOCs, PCBs, Arsenic/Beryllium
	26-SS13	0.00-5.00	9/20/97	VOCs, SVOCs, PCBs, Arsenic/Beryllium
	26-SS14	0.00-5.00	9/20/97	VOCs, SVOCs, PCBs, Arsenic/Beryllium
	26-SS15	0.00-5.00	9/20/97	VOCs, SVOCs, PCBs, Arsenic/Beryllium
Subsurface Soil	26-SB06	2.50-3.00	9/20/97	VOCs, SVOCs, PCBs, Arsenic/Beryllium
	26-SB07	2.50-3.00	9/20/97	VOCs, SVOCs, PCBs, Arsenic/Beryllium
	26-SB08	2.50-3.00	9/20/97	VOCs, SVOCs, PCBs, Arsenic/Beryllium
	26-SB09	2.50-3.00	9/20/97	VOCs, SVOCs, PCBs, Arsenic/Beryllium
	26-SB10	2.50-3.00	9/20/97	VOCs, SVOCs, PCBs, Arsenic/Beryllium
	26-SB11	2.50-3.00	9/20/97	VOCs, SVOCs, PCBs, Arsenic/Beryllium
	26-SB12	2.50-3.00	9/20/97	VOCs, SVOCs, PCBs, Arsenic/Beryllium
	26-SB13	2.50-3.00	9/20/97	VOCs, SVOCs, PCBs, Arsenic/Beryllium
	26-SB14	2.50-3.00	9/20/97	VOCs, SVOCs, PCBs, Arsenic/Beryllium
	26-SB15	2.50-3.00	9/20/97	VOCs, SVOCs, PCBs, Arsenic/Beryllium

TABLE 2-21

SUMMARY OF ORGANIC DETECTIONS IN SURFACE SOIL
SWMU 26 (BUILDING 544 AREA)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	2 x Average Detected Background (ug/kg)	**EPA Region III Industrial Soil RBCs** (ug/kg)	EPA Region III Residential Soil RBCs (ug/kg)	26SS01 10/29/95 0.00-1.00	26SS02 10/29/95 0.00-1.00	26SS03 10/29/95 0.00-1.00	26SS04 10/29/95 0.00-1.00	26SS05 10/29/95 0.00-1.00	26SS06 09/20/97 0.00-0.50
Volatiles (ug/kg)									
2-Hexanone	0	82,000,000	3,100,000	12 U	12 U	12 U	12 U	12 U	11
Semivolatiles (ug/kg)									
Benzo(a)anthracene	303	7,800	880	410 U	400 U	380 U	400 U	390 U	360 U
Benzo(a)pyrene	329	780	88	410 U	400 U	380 U	400 U	60 J	360 U
Benzo(b)fluoranthene	271	7,800	880	410 U	400 U	380 U	400 U	100 J	360 U
Benzo(g,h,i)perylene	211	61,000,000	2,300,000	410 U	400 U	380 U	400 U	390 U	360 U
Benzo(k)fluoranthene	227	78,000	8,800	410 U	400 U	380 U	400 U	390 U	360 U
Bis(2-ethylhexyl)phthalate	225	410,000	46,000	150 J	47 J	48 J	72 J	390 U	360 U
Chrysene	253	780,000	88,000	410 U	400 U	51 J	400 U	150 J	360 U
Di-n-octylphthalate	0	41,000,000	1,600,000	410 U	400 U	380 U	400 U	390 U	360 U
Fluoranthene	206	82,000,000	3,100,000	410 U	400 U	380 U	400 U	460	360 U
Indeno(1,2,3-cd)pyrene	960	7,800	880	410 U	400 U	380 U	400 U	390 U	360 U
Pentachlorophenol	0	48,000	5,300	2,000 U	2,000 U	1,900 U	2,000 U	170 J	1,800 U
Phenanthrene	0	61,000,000	2,300,000	410 U	400 U	380 U	400 U	290 J	360 U
Pyrene	329	61,000,000	2,300,000	410 U	400 U	380 U	400 U	330 J	360 U
Pesticides/PCBs (ug/kg)									
4,4'-DDT	0	17,000	1,900	21	48 U	91 U	93 U	93 U	NA

Data Qualifiers:

J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associated number indicates the approximate sample concentration necessary to be detected.
UJ - Not detected, quantitation limit may be inaccurate or imprecise.

Notes:

NA - Not analyzed.

TABLE 2-21

SUMMARY OF ORGANIC DETECTIONS IN SURFACE SOIL
SWMU 26 (BUILDING 544 AREA)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	2 x Average Detected Background (ug/kg)	**EPA Region III Industrial Soil RBCs** (ug/kg)	EPA Region III Residential Soil RBCs (ug/kg)	26SS07 09/20/97 0.00-0.50	26SS08 09/20/97 0.00-0.50	26SS09 09/20/97 0.00-0.50	26SS10 09/20/97 0.00-0.50	26SS11 09/20/97 0.00-0.50	26SS12 09/20/97 0.00-0.50
Volatiles (ug/kg)									
2-Hexanone	0	82,000,000	3,100,000	11 UJ	12 U	11 UJ	12 U	11 UJ	11 UJ
Semivolatiles (ug/kg)									
Benzo(a)anthracene	303	7,800	880	89 J	370 U	360 U	40 J	77 J	360 U
Benzo(a)pyrene	329	780	88	66 J	370 U	360 U	40 J	80 J	48 J
Benzo(b)fluoranthene	271	7,800	880	140 J	370 U	360 U	68 J	130 J	72 J
Benzo(g,h,i)perylene	211	61,000,000	2,300,000	41 J	370 U	360 U	380 U	56 J	360 U
Benzo(k)fluoranthene	227	78,000	8,800	57 J	370 U	360 U	46 J	68 J	53 J
Bis(2-ethylhexyl)phthalate	225	410,000	46,000	150 J	110 J	360 U	52 J	72 J	41 J
Chrysene	253	780,000	88,000	110 J	44 J	360 U	380 U	100 J	360 U
Di-n-octylphthalate	0	41,000,000	1,600,000	350 U	370 U	360 U	64 J	43 J	39 J
Fluoranthene	206	82,000,000	3,100,000	98 J	370 U	360 U	380 U	120 J	360 U
Indeno(1,2,3-cd)pyrene	960	7,800	880	44 J	370 U	360 UJ	380 U	46 J	360 U
Pentachlorophenol	0	48,000	5,300	1,800 U	1,900 U	1,800 U	1,900 U	1,800 U	1,800 U
Phenanthrene	0	61,000,000	2,300,000	350 U	370 U	360 U	380 U	89 J	360 U
Pyrene	329	61,000,000	2,300,000	74 J	370 U	360 U	380 U	87 J	360 U
Pesticides/PCBs (ug/kg)									
4,4'-DDT	0	17,000	1,900	NA	NA	NA	NA	NA	NA

Data Qualifiers:

J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associated number indicates the approximate sample concentration necessary to be detected.
UJ - Not detected, quantitation limit may be inaccurate or imprecise.

Notes:

NA - Not analyzed.

TABLE 2-21

SUMMARY OF ORGANIC DETECTIONS IN SURFACE SOIL
SWMU 26 (BUILDING 544 AREA)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	2 x Average Detected Background (ug/kg)	**EPA Region III Industrial Soil RBCs** (ug/kg)	EPA Region III Residential Soil RBCs (ug/kg)	Number Exceeding 2 x Average Detected Background	Range Exceeding 2 x Average Detected Background	**Number Exceeding Region III Industrial Soil RBCs**	**Range Exceeding Region III Industrial Soil RBCs**	Number Exceeding Region III Residential RBCs	Range Exceeding Region III Residential RBCs	Location Maximum Detect
Volatiles (ug/kg)										
2-Hexanone	0	82,000,000	3,100,000	1/12		0/12		0/12		26SS06
Semivolatiles (ug/kg)										
Benzo(a)anthracene	303	7,800	880	0/12		0/12		0/12		26SS07
Benzo(a)pyrene	329	780	88	0/12		0/12		0/12		26SS11
Benzo(b)fluoranthene	271	7,800	880	0/12		0/12		0/12		26SS07
Benzo(g,h,i)perylene	211	61,000,000	2,300,000	0/12		0/12		0/12		26SS11
Benzo(k)fluoranthene	227	78,000	8,800	0/12		0/12		0/12		26SS11
Bis(2-ethylhexyl)phthalate	225	410,000	46,000	0/12		0/12		0/12		26SS01, 26SS07
Chrysene	253	780,000	88,000	0/12		0/12		0/12		26SS05
Di-n-octylphthalate	0	41,000,000	1,600,000	3/12	39 J - 64 J	0/12		0/12		26SS10
Fluoranthene	206	82,000,000	3,100,000	1/12	460	0/12		0/12		26SS05
Indeno(1,2,3-cd)pyrene	960	7,800	880	0/12		0/12		0/12		26SS11
Pentachlorophenol	0	48,000	5,300	1/12	170 J	0/12		0/12		26SS05
Phenanthrene	0	61,000,000	2,300,000	2/12	89 J - 290 J	0/12		0/12		26SS05
Pyrene	329	61,000,000	2,300,000	1/12	330 J	0/12		0/12		26SS05
Pesticides/PCBs (ug/kg)										
4,4'-DDT	0	17,000	1,900	0/5		0/5		0/5		26SS01

Data Qualifiers:

J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associated number indicates the approximate sample concentration necessary to be detected.
UJ - Not detected, quantitation limit may be inaccurate or imprecise.

Notes:

NA - Not analyzed.

TABLE 2-22

SUMMARY OF INORGANIC DETECTIONS IN SURFACE SOIL
SWMU 26 (BUILDING 544 AREA)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	2 x Average Detected Background (ug/kg)	**EPA Region III Industrial Soil RBCs** (ug/kg)	EPA Region III Residential Soil RBCs (ug/kg)	26SS01 10/29/95 0.00-1.00	26SS02 10/29/95 0.00-1.00	26SS03 10/29/95 0.00-1.00	26SS04 10/29/95 0.00-1.00	26SS05 10/29/95 0.00-1.00	26SS06 09/20/97 0.00-0.50
Inorganics (ug/kg)									
Antimony, Total	NE	820,000	31,000	2,300 UJ	2,400 UJ	2,000 UJ	2,500 UJ	1,900	NA
Arsenic, Total	2,867	3,800	430	830 J	1,200 J	840 J	290 J	940 J	1,300 J
Barium, Total	NE	140,000,000	5,500,000	181,000	179,000	186,000	178,000	233,000	NA
Beryllium, Total	1,940	1,300	150	170	110	90 U	120	350	800
Cadmium, Total	NE	1,000,000	39,000	350	210 U	180 U	230 U	400 U	NA
Chromium, Total	NE	10,000,000	390,000	23,100	24,800	17,200	9,200	13,300	NA
Cobalt, Total	NE	120,000,000	4,700,000	21,700	18,900	14,500	13,000	17,600	NA
Copper, Total	NE	82,000,000	3,100,000	113,000	112,000	86,000	81,100	104,000	NA
Lead, Total	NE	NE	400,000 *	21,400	28,500	15,700	8,400	22,500	NA
Nickel, Total	NE	41,000,000	1,600,000	10,000	11,600	11,000	5,300	7,300	NA
Selenium, Total	NE	10,000,000	390,000	610	860	560 U	440 J	1,300 UJ	NA
Tin, Total	NE	1,000,000,000	47,000,000	2,900	1,800 U	3,100	2,500	1,100 U	NA
Vanadium, Total	NE	14,000,000	550,000	120,000	129,000	103,000	79,600	107,000	NA
Zinc, Total	NE	610,000,000	23,000,000	67,400	80,600	53,200	34,900	69,500	NA

Data Qualifiers:

J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associated number indicates the approximate sample concentration necessary to be detected.
UJ - Not detected, quantitation limit may be inaccurate or imprecise.

Notes:

NA - Not analyzed.
NE - Not established.
* - Residential action level for lead in soils.

TABLE 2-22

SUMMARY OF INORGANIC DETECTIONS IN SURFACE SOIL
SWMU 26 (BUILDING 544 AREA)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	2 x Average Detected Background (ug/kg)	**EPA Region III Industrial Soil RBCs** (ug/kg)	EPA Region III Residential Soil RBCs (ug/kg)	26SS07 09/20/97 0.00-0.50	26SS08 09/20/97 0.00-0.50	26SS09 09/20/97 0.00-0.50	26SS10 09/20/97 0.00-0.50	26SS11 09/20/97 0.00-0.50	26SS12 09/20/97 0.00-0.50
Inorganics (ug/kg)									
Antimony, Total	NE	820,000	31,000	NA	NA	NA	NA	NA	NA
Arsenic, Total	2,867	3,800	430	1,100 J	1,200 J	1,500 J	1,200 J	900 J	660 J
Barium, Total	NE	140,000,000	5,500,000	NA	NA	NA	NA	NA	NA
Beryllium, Total	1,940	1,300	150	510	**1,700**	1,100	1,300	**1,600**	**1,700**
Cadmium, Total	NE	1,000,000	39,000	NA	NA	NA	NA	NA	NA
Chromium, Total	NE	10,000,000	390,000	NA	NA	NA	NA	NA	NA
Cobalt, Total	NE	120,000,000	4,700,000	NA	NA	NA	NA	NA	NA
Copper, Total	NE	82,000,000	3,100,000	NA	NA	NA	NA	NA	NA
Lead, Total	NE	NE	400,000 *	NA	NA	NA	NA	NA	NA
Nickel, Total	NE	41,000,000	1,600,000	NA	NA	NA	NA	NA	NA
Selenium, Total	NE	10,000,000	390,000	NA	NA	NA	NA	NA	NA
Tin, Total	NE	1,000,000,000	47,000,000	NA	NA	NA	NA	NA	NA
Vanadium, Total	NE	14,000,000	550,000	NA	NA	NA	NA	NA	NA
Zinc, Total	NE	610,000,000	23,000,000	NA	NA	NA	NA	NA	NA

Data Qualifiers:

J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associated number indicates the approximate sample concentration necessary to be detected.
UJ - Not detected, quantitation limit may be inaccurate or imprecise.

Notes:

NA - Not analyzed.
NE - Not established.
* - Residential action level for lead in soils.

TABLE 2-22

SUMMARY OF INORGANIC DETECTIONS IN SURFACE SOIL
SWMU 26 (BUILDING 544 AREA)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	2 x Average Detected Background (ug/kg)	**EPA Region III Industrial Soil RBCs** (ug/kg)	EPA Region III Residential Soil RBCs (ug/kg)	Number Exceeding 2 x Average Detected Background	Range Exceeding 2 x Average Detected Background	**Number Exceeding Region III Industrial Soil RBCs**	**Range Exceeding Region III Industrial Soil RBCs**	Number Exceeding Region III Residential RBCs	Range Exceeding Region III Residential RBCs	Location Maximum Detect
Inorganics (ug/kg)										
Antimony, Total	NE	820,000	31,000	NE		0/5		0/5		26SS05
Arsenic, Total	2,867	3,800	430	0/12		0/12		11/12	660 J-1,500 J	26SS09
Barium, Total	NE	140,000,000	5,500,000	NE		0/5		0/5		26SS05
Beryllium, Total	1,940	1,300	150	0/12		3/12	1,600-1,700	9/12	170-1,700	26SS08, 26SS12
Cadmium, Total	NE	1,000,000	39,000	NE		0/5		0/5		26SS01
Chromium, Total	NE	10,000,000	390,000	NE		0/5		0/5		26SS02
Cobalt, Total	NE	120,000,000	4,700,000	NE		0/5		0/5		26SS01
Copper, Total	NE	82,000,000	3,100,000	NE		0/5		0/5		26SS01
Lead, Total	NE	NE	400,000 *	NE		NE		0/5		26SS02
Nickel, Total	NE	41,000,000	1,600,000	NE		0/5		0/5		26SS02
Selenium, Total	NE	10,000,000	390,000	NE		0/5		0/5		26SS02
Tin, Total	NE	1,000,000,000	47,000,000	NE		0/5		0/5		26SS03
Vanadium, Total	NE	14,000,000	550,000	NE		0/5		0/5		26SS02
Zinc, Total	NE	610,000,000	23,000,000	NE		0/5		0/5		26SS02

Data Qualifiers:

J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associated number indicates the approximate sample concentration necessary to be detected.
UJ - Not detected, quantitation limit may be inaccurate or imprecise.

Notes:

NA - Not analyzed.
NE - Not established.
* - Residential action level for lead in soils.

TABLE 2-23

SUMMARY OF ORGANIC DETECTIONS IN BACKGROUND SURFACE SOIL
SWMU 26 (BUILDING 544 AREA)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	EPA Region III Industrial Soil RBCs (ug/kg)	**EPA Region III Residential Soil RBCs** (ug/kg)	26SS13 09/20/97 0.00-0.50	26SS14 09/20/97 0.00-0.50	26SS15 09/20/97 0.00-0.50
Volatiles (ug/kg)					
Semivolatiles (ug/kg)					
Benzo(a)anthracene	7,800	880	410 U	59 J	380 U
Benzo(a)pyrene	780	88	410 U	**99 J**	380 U
Benzo(b)fluoranthene	7,800	880	75 J	280 J	52 J
Benzo(g,h,i)perylene	61,000,000	2,300,000	49 J	78 J	380 U
Benzo(k)fluoranthene	78,000	8,800	54 J	96 J	380 U
Bis(2-ethylhexyl)phthalate	410,000	46,000	54 J	460 U	54 J
Chrysene	780,000	88,000	60 J	130 J	380 U
Fluoranthene	82,000,000	3,100,000	410 U	61 J	43 J
Indeno(1,2,3-cd)pyrene	7,800	880	410 U	85 J	380 U
Pyrene	61,000,000	2,300,000	410 U	99 J	380 U
PCBs (ug/kg)					

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.

TABLE 2-23

SUMMARY OF ORGANIC DETECTIONS IN BACKGROUND SURFACE SOIL
SWMU 26 (BUILDING 544 AREA)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	EPA Region III Industrial Soil RBCs (ug/kg)	**EPA Region III Residential Soil RBCs** (ug/kg)	Number Exceeding EPA Region III Industrial Soil RBCs	Range Exceeding EPA Region III Industrial Soil RBCs	**Number Exceeding EPA Region III Residential Soil RBCs**	**Range Exceeding EPA Region III Residential Soil RBCs**	Location Maximum Detect
Volatiles (ug/kg)							
Semivolatiles (ug/kg)							
Benzo(a)anthracene	7,800	880	0/3		0/3		26SS14
Benzo(a)pyrene	780	88	0/3		1/3	99J	26SS14
Benzo(b)fluoranthene	7,800	880	0/3		0/3		26SS14
Benzo(g,h,i)perylene	61,000,000	2,300,000	0/3		0/3		26SS14
Benzo(k)fluoranthene	78,000	8,800	0/3		0/3		26SS14
Bis(2-ethylhexyl)phthalate	410,000	46,000	0/3		0/3		26SS13, 26SS15
Chrysene	780,000	88,000	0/3		0/3		26SS14
Fluoranthene	82,000,000	3,100,000	0/3		0/3		26SS14
Indeno(1,2,3-cd)pyrene	7,800	880	0/3		0/3		26SS14
Pyrene	61,000,000	2,300,000	0/3		0/3		26SS14
PCBs (ug/kg)							

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.

TABLE 2-24

SUMMARY OF INORGANIC DETECTIONS IN BACKGROUND SURFACE SOIL
SWMU 26 (BUILDING 544 AREA)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	EPA Region III Industrial Soil RBCs (ug/kg)	**EPA Region III Residential Soil RBCs** (ug/kg)	26SS13 09/20/97 0.00-0.50	26SS14 09/20/97 0.00-0.50	26SS15 09/20/97 0.00-0.50
Inorganics (ug/kg)					
Arsenic, Total	3,800	430	**1,100 J**	**1,700 J**	**1,500 J**
Beryllium, Total	1,300	150	**960**	**750**	**1,200**

Data Qualifers:
J - Analyte present. Reported value may not be accurate or precise.

TABLE 2-24

SUMMARY OF INORGANIC DETECTIONS IN BACKGROUND SURFACE SOIL
SWMU 26 (BUILDING 544 AREA)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	EPA Region III Industrial Soil RBCs (ug/kg)	**EPA Region III Residential Soil RBCs** (ug/kg)	Number Exceeding EPA Region III Industrial Soil RBCs	Range Exceeding EPA Region III Industrial Soil RBCs	**Number Exceeding EPA Region III Residential Soil RBCs**	**Range Exceeding EPA Region III Residential Soil RBCs**	Location Maximum Detect
Inorganics (ug/kg)							
Arsenic, Total	3,800	430	0/3		3/3	1,100J-1,700J	26SS14
Beryllium, Total	1,300	150	0/3		3/3	750-1,200	26SS15

Data Qualifers:
J - Analyte present. Reported value may not be accurate or precise.

TABLE 2-25

SUMMARY OF ORGANIC DETECTIONS IN SUBSURFACE SOIL
SMWU 26 (BUILDING 544 AREA)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	2 x Average Detected Background (ug/kg)	**EPA Region III Industrial Soil RBCs** (ug/kg)	EPA Region III Residential Soil RBCs (ug/kg)	26SB06 09/20/97 2.50-3.00	26SB07 09/20/97 2.50-3.00	26SB08 09/20/97 2.50-3.00	26SB09 09/20/97 2.50-3.00	26SB10 09/20/97 2.50-3.00	26SB11 09/20/97 2.50-3.00	26SB12 09/20/97 2.50-3.00
Volatiles (ug/kg)										
2-Hexanone	0	82,000,000	3,100,000	13 UJ	13 UJ	11 UJ	13 UJ	17 J	12 UJ	11 UJ
Semivolatiles (ug/kg)										
Diethylphthalate	233	1,000,000,000	63,000,000	440 U	55 J	370 U	420 U	400 U	420 U	160 J
PCBs (ug/kg)										

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.
UJ - Not detected, quantitation limit may be inaccurate or imprecise.

TABLE 2-25

SUMMARY OF ORGANIC DETECTIONS IN SUBSURFACE SOIL
SMWU 26 (BUILDING 544 AREA)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	2 x Average Detected Background (ug/kg)	**EPA Region III Industrial Soil RBCs** (ug/kg)	EPA Region III Residential Soil RBCs (ug/kg)	Number Exceeding 2 x Average Detected Background	Range Exceeding 2 x Average Detected Background	**Number Exceeding EPA Region III Industrial Soil RBCs**	**Range Exceeding EPA Region III Industrial Soil RBCs**	Number Exceeding EPA Region III Residential Soil RBCs	Range Exceeding EPA Region III Residential Soil RBCs
Volatiles (ug/kg)									
2-Hexanone	0	82,000,000	3,100,000	1/7	17J	0/7		0/7	
Semivolatiles (ug/kg)									
Diethylphthalate	233	1,000,000,000	63,000,000	0/7		0/7		0/7	
PCBs (ug/kg)									

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.
UJ - Not detected, quantitation limit may be inaccurate or imprecise.

TABLE 2-25

SUMMARY OF ORGANIC DETECTIONS IN SUBSURFACE SOIL
SMWU 26 (BUILDING 544 AREA)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	2 x Average Detected Background (ug/kg)	**EPA Region III Industrial Soil RBCs** (ug/kg)	EPA Region III Residential Soil RBCs (ug/kg)	Location Maximum Detect
Volatiles (ug/kg)				
2-Hexanone	0	82,000,000	3,100,000	26SB10
Semivolatiles (ug/kg)				
Diethylphthalate	233	1,000,000,000	63,000,000	26SB12
PCBs (ug/kg)				

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.
UJ - Not detected, quantitation limit may be inaccurate or imprecise.

TABLE 2-26

SUMMARY OF INORGANIC DETECTIONS IN SUBSURFACE SOIL
SMWU 26 (BUILDING 544 AREA)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	2 x Average Detected Background (ug/kg)	**EPA Region III Industrial Soil RBCs** (ug/kg)	EPA Region III Residential Soil RBCs (ug/kg)	26SB06 09/20/97 2.50-3.00	26SB07 09/20/97 2.50-3.00	26SB08 09/20/97 2.50-3.00	26SB09 09/20/97 2.50-3.00	26SB10 09/20/97 2.50-3.00	26SB11 09/20/97 2.50-3.00	26SB12 09/20/97 2.50-3.00
Inorganics (ug/kg)										
Arsenic, Total	2,287	3,800	430	710 U	700 U	1,800 J	1,200 J	590 U	670 U	600 J
Beryllium, Total	1,673	1,300	150	**2,900**	850	**1,400**	960	960	**1,700**	**1,900**

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.

TABLE 2-26

SUMMARY OF INORGANIC DETECTIONS IN SUBSURFACE SOIL
SMWU 26 (BUILDING 544 AREA)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	2 x Average Detected Background (ug/kg)	**EPA Region III Industrial Soil RBCs** (ug/kg)	EPA Region III Residential Soil RBCs (ug/kg)	Number Exceeding 2 x Average Detected Background	Range Exceeding 2 x Average Detected Background	**Number Exceeding EPA Region III Industrial Soil RBCs**	**Range Exceeding EPA Region III Industrial Soil RBCs**	Number Exceeding EPA Region III Residential Soil RBCs	Range Exceeding EPA Region III Residential Soil RBCs	Location Maximum Detect
Inorganics (ug/kg)										
Arsenic, Total	2,287	3,800	430	0/7		0/7		3/7	600J-1,800J	26SB08
Beryllium, Total	1,673	1,300	150	3/7	1,700-2,900	4/7	1,400-2,900	7/7	850-2,900	26SB06

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.

TABLE 2-27

SUMMARY OF ORGANIC DETECTIONS IN BACKGROUND SUBSURFACE SOIL
SWMU 26 (BUILDING 544 AREA)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	EPA Region III Industrial Soil RBCs (ug/kg)	**EPA Region III Residential Soil RBCs** (ug/kg)	26SB13 09/20/97 2.50-3.00	26SB14 09/20/97 2.50-3.00	26SB15 09/20/97 2.50-3.00
Volatiles (ug/kg)					
Semivolatiles (ug/kg)					
Benzo(a)anthracene	7,800	880	350 U	410 U	120 J
Benzo(a)pyrene	780	88	350 U	410 U	**160 J**
Benzo(b)fluoranthene	7,800	880	350 U	410 U	190 J
Benzo(g,h,i)perylene	61,000,000	2,300,000	350 U	410 U	140 J
Bis(2-ethylhexyl)phthalate	410,000	46,000	350 U	410 U	340 J
Chrysene	780,000	88,000	350 U	410 U	140 J
Diethylphthalate	1,000,000,000	63,000,000	95 J	65 J	380 U
Fluoranthene	82,000,000	3,100,000	350 U	410 U	180 J
Indeno(1,2,3-cd)pyrene	7,800	880	350 U	410 U	150 J
Pyrene	61,000,000	2,300,000	350 U	410 U	280 J
PCBs (ug/kg)					

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.

TABLE 2-27

SUMMARY OF ORGANIC DETECTIONS IN BACKGROUND SUBSURFACE SOIL
SWMU 26 (BUILDING 544 AREA)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	EPA Region III Industrial Soil RBCs (ug/kg)	**EPA Region III Residential Soil RBCs** (ug/kg)	Number Exceeding EPA Region III Industrial Soil RBCs	Range Exceeding EPA Region III Industrial Soil RBCs	**Number Exceeding EPA Region III Residential Soil RBCs**	**Range Exceeding EPA Region III Residential Soil RBCs**	Location Maximum Detect
Volatiles (ug/kg)							
Semivolatiles (ug/kg)							
Benzo(a)anthracene	7,800	880	0/3		0/3		26SB15
Benzo(a)pyrene	780	88	0/3		1/3	160J	26SB15
Benzo(b)fluoranthene	7,800	880	0/3		0/3		26SB15
Benzo(g,h,i)perylene	61,000,000	2,300,000	0/3		0/3		26SB15
Bis(2-ethylhexyl)phthalate	410,000	46,000	0/3		0/3		26SB15
Chrysene	780,000	88,000	0/3		0/3		26SB15
Diethylphthalate	1,000,000,000	63,000,000	0/3		0/3		26SB13
Fluoranthene	82,000,000	3,100,000	0/3		0/3		26SB15
Indeno(1,2,3-cd)pyrene	7,800	880	0/3		0/3		26SB15
Pyrene	61,000,000	2,300,000	0/3		0/3		26SB15
PCBs (ug/kg)							

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.

TABLE 2-28

SUMMARY OF INORGANIC DETCTIONS IN BACKGROUND SUBSURFACE SOIL
SWMU 26 (BUILDING 544 AREA)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	EPA Region III Industrial Soil RBCs (ug/kg)	**EPA Region III Residential Soil RBCs** (ug/kg)	26SB13 09/20/97 2.50-3.00	26SB14 09/20/97 2.50-3.00	26SB15 09/20/97 2.50-3.00
Inorganics (ug/kg)					
Arsenic, Total	3,800	430	**890 J**	**940 J**	**1,600**
Beryllium, Total	1,300	150	**620**	**690**	**1,200**

Data Qualifers:
J - Analyte present. Reported value may not be accurate or precise.

TABLE 2-28

SUMMARY OF INORGANIC DETCTIONS IN BACKGROUND SUBSURFACE SOIL
SWMU 26 (BUILDING 544 AREA)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	EPA Region III Industrial Soil RBCs (ug/kg)	**EPA Region III Residential Soil RBCs** (ug/kg)	Number Exceeding EPA Region III Industrial Soil RBCs	Range Exceeding EPA Region III Industrial Soil RBCs	**Number Exceeding EPA Region III Residential Soil RBCs**	**Range Exceeding EPA Region III Residential Soil RBCs**	Location Maximum Detect
Inorganics (ug/kg)							
Arsenic, Total	3,800	430	0/3		3/3	890J-1,600	26SB15
Beryllium, Total	1,300	150	0/3		3/3	620-1,200	26SB15

Data Qualifers:
J - Analyte present. Reported value may not be accurate or precise.

TABLE 2-29

SUMMARY OF SAMPLING AND ANALYTICAL PROGRAM
SWMU 31 (PUBLIC WORKS YARD)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample Media	Sample ID	Sample Depth (ft bgs)	Sample Date	Analytical Parameters
Surface Soil	31SS01	0.00-1.00	10/31/95	Dioxins
	31SS02	0.00-1.00	10/31/95	Dioxins
	31SS03	0.00-1.00	10/31/95	Dioxins
	31SS04	0.00-1.00	10/31/95	Dioxins
	31-SS05	0.25-0.75	9/24/97	Dioxins
	31-SS06	0.25-0.75	9/24/97	Dioxins
	31-SS07	0.25-0.75	9/24/97	Dioxins
	31-SS08	0.25-0.75	9/24/97	Dioxins
	31-SS09	0.25-0.75	9/24/97	Dioxins
	31-SS10	0.25-0.75	9/24/97	Dioxins
	31-SS11	0.25-0.75	9/24/97	Dioxins
	31-SS12	0.25-0.75	9/24/97	Dioxins

TABLE 2-30

SUMMARY OF DIOXIN DETECTIONS IN SURFACE SOIL
SWMU 31 (PUBLIC WORKS YARD)
NAVAL STATOADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	EPA Region III Industrial Soil RBCs (ug/kg)	**EPA Region III Residential Soil RBCs** (ug/kg)	31SS01 10/31/95 0.00-1.00	31SS02 10/31/95 0.00-1.00	31SS03 10/31/95 0.00-1.00	31SS04 10/31/95 0.00-1.00	31SS05 09/24/97 0.25-0.75	31SS06 09/24/97 0.25-0.75
Dioxins (ug/kg)								
Total HxCDD	0.038	0.0043	0.1 U	0.06 U	0.06 U	**12**	**1.5 J**	**0.58 J**
Total HxCDF	0.038	0.0043	0.1 U	**0.06 J**	0.06 U	**43**	**3.3**	**1.7**
Total PeCDD	NE	NE	0.13 U	0.09 U	0.07 U	0.74 J	0.12 U	0.01 U
Total PeCDF	0.076	0.0083	0.07 U	0.06 U	0.06 U	**3.1**	**0.52 J**	**0.69 J**
Total TCDF	0.038	0.0043	0.06 U	0.05 U	0.04 U	**0.17 J**	0.08 U	**0.15 J**

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.
UJ - Not detected, quantitation limit may be inaccurate or imprecise.

Notes:
NE - Not established.

TABLE 2-30

SUMMARY OF DIOXIN DETECTIONS IN SURFACE SOIL
SWMU 31 (PUBLIC WORKS YARD)
NAVAL STATOADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	EPA Region III Industrial Soil RBCs (ug/kg)	**EPA Region III Residential Soil RBCs** (ug/kg)	31SS07 09/24/97 0.25-0.75	31SS08 09/24/97 0.25-0.75	31SS09 09/24/97 0.25-0.75	31SS10 09/24/97 0.25-0.75	31SS11 09/24/97 0.25-0.75	31SS12 09/24/97 0.25-0.75
Dioxins (ug/kg)								
Total HxCDD	0.038	0.0043	**1.4 J**	**0.16 J**	0.03 U	0.18 U	0.17 U	0.1 U
Total HxCDF	0.038	0.0043	**1.8**	**0.4 J**	0.03 U	0.19 U	0.15 U	**0.1 J**
Total PeCDD	NE	NE	0.17 U	0.02 U	0.05 U	0.03 U	0.05 UJ	0.18 U
Total PeCDF	0.076	0.0083	**1.1**	**0.29 J**	0.03 U	0.03 U	**0.07 J**	0.14 U
Total TCDF	0.038	0.0043	0.12 U	**0.04 J**	0.01 U	0.04 U	0.08 UJ	0.06 U

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.
UJ - Not detected, quantitation limit may be inaccurate or imprecise.

Notes:
NE - Not established.

TABLE 2-30

SUMMARY OF DIOXIN DETECTIONS IN SURFACE SOIL
SWMU 31 (PUBLIC WORKS YARD)
NAVAL STATOADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	EPA Region III Industrial Soil RBCs (ug/kg)	**EPA Region III Residential Soil RBCs** (ug/kg)	Number Exceeding EPA Region III Industrial Soil RBCs	Range Exceeding EPA Region III Industrial Soil RBCs	**Number Exceeding EPA Region III Residential Soil RBCs**	**Range Exceeding EPA Region III Residential Soil RBCs**	Location Maximum Detect
Dioxins (ug/kg)							
Total HxCDD	0.038	0.0043	1/4	12	1/4	12	31SS04
Total HxCDF	0.038	0.0043	2/4	.06J-43	2/4	.06J-43	31SS04
Total PeCDD	NE	NE	NE		NE		31SS04
Total PeCDF	0.076	0.0083	1/4	3.1	1/4	3.1	31SS04
Total TCDF	0.038	0.0043	1/4	.17J	1/4	.17J	31SS04

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.
UJ - Not detected, quantitation limit may be inaccurate or imprecise.

Notes:
NE - Not established.

TABLE 2-31

SUMMARY OF SAMPLING AND ANALYTICAL PROGRAM
SWMU 46 (POLE STORAGE YARD COVERED PAD)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample Media	Sample ID	Sample Depth (ft bgs)	Sample Date	Analytical Parameters
Surface Soil	46SS01	0.00-1.00	10/26/95	VOC, SVOC, PCB, RCRA Metals
	46SS02	0.00-1.00	10/26/95	VOC, SVOC, PCB, RCRA Metals
	46SS03	0.00-1.00	10/26/95	VOC, SVOC, PCB, RCRA Metals
	46SS04	0.00-1.00	10/26/95	VOC, SVOC, PCB, RCRA Metals
	46SS05	0.00-1.00	10/26/95	VOC, SVOC, PCB, RCRA Metals
	46SS06	0.00-1.00	10/26/95	VOC, SVOC, PCB, RCRA Metals
	46SS07	0.00-1.00	10/26/95	VOC, SVOC, PCB, RCRA Metals
	46SS08	0.00-1.00	10/26/95	VOC, SVOC, PCB, RCRA Metals
	46SS09	0.00-1.00	10/26/95	VOC, SVOC, PCB, RCRA Metals
	46-SS10	0.00-0.50	9/21/97	SVOC, PCB, Arsenic/Beryllium
	46-SS-11	0.00-0.50	9/21/97	SVOC, PCB, Arsenic/Beryllium
	46-SS-12	0.00-0.50	9/21/97	SVOC, PCB, Arsenic/Beryllium
	46-SS-13	0.00-0.50	9/21/97	SVOC, PCB, Arsenic/Beryllium
	46-SS-14	0.00-0.50	9/21/97	SVOC, PCB, Arsenic/Beryllium
	46-SS-15	0.00-0.50	9/21/97	SVOC, PCB, Arsenic/Beryllium
	46-SS-16	0.00-0.50	9/21/97	SVOC, PCB, Arsenic/Beryllium
	46-SS-17	0.00-0.50	9/21/97	SVOC, PCB, Arsenic/Beryllium
	46-SS-18	0.00-0.50	9/21/97	SVOC, PCB, Arsenic/Beryllium
	46-SS-18D	0.00-0.50	9/21/97	SVOC, PCB, Arsenic/Beryllium
	46-SS-19	0.00-0.50	9/21/97	SVOC, PCB, Arsenic/Beryllium
	46-SS19D	0.00-0.50	9/21/97	SVOC, PCB, Arsenic/Beryllium
	46-SS20	0.00-0.50	9/21/97	SVOC, PCB, Arsenic/Beryllium
	46-SS21	0.00-0.50	9/21/97	SVOC, PCB, Arsenic/Beryllium
	46-SS22	0.00-0.50	9/21/97	SVOC, PCB, Arsenic/Beryllium
	46-SS23	0.00-0.50	9/21/97	SVOC, PCB, Arsenic/Beryllium
	46-SS23D	0.00-0.50	9/21/97	SVOC, PCB, Arsenic/Beryllium
	46-SS24	0.00-0.50	9/21/97	SVOC, PCB, Arsenic/Beryllium
	AC-SS39	9/23/97	0.00-0.50	VOC, SVOC, PCB, App. IX Metals
	AC-SS40	9/23/97	0.00-0.50	VOC, SVOC, PCB, App. IX Metals
	AC-SS41	9/23/97	0.00-0.50	VOC, SVOC, PCB, App. IX Metals

TABLE 2-31 (continued)

SUMMARY OF SAMPLING AND ANALYTICAL PROGRAM
SWMU 46 (POLE STORAGE YARD COVERED PAD)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample Media	Sample ID	Sample Depth (ft bgs)	Sample Date	Analytical Parameters
Subsurface Soil	46SB01-03	5.00-6.00	10/27/95	VOC, SVOC, PCB, RCRA Metals
	46SB01-06	10.00-11.00	10/31/95	VOC, SVOC, PCB, RCRA Metals
	46SB02-03	4.00-6.00	10/31/95	VOC, SVOC, PCB, RCRA Metals
	46SB02-05	10.00-12.00	10/31/95	VOC, SVOC, PCB, RCRA Metals
	46-SB01	2.50-3.00	9/23/97	SVOC, PCB, Arsenic/Beryllium
	46-SB02	2.50-3.00	9/23/97	SVOC, PCB, Arsenic/Beryllium
	46-SB03	2.50-3.00	9/23/97	SVOC, PCB, Arsenic/Beryllium
	46-SB04	2.50-3.00	9/23/97	SVOC, PCB, Arsenic/Beryllium
	46-SB05	2.50-3.00	9/23/97	SVOC, PCB, Arsenic/Beryllium
	46-SB06	2.50-3.00	9/23/97	SVOC, PCB, Arsenic/Beryllium
	46-SB07	2.50-3.00	9/23/97	SVOC, PCB, Arsenic/Beryllium
	46-SB08	2.50-3.00	9/23/97	SVOC, PCB, Arsenic/Beryllium
	46-SB09	2.50-3.00	9/23/97	SVOC, PCB, Arsenic/Beryllium
	46-SB10	2.50-3.00	9/23/97	SVOC, PCB, Arsenic/Beryllium
	46-SB11	2.50-3.00	9/23/97	SVOC, PCB, Arsenic/Beryllium
	46-SB12	2.50-3.00	9/23/97	SVOC, PCB, Arsenic/Beryllium
	46-SB13	2.50-3.00	9/23/97	SVOC, PCB, Arsenic/Beryllium

TABLE 2-32

SUMMARY OF ORGANIC DETECTIONS IN SURFACE SOIL
SWMU 46 (POLE STORAGE YARD COVERED PAD)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID	EPA Region III	**EPA Region III**	46SS01	46SS02	46SS03	46SS04	46SS05	46SS06	46SS07	46SS08	46SS09
Sample Date	Industrial	**Residential**	10/26/95	10/26/95	10/26/95	10/26/95	10/26/95	10/26/95	10/26/95	10/26/95	10/26/95
Depth Range (ft bgs)	Soil RBC	**Soil RBC**	0.00-1.00	0.00-1.00	0.00-1.00	0.00-1.00	0.00-1.00	0.00-1.00	0.00-1.00	0.00-1.00	0.00-1.00
	(ug/kg)	(ug/kg)									
Volatiles (ug/kg)											
Carbon disulfide	200,000,000	7,800,000	6 UJ	5 U	2 J	8 U	6 U	7 U	6 U	6 UJ	6 U
Xylene (total)	1,000,000,000	160,000,000	6 UJ	5 U	3 J	8 UJ	2 J	7 U	6 U	6 UJ	6 U
Semivolatiles (ug/kg)											
2,4-Dimethylphenol	41,000,000	1,600,000	420 U	93 J	420 U	500 U	410 U	460 U	420 U	430 U	360 U
Acenaphthylene	120,000,000	4,700,000	420 U	350 U	420 U	500 U	410 U	460 U	420 U	430 U	360 U
Anthracene	610,000,000	23,000,000	420 U	45 J	420 U	500 U	410 U	460 U	420 U	430 U	360 U
Benzo(a)anthracene	7,800	880	**880 J**	550 J	76 J	500 U	86 J	57 J	410 J	430 U	360 U
Benzo(a)pyrene	780	88	**890 J**	**560 J**	86 J	500 U	**120 J**	62 J	**320 J**	430 U	360 U
Benzo(b)fluoranthene	7,800	880	**1,200 J**	840 J	110 J	500 U	130 J	80 J	400 J	430 U	360 U
Benzo(g,h,i)perylene	61,000,000	2,300,000	420 UJ	340 J	76 J	500 U	410 U	460 U	180 J	430 U	360 U
Benzo(k)fluoranthene	78,000	8,800	790 J	410 J	140 J	500 U	120 J	460 U	460	430 U	360 U
Bis(2-ethylhexyl)phthalate	410,000	46,000	1100 UJ	350 U	420 U	500 U	410 U	460 U	420 U	430 U	360 U
Butylbenzylphthalate	410,000,000	16,000,000	150 J	350 UJ	420 U	500 U	410 U	460 U	420 U	430 U	360 U
Carbazole	290,000	32,000	420 U	350 U	NA	NA	NA	NA	NA	NA	NA
Chrysene	780,000	88,000	890 J	760 J	120 J	500 U	110 J	76 J	470	430 U	360 U
Dibenzo(a,h)anthracene	780	88	420 UJ	**100 J**	420 U	500 U	410 U	460 U	73 J	430 U	360 U
Diethylphthalate	1,000,000,000	63,000,000	420 U	350 U	420 U	500 U	410 U	460 U	420 U	430 U	360 U
Fluoranthene	82,000,000	3,100,000	440	350 J	150 J	500 U	130 J	73 J	410 J	430 U	360 U
Indeno(1,2,3-cd)pyrene	7,800	880	550 J	360 J	66 J	500 U	410 U	460 U	130 J	430 U	360 U
Phenanthrene	61,000,000	2,300,000	49 J	98 J	420 U	500 U	410 U	460 U	71 J	430 U	360 U
Pyrene	61,000,000	2,300,000	1100 J	880 J	130 J	500 U	120 J	75 J	390 J	430 U	360 U
PCBs (ug/kg)											
Aroclor-1260	2,900	320	**3,600**	**390**	190	**560**	**1,200**	**1,000**	240 J	160	59

Data Qualifiers:

J - Analyte present. Reported value may not be accurate or precise.

UJ - Not detected, quantitation limit may be inaccurate or imprecise.

U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.

Notes:

NA - Not Analyzed.

TABLE 2-32 (continued)

SUMMARY OF ORGANIC DETECTIONS IN SURFACE SOIL
SWMU 46 (POLE STORAGE YARD COVERED PAD)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID	EPA Region III	**EPA Region III**	46SS10	46SS11	46SS12	46SS13	46SS14	46SS15	46SS16	46SS17	46SS18
Sample Date	Industrial	**Residential**	09/21/97	09/21/97	09/21/97	09/21/97	09/21/97	09/21/97	09/21/97	09/21/97	09/21/97
Depth Range (ft bgs)	Soil RBC	**Soil RBC**	0.00-0.50	0.00-0.50	0.00-0.50	0.00-0.50	0.00-0.50	0.00-0.50	0.00-0.50	0.00-0.50	0.00-0.50
	(ug/kg)	(ug/kg)									
Volatiles (ug/kg)											
Carbon disulfide	200,000,000	7,800,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylene (total)	1,000,000,000	160,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Semivolatiles (ug/kg)											
2,4-Dimethylphenol	41,000,000	1,600,000	450 U	410 U	440 U	420 U	380 U	480 U	460 U	540	460 U
Acenaphthylene	120,000,000	4,700,000	450 U	89 J	440 U	420 U	380 U	480 U	460 U	430 U	460 U
Anthracene	610,000,000	23,000,000	72 J	320 J	440 U	420 U	380 U	480 U	460 U	430 U	460 U
Benzo(a)anthracene	7,800	880	430 J	630	120 J	55 J	54 J	190 J	470	360 J	170 J
Benzo(a)pyrene	780	88	**680**	**2,400**	**120 J**	54 J	66 J	**210 J**	**540**	**400 J**	**220 J**
Benzo(b)fluoranthene	7,800	880	**1,800**	**5,400**	180 J	87 J	170 J	320 J	800	620	450 J
Benzo(g,h,i)perylene	61,000,000	2,300,000	650	2,900	71 J	44 J	61 J	120 J	290 J	180 J	130 J
Benzo(k)fluoranthene	78,000	8,800	560	1,900	88 J	48 J	67 J	140 J	360 J	250 J	170 J
Bis(2-ethylhexyl)phthalate	410,000	46,000	450 U	410 U	440 U	420 U	380 U	480 U	84 J	430 U	460 U
Butylbenzylphthalate	410,000,000	16,000,000	450 U	410 U	440 U	420 U	380 U	480 U	460 U	430 U	460 U
Carbazole	290,000	32,000	63 J	86 J	440 UJ	420 U	380 U	480 U	460 U	430 U	460 U
Chrysene	780,000	88,000	950	1,600	130 J	85 J	130 J	260 J	580	450	320 J
Dibenzo(a,h)anthracene	780	88	**130 J**	**820**	440 U	420 UJ	380 UJ	480 UJ	460 UJ	430 U	460 UJ
Diethylphthalate	1,000,000,000	63,000,000	450 U	410 U	440 U	65 J	380 U	480 U	460 U	430 U	460 U
Fluoranthene	82,000,000	3,100,000	760	600	170 J	70 J	150 J	250 J	520	470	320 J
Indeno(1,2,3-cd)pyrene	7,800	880	760 J	**2,700**	85 J	49 J	71 J	150 J	370 J	220 J	160 J
Phenanthrene	61,000,000	2,300,000	79 J	410 U	440 U	420 U	380 U	480 U	75 J	430 U	460 U
Pyrene	61,000,000	2,300,000	950	740	120 J	68 J	160 J	220 J	500	350 J	390 J
PCBs (ug/kg)											
Aroclor-1260	2,900	320	**630**	**2,900**	290	510 U	120	**1,700**	**1,200**	**4,900**	**1,200 J**

Data Qualifiers:

J - Analyte present. Reported value may not be accurate or precise.

UJ - Not detected, quantitation limit may be inaccurate or imprecise.

U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.

Notes:

NA - Not Analyzed.

TABLE 2-32 (continued)

SUMMARY OF ORGANIC DETECTIONS IN SURFACE SOIL
SWMU 46 (POLE STORAGE YARD COVERED PAD)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	EPA Region III Industrial Soil RBC (ug/kg)	**EPA Region III Residential Soil RBC** (ug/kg)	46SS19 09/21/97 0.00-0.50	46SS20 09/21/97 0.00-0.50	46SS21 09/21/97 0.00-0.50	46SS22 09/21/97 0.00-0.50	46SS23 09/21/97 0.00-0.50	46SS24 09/21/97 0.00-0.50	ACSS39 09/23/97 0.00-0.50	ACSS40 09/23/97 0.00-0.50	ACSS41 9/23/97 0.00-0.50
Volatiles (ug/kg)											
Carbon disulfide	200,000,000	7,800,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylene (total)	1,000,000,000	160,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Semivolatiles (ug/kg)											
2,4-Dimethylphenol	41,000,000	1,600,000	470 U	410 U	430 U	380 U	380 U	440 U	410 U	470 U	360 U
Acenaphthylene	120,000,000	4,700,000	470 U	410 U	430 U	380 U	380 U	440 U	410 U	470 U	360 U
Anthracene	610,000,000	23,000,000	470 U	410 U	60 J	380 U	380 U	440 U	410 U	470 U	360 U
Benzo(a)anthracene	7,800	880	330 J	150 J	610	130 J	550	300 J	400 J	140 J	360 U
Benzo(a)pyrene	780	88	**420 J**	**170 J**	**640**	**160 J**	**630**	**290 J**	**460**	**160 J**	360 U
Benzo(b)fluoranthene	7,800	880	860	370 J	**1,200**	300 J	**1,200**	540	620	340 J	40 J
Benzo(g,h,i)perylene	61,000,000	2,300,000	220 J	120 J	340 J	89 J	260 J	150 J	240 J	100 J	360 U
Benzo(k)fluoranthene	78,000	8,800	350 J	130 J	520	120 J	530	220 J	290 J	140 J	360 U
Bis(2-ethylhexyl)phthalate	410,000	46,000	470 U	410 U	430 U	380 U	380 U	440 U	410 U	470 U	360 U
Butylbenzylphthalate	410,000,000	16,000,000	98 J	410 U	430 U	380 U	380 U	440 U	410 U	470 U	360 U
Carbazole	290,000	32,000	470 U	410 U	67 J	380 U	78 J	440 U	410 U	230 J	360 U
Chrysene	780,000	88,000	710	240 J	950	190 J	1000	380 J	460	270 J	360 U
Dibenzo(a,h)anthracene	780	88	62 J	410 U	**110 J**	380 U	380 U	440 U	**92 J**	470 U	360 U
Diethylphthalate	1,000,000,000	63,000,000	470 U	410 U	430 U	380 U	380 U	440 U	410 U	470 U	360 U
Fluoranthene	82,000,000	3,100,000	770	320 J	1400	220 J	1600	500	530	290 J	360 U
Indeno(1,2,3-cd)pyrene	7,800	880	260 J	140 J	400 J	120 J	360 J	170 J	270 J	120 J	360 U
Phenanthrene	61,000,000	2,300,000	100 J	49 J	210 J	380 U	210 J	440 U	190 J	470 U	360 U
Pyrene	61,000,000	2,300,000	540	240 J	860	160 J	1100	300 J	400 J	290 J	360 U
PCBs (ug/kg)											
Aroclor-1260	2,900	320	**13,000**	**1,300 J**	**35,000**	**6,200**	**1,500 J**	**570**	**1,300**	**4,200**	290

Data Qualifiers:

J - Analyte present. Reported value may not be accurate or precise.

UJ - Not detected, quantitation limit may be inaccurate or imprecise.

U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.

Notes:

NA - Not Analyzed.

TABLE 2-32 (continued)

SUMMARY OF ORGANIC DETECTIONS IN SURFACE SOIL
SWMU 46 (POLE STORAGE YARD COVERED PAD)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	EPA Region III Industrial Soil RBC (ug/kg)	**EPA Region III Residential Soil RBC** (ug/kg)	Number Exceeding Industrial Soil RBC	Range Exceeding Industrial Soil RBC	**Number Exceeding Residential Soil RBC**	**Range Exceeding Residential Soil RBC**	Location Maximum Detect
Volatiles (ug/kg)							
Carbon disulfide	200,000,000	7,800,000	0/9		0/9		46SS03
Xylene (total)	1,000,000,000	160,000,000	0/9		0/9		46SS03
Semivolatiles (ug/kg)							
2,4-Dimethylphenol	41,000,000	1,600,000	0/27		0/27		46SS17
Acenaphthylene	120,000,000	4,700,000	0/27		0/27		46SS11
Anthracene	610,000,000	23,000,000	0/27		0/27		46SS11
Benzo(a)anthracene	7,800	880	0/27		1/27	880J	46SS01
Benzo(a)pyrene	780	88	2/27	890J-2,400	17/27	120J-2,400	46SS11
Benzo(b)fluoranthene	7,800	880	0/27		5/27	1,200-5,400	46SS11
Benzo(g,h,i)perylene	61,000,000	2,300,000	0/27		0/27		46SS11
Benzo(k)fluoranthene	78,000	8,800	0/27		0/27		46SS11
Bis(2-ethylhexyl)phthalate	410,000	46,000	0/27		0/27		46SS16
Butylbenzylphthalate	410,000,000	16,000,000	0/27		0/27		46SS01
Carbazole	290,000	32,000	0/27		0/27		46SS11
Chrysene	780,000	88,000	0/27		0/27		46SS11
Dibenzo(a,h)anthracene	780	88	1/27	820	4/27	100J-820	46SS11
Diethylphthalate	1,000,000,000	63,000,000	0/27		0/27		46SS13
Fluoranthene	82,000,000	3,100,000	0/27		0/27		46SS23
Indeno(1,2,3-cd)pyrene	7,800	880	0/27		1/27	2,700	46SS11
Phenanthrene	61,000,000	2,300,000	0/27		0/27		46SS21
Pyrene	61,000,000	2,300,000	0/27		0/27		46SS01, 46SS23
PCBs (ug/kg)							
Aroclor-1260	2,900	320	7/27	2,900-35,000	19/27	390-35,000	46SS21

Data Qualifiers:

J - Analyte present. Reported value may not be accurate or precise.

UJ - Not detected, quantitation limit may be inaccurate or imprecise.

U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.

Notes:

NA - Not Analyzed.

TABLE 2-33

SUMMARY OF INORGANIC DETECTIONS IN SURFACE SOIL
SWMU 46 (POLE STORAGE YARD COVERED PAD)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID	2 x Average	**EPA Region III**	EPA Region III	46SS01	46SS02	46SS03	46SS04	46SS05	46SS06	46SS07	46SS08	46SS09
Sample Date	Detected	**Industrial**	Residential	10/26/95	10/26/95	10/26/95	10/26/95	10/26/95	10/26/95	10/26/95	10/26/95	10/26/9
Depth Range (ft bgs)	Background	**Soil RBC**	Soil RBC	0.00-1.00	0.00-1.00	0.00-1.00	0.00-1.00	0.00-1.00	0.00-1.00	0.00-1.00	0.00-1.00	0.00-1.0
	(ug/kg)	(ug/kg)	(ug/kg)									
Inorganics (ug/kg)												
Arsenic, Total	2,425	3,800	430	1,600 J	710	670 J	610 J	520 J	350 J	190 UJ	200 UJ	230
Barium, Total	181,200	140,000,000	5,500,000	110,000	41,600	83,000	108,000	56,700	120,000	155,000	173,000	171,000
Beryllium, Total	450	1,300	150	120 U	180	NA	NA	NA	NA	NA	NA	NA
Cadmium, Total	0	1,000,000	39,000	450	360	430 UJ	510 UJ	420 UJ	470 UJ	430 UJ	440 UJ	370
Chromium, Total	59,300	10,000,000	390,000	24,300 J	3,100 J	15,300	19,700	9,700	19,500	11,300	14,000	2,400
Cobalt, Total	43,950	120,000,000	4,700,000	30,000	6,400	NA	NA	NA	NA	NA	NA	NA
Copper, Total	234,200	82,000,000	3,100,000	106,000	20,200	NA	NA	NA	NA	NA	NA	NA
Lead, Total	15,250	NE	400,000 *	15,400 J	36,300	28,700 J	15,700 J	9,400 J	11,200 J	5,100 J	7,600 J	3,000
Nickel, Total	16,550	41,000,000	1,600,000	14,800	2,400	NA	NA	NA	NA	NA	NA	NA
Tin, Total	2,425	1,000,000,000	47,000,000	2,200 U	1,900 J	NA	NA	NA	NA	NA	NA	NA
Vanadium, Total	354,500	14,000,000	550,000	179,000 J	45,500 J	NA	NA	NA	NA	NA	NA	NA
Zinc, Total	125,150	610,000,000	23,000,000	241,000 J	36,200 J	NA	NA	NA	NA	NA	NA	NA

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.
UJ - Not detected, quantitation limit may be inaccurate or imprecise.

Notes:
NA - Not Analyzed
NE - Not established.
* - Residential action level for lead in soils.

TABLE 2-33

SUMMARY OF INORGANIC DETECTIONS IN SURFACE SOIL
SWMU 46 (POLE STORAGE YARD COVERED PAD)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID	2 x Average	**EPA Region III**	EPA Region III		46SS10	46SS11	46SS12	46SS13	46SS14	46SS15	46SS16	46SS17	46SS18
Sample Date	Detected	**Industrial**	Residential	5	09/21/97	09/21/97	09/21/97	09/21/97	09/21/97	09/21/97	09/21/97	09/21/97	09/21/97
Depth Range (ft bgs)	Background	**Soil RBC**	Soil RBC	)0	0.00-0.50	0.00-0.50	0.00-0.50	0.00-0.50	0.00-0.50	0.00-0.50	0.00-0.50	0.00-0.50	0.00-0.50
	(ug/kg)	(ug/kg)	(ug/kg)										
Inorganics (ug/kg)													
Arsenic, Total	2,425	3,800	430	J	1,200 J	2,300 J	1,100 J	**3,800 J**	890 J	2,400 J	1,100 J	1,600 J	**4,100 J**
Barium, Total	181,200	140,000,000	5,500,000		NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium, Total	450	1,300	150		1,100	670	850	**1,400**	530 J	**1,300**	**1,800**	1,100	920
Cadmium, Total	0	1,000,000	39,000	UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Total	59,300	10,000,000	390,000		NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt, Total	43,950	120,000,000	4,700,000		NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper, Total	234,200	82,000,000	3,100,000		NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead, Total	15,250	NE	400,000 *	J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel, Total	16,550	41,000,000	1,600,000		NA	NA	NA	NA	NA	NA	NA	NA	NA
Tin, Total	2,425	1,000,000,000	47,000,000		NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium, Total	354,500	14,000,000	550,000		NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Total	125,150	610,000,000	23,000,000		NA	NA	NA	NA	NA	NA	NA	NA	NA

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.
UJ - Not detected, quantitation limit may be inaccurate or imprecise.

Notes:
NA - Not Analyzed
NE - Not established.
* - Residential action level for lead in soils.

TABLE 2-33

SUMMARY OF INORGANIC DETECTIONS IN SURFACE SOIL
SWMU 46 (POLE STORAGE YARD COVERED PAD)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID	2 x Average Detected Background (ug/kg)	**EPA Region III Industrial Soil RBC** (ug/kg)	EPA Region III Residential Soil RBC (ug/kg)	46SS19	46SS20	46SS21	46SS22	46SS23	46SS24	ACSS39	ACSS40	ACSS41
Sample Date				09/21/97	09/21/97	09/21/97	09/21/97	09/21/97	09/21/97	09/23/97	09/23/97	09/23/97
Depth Range (ft bgs)				0.00-0.50	0.00-0.50	0.00-0.50	0.00-0.50	0.00-0.50	0.00-0.50	0.00-0.50	0.00-0.50	0.00-0.50
Inorganics (ug/kg)												
Arsenic, Total	2,425	3,800	430	**4,300 J**	1,200 J	3,200 J	2,900 J	1,600 J	860 J	1,700 J	**5,300 J**	610 U
Barium, Total	181,200	140,000,000	5,500,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium, Total	450	1,300	150	1,100	840	1,100	790	1,200	**1,400**	170 J	180 J	160 J
Cadmium, Total	0	1,000,000	39,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Total	59,300	10,000,000	390,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt, Total	43,950	120,000,000	4,700,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper, Total	234,200	82,000,000	3,100,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead, Total	15,250	NE	400,000 *	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel, Total	16,550	41,000,000	1,600,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tin, Total	2,425	1,000,000,000	47,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium, Total	354,500	14,000,000	550,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Total	125,150	610,000,000	23,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.
UJ - Not detected, quantitation limit may be inaccurate or imprecise.

Notes:
NA - Not Analyzed
NE - Not established.
* - Residential action level for lead in soils.

TABLE 2-33

SUMMARY OF INORGANIC DETECTIONS IN SURFACE SOIL
SWMU 46 (POLE STORAGE YARD COVERED PAD)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	2 x Average Detected Background (ug/kg)	**EPA Region III Industrial Soil RBC** (ug/kg)	EPA Region III Residential Soil RBC (ug/kg)	Number Exceeding 2 x Average Detected Background	Range Exceeding 2 x Average Detected Background	**Number Exceeding EPA Region III Industrial Soil RBC**	**Range Exceeding EPA Region III Industrial Soil RBC**	Number Exceeding EPA Region III Residential Soil RBC	Range Exceeding EPA Region III Residential Soil RBC	Location Maximum Detect
Inorganics (ug/kg)										
Arsenic, Total	2,425	3,800	430	6/27	2,900J-4,300J	4/27	3,800J-4,300	22/27	520J-4,300	46SS19
Barium, Total	181,200	140,000,000	5,500,000	0/9		0/9		0/9		46SS08
Beryllium, Total	450	1,300	150	15/20	530J-1,800	3/20	1,300-1,800	19/20	180-1,800	46SS16
Cadmium, Total	0	1,000,000	39,000	2/9	360-450	0/9		0/9		46SS01
Chromium, Total	59,300	10,000,000	390,000	0/9		0/9		0/9		46SS01
Cobalt, Total	43,950	120,000,000	4,700,000	0/2		0/2		0/2		46SS01
Copper, Total	234,200	82,000,000	3,100,000	0/2		0/2		0/2		46SS01
Lead, Total	15,250	NE	400,000 *	4/9	15,400J-36,300	NE		0/9		46SS02
Nickel, Total	16,550	41,000,000	1,600,000	0/2		0/2		0/2		46SS01
Tin, Total	2,425	1,000,000,000	47,000,000	0/2		0/2		0/2		46SS02
Vanadium, Total	354,500	14,000,000	550,000	0/2		0/2		0/2		46SS01
Zinc, Total	125,150	610,000,000	23,000,000	1/2	241,000J	0/2		0/2		46SS01

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.
UJ - Not detected, quantitation limit may be inaccurate or imprecise.

Notes:
NA - Not Analyzed
NE - Not established.
* - Residential action level for lead in soils.

TABLE 2-34

SUMMARY OF ORGANIC DETECTIONS IN SUBSURFACE SOIL
SWMU 46 (POLE STORAGE YARD COVERED PAD)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID	EPA Region III	**EPA Region III**	46SB01-03	46SB01-06	46SB01	46SB02-03	46SB02-05	46SB02	46SB03	46SB04	46SB05
Sample Date	Industrial Soil	**Residential Soil**	10/27/95	10/31/95	09/23/97	10/31/95	10/31/95	09/23/97	09/23/97	09/23/97	09/23/97
Depth Range (ft bgs)	RBCs	**RBCs**	5.00-6.00	10.00-11.00	2.50-3.00	4.00-6.00	10.00-12.00	2.50-3.00	2.50-3.00	2.50-3.00	2.50-3.00
	(ug/kg)	(ug/kg)									
Volatiles (ug/kg)											
Semivolatiles (ug/kg)											
Bis(2-ethylhexyl)phthalate	410,000	46,000	430 U	150 J	510 U	3,600	430 U	500 U	470 U	420 U	480 U
Diethylphthalate	1,000,000,000	63,000,000	430 U	400 U	510 U	470 U	430 U	500 U	470 U	420 U	480 U
Phenol	1,000,000,000	47,000,000	430 U	400 U	510 U	470 U	280 J	500 U	470 U	420 U	480 U
Pyrene	61,000,000	2,300,000	430 U	400 U	510 U	470 U	430 U	500 U	470 U	160 J	480 U
PCBs (ug/kg)											
Aroclor-1260	2,900	320	43 U	97 U	120 U	110 U	43 U	120 U	120 U	100 U	120 U

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentraton necessary to be detected.

Notes:
NE - Not established.

TABLE 2-34

SUMMARY OF ORGANIC DETECTIONS IN SUBSURFACE SOIL
SWMU 46 (POLE STORAGE YARD COVERED PAD)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	EPA Region III Industrial Soil RBCs (ug/kg)	**EPA Region III Residential Soil RBCs** (ug/kg)	46SB06 09/23/97 2.50-3.00	46SB07 09/23/97 2.50-3.00	46SB08 09/23/97 2.50-3.00	46SB09 09/23/97 2.50-3.00	46SB10 09/23/97 2.50-3.00	46SB11 09/23/97 2.50-3.00	46SB12 09/23/97 2.50-3.00	46SB13 09/23/97 2.50-3.00
Volatiles (ug/kg)										
Semivolatiles (ug/kg)										
Bis(2-ethylhexyl)phthalate	410,000	46,000	370 U	410 U	400 U	460 U	480 U	470 U	460 U	380 U
Diethylphthalate	1,000,000,000	63,000,000	370 U	240 J	400 U	460 U	480 U	470 U	160 J	67 J
Phenol	1,000,000,000	47,000,000	370 U	410 U	400 U	460 U	480 U	470 U	460 U	380 U
Pyrene	61,000,000	2,300,000	370 U	410 U	400 U	460 U	480 U	470 U	460 U	380 U
PCBs (ug/kg)										
Aroclor-1260	2,900	320	89 U	98 U	99 U	14 J	110 U	110 U	110 U	92 U

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentraton necessary to be detected.

Notes:
NE - Not established.

TABLE 2-34

SUMMARY OF ORGANIC DETECTIONS IN SUBSURFACE SOIL
SWMU 46 (POLE STORAGE YARD COVERED PAD)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	EPA Region III Industrial Soil RBCs (ug/kg)	**EPA Region III Residential Soil RBCs** (ug/kg)	Number Exceeding EPA Region III Industrial Soil RBCs	Range Exceeding EPA Region III Industrial Soil RBCs	**Number Exceeding EPA Region III Residential Soil RBCs**	**Range Exceeding EPA Region III Residential Soil RBCs**	Location Maximum Detect
Volatiles (ug/kg)							
Semivolatiles (ug/kg)							
Bis(2-ethylhexyl)phthalate	410,000	46,000	0/17		0/17		46SB02-03
Diethylphthalate	1,000,000,000	63,000,000	0/17		0/17		46SB07
Phenol	1,000,000,000	47,000,000	0/17		0/17		46SB02-05
Pyrene	61,000,000	2,300,000	0/17		0/17		46SB04
PCBs (ug/kg)							
Aroclor-1260	2,900	320	0/17		0/17		46SB09

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentraton necessary to be detected.

Notes:
NE - Not established.

TABLE 2-35

SUMMARY OF INORGANIC DETECTIONS IN SUBSURFACE SOIL
SWMU 46 (POLE STORAGE YARD COVERED PAD)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Samle ID Sample Date Depth Range (ft bgs)	2 x Average Detected Background (ug/kg)	**EPA Region III Industrial Soil RBC** (ug/kg)	EPA Region III Residential Soil RBC (ug/kg)	46SB01-03 10/27/95 5.00-6.00	46SB01-06 10/31/95 10.00-11.00	46SB01 09/23/97 2.50-3.00	46SB02-03 10/31/95 4.00-6.00	46SB02-05 10/31/95 10.00-12.00	46SB02 09/23/97 2.50-3.00	46SB03 09/23/97 2.50-3.00	46SB04 09/23/97 2.50-3.00
Inorganics (ug/kg)											
Arsenic, Total	2,047.50	3,800	430	230 U	170 UJ	800 J	680 J	230 U	950 J	800 J	1,000 J
Barium, Total	222,125	140,000,000	5,500,000	220,000	114,000	NA	49,800	113,000	NA	NA	NA
Beryllium, Total	740	1,300	150	NA	120 U	430 J	100 U	NA	640 J	570 J	880
Chromium, Total	132,575	10,000,000	390,000	10,600	11,100	NA	30,700	9,200	NA	NA	NA
Cobalt, Total	30,000	120,000,000	4,700,000	NA	34,000	NA	7,400	NA	NA	NA	NA
Copper, Total	193,075	82,000,000	3,100,000	NA	69,000	NA	66,800	NA	NA	NA	NA
Lead, Total	8,675	NE	400,000 *	1,800	860	NA	3,300	1,800	NA	NA	NA
Nickel, Total	31,900	41,000,000	1,600,000	NA	23,400	NA	9,800	NA	NA	NA	NA
Selenium, Total	570	10,000,000	390,000	200 U	630 U	NA	880	210 U	NA	NA	NA
Silver, Total	0	10,000,000	390,000	560 U	350 U	NA	300 U	2,000	NA	NA	NA
Vanadium, Total	462,225	14,000,000	550,000	NA	118,000	NA	243,000	NA	NA	NA	NA
Zinc, Total	88,625	610,000,000	23,000,000	NA	86,800	NA	57,400	NA	NA	NA	NA

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.
UJ - Not detected, quantitation limit may be inaccurate or imprecise.

Notes:
NA - Not Analyzed
NE - Not established.
* - Residential action level for lead in soils.

TABLE 2-35

SUMMARY OF INORGANIC DETECTIONS IN SUBSURFACE SOIL
SWMU 46 (POLE STORAGE YARD COVERED PAD)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Samle ID Sample Date Depth Range (ft bgs)	2 x Average Detected Background (ug/kg)	**EPA Region III Industrial Soil RBC** (ug/kg)	EPA Region III Residential Soil RBC (ug/kg)	46SB05 09/23/97 2.50-3.00	46SB06 09/23/97 2.50-3.00	46SB07 09/23/97 2.50-3.00	46SB08 09/23/97 2.50-3.00	46SB09 09/23/97 2.50-3.00	46SB10 09/23/97 2.50-3.00	46SB11 09/23/97 2.50-3.00	46SB12 09/23/97 2.50-3.00	46SB13 09/23/97 2.50-3.00
Inorganics (ug/kg)												
Arsenic, Total	2,047.50	3,800	430	890 J	130 UJ	950 J	140 UJ	720 J	320 J	840 J	790 UJ	1,100 J
Barium, Total	222,125	140,000,000	5,500,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium, Total	740	1,300	150	790	**2,200**	**1,900**	**1,500**	630	320 J	630	550 J	**1,700**
Chromium, Total	132,575	10,000,000	390,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt, Total	30,000	120,000,000	4,700,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper, Total	193,075	82,000,000	3,100,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead, Total	8,675	NE	400,000 *	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel, Total	31,900	41,000,000	1,600,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium, Total	570	10,000,000	390,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver, Total	0	10,000,000	390,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium, Total	462,225	14,000,000	550,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Total	88,625	610,000,000	23,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.
UJ - Not detected, quantitation limit may be inaccurate or imprecise.

Notes:
NA - Not Analyzed
NE - Not established.
* - Residential action level for lead in soils.

TABLE 2-35

SUMMARY OF INORGANIC DETECTIONS IN SUBSURFACE SOIL
SWMU 46 (POLE STORAGE YARD COVERED PAD)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Samle ID Sample Date Depth Range (ft bgs)	2 x Average Detected Background (ug/kg)	**EPA Region III Industrial Soil RBC** (ug/kg)	EPA Region III Residential Soil RBC (ug/kg)	Number Exceeding 2 x Average Detected Background	Range Exceeding 2 x Average Detected Background	**Number Exceeding EPA Region III Industrial Soil RBC**	**Range Exceeding EPA Region III Industrial Soil RBC**	Number Exceeding EPA Region III Residential Soil RBC	Range Exceeding EPA Region III Residential Soil RBC	Location Maximum Detect
Inorganics (ug/kg)										
Arsenic, Total	2,047.50	3,800	430	0/17		0/17		10/17	680J-1,100J	46SB13
Barium, Total	222,125	140,000,000	5,500,000	0/4		0/4		0/4		46SB01-03
Beryllium, Total	740	1,300	150	6/15	790-2,200	4/15	1,500-2,200	13/15	320J-2,200	46SB06
Chromium, Total	132,575	10,000,000	390,000	0/4		0/4		0/4		46SB02-03
Cobalt, Total	30,000	120,000,000	4,700,000	1/2	34,000	0/2		0/2		46SB01-06
Copper, Total	193,075	82,000,000	3,100,000	0/2		0/2		0/2		46SB01-06
Lead, Total	8,675	NE	400,000 *	0/4		NE		0/4		46SB02-03
Nickel, Total	31,900	41,000,000	1,600,000	0/2		0/2		0/2		46SB01-06
Selenium, Total	570	10,000,000	390,000	1/4	880	0/4		0/4		46SB02-03
Silver, Total	0	10,000,000	390,000	1/4	2,000	0/4		0/4		46SB02-05
Vanadium, Total	462,225	14,000,000	550,000	0/2		0/2		0/2		46SB02-03
Zinc, Total	88,625	610,000,000	23,000,000	0/2		0/2		0/2		46SB01-06

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.
UJ - Not detected, quantitation limit may be inaccurate or imprecise.

Notes:
NA - Not Analyzed
NE - Not established.
* - Residential action level for lead in soils.

TABLE 2-36

SUMMARY OF SAMPLING AND ANALYTICAL PROGRAM
AOC C (TRANSFORMER STORAGE PAD)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample Media	Sample ID	Sample Depth (ft bgs)	Sample Date	Analytical Parameters
Surface Soil	AC-SS13	9/21/97	0.00-0.50	VOC, SVOC, PCB, App. IX Metals
	AC-SS14	9/21/97	0.00-0.50	VOC, SVOC, PCB, App. IX Metals
	AC-SS15	9/21/97	0.00-0.50	VOC, SVOC, PCB, App. IX Metals
	AC-SS16	9/21/97	0.00-0.50	VOC, SVOC, PCB, App. IX Metals
	AC-SS17	9/21/97	0.00-0.50	VOC, SVOC, PCB, App. IX Metals
	AC-SS18	9/21/97	0.00-0.50	VOC, SVOC, PCB, App. IX Metals
	AC-SS19	9/21/97	0.00-0.50	VOC, SVOC, PCB, App. IX Metals
	AC-SS20	9/21/97	0.00-0.50	VOC, SVOC, PCB, App. IX Metals
	AC-SS21	9/21/97	0.00-0.50	VOC, SVOC, PCB, App. IX Metals
	AC-SS22	9/21/97	0.00-0.50	VOC, SVOC, PCB, App. IX Metals
	AC-SS23	9/21/97	0.00-0.50	VOC, SVOC, PCB, App. IX Metals
	AC-SS24	9/21/97	0.00-0.50	VOC, SVOC, PCB, App. IX Metals
	AC-SS25	9/21/97	0.00-0.50	VOC, SVOC, PCB, App. IX Metals
	AC-SS26	9/21/97	0.00-0.50	VOC, SVOC, PCB, App. IX Metals
	AC-SS27	9/23/97	0.00-0.50	VOC, SVOC, PCB, App. IX Metals
	AC-SS28	9/23/97	0.00-0.50	VOC, SVOC, PCB, App. IX Metals
	AC-SS29	9/23/97	0.00-0.50	VOC, SVOC, PCB, App. IX Metals
	AC-SS30	9/23/97	0.00-0.50	VOC, SVOC, PCB, App. IX Metals
	AC-SS31	9/23/97	0.00-0.50	VOC, SVOC, PCB, App. IX Metals
	AC-SS32	9/23/97	0.00-0.50	VOC, SVOC, PCB, App. IX Metals
	AC-SS33	9/23/97	0.00-0.50	VOC, SVOC, PCB, App. IX Metals
	AC-SS34	9/23/97	0.00-0.50	VOC, SVOC, PCB, App. IX Metals
	AC-SS35	9/23/97	0.00-0.50	VOC, SVOC, PCB, App. IX Metals
	AC-SS36	9/23/97	0.00-0.50	VOC, SVOC, PCB, App. IX Metals
	AC-SS37	9/23/97	0.00-0.50	VOC, SVOC, PCB, App. IX Metals
	AC-SS38	9/23/97	0.00-0.50	VOC, SVOC, PCB, App. IX Metals
Subsurface Soil	AC-SB13	9/22/97	2.50-3.00	VOC, SVOC, PCB, App. IX Metals
	AC-SB14	9/22/97	2.50-3.00	VOC, SVOC, PCB, App. IX Metals
	AC-SB15	9/22/97	2.50-3.00	VOC, SVOC, PCB, App. IX Metals
	AC-SB16	9/22/97	2.50-3.00	VOC, SVOC, PCB, App. IX Metals
	AC-SB17	9/22/97	2.50-3.00	VOC, SVOC, PCB, App. IX Metals
	AC-SB18	9/22/97	2.50-3.00	VOC, SVOC, PCB, App. IX Metals
	AC-SB19	9/22/97	2.50-3.00	VOC, SVOC, PCB, App. IX Metals
	AC-SB20	9/21/97	2.50-3.00	VOC, SVOC, PCB, App. IX Metals
	AC-SB21	9/22/97	2.50-3.00	VOC, SVOC, PCB, App. IX Metals
	AC-SB22	9/22/97	2.50-3.00	VOC, SVOC, PCB, App. IX Metals
	AC-SB23	9/22/97	2.50-3.00	VOC, SVOC, PCB, App. IX Metals
	AC-SB24	9/22/97	2.50-3.00	VOC, SVOC, PCB, App. IX Metals
	AC-SB25	9/22/97	2.50-3.00	VOC, SVOC, PCB, App. IX Metals
	AC-SB26	9/22/97	2.50-3.00	VOC, SVOC, PCB, App. IX Metals

TABLE 2-36 (continued)

SUMMARY OF SAMPLING AND ANALYTICAL PROGRAM
AOC C (TRANSFORMER STORAGE PAD)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample Media	Sample ID	Sample Depth (ft bgs)	Sample Date	Analytical Parameters
Wipe Sample	ACWS01	NA		PCBs
	ACWS02	NA		PCBs
	ACWS03	NA		PCBs
	ACWS04	NA		PCBs
	ACWS05	NA		PCBs
	ACWS06	NA		PCBs
	ACWS07	NA		PCBs
	ACWS08	NA		PCBs
	ACWS09	NA		PCBs
	ACWS10	NA		PCBs

TABLE 2-37

SUMMARY OF ORGANIC DETECTIONS IN SURFACE SOIL
AOC C (TRANSFORMER STORAGE PADS)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID	EPA Region III Industrial Soil RBCs (ug/kg)	**EPA Region III Residential Soil RBCs** (ug/kg)	ACSS13	ACSS14	ACSS15	ACSS16	ACSS17	ACSS18	ACSS19	ACSS20	ACSS21
Sample Date			09/21/97	09/21/97	09/21/97	09/21/97	09/21/97	09/21/97	09/21/97	09/21/97	09/21/97
Depth Range (ft bgs)			0.00-0.50	0.00-0.50	0.00-0.50	0.00-0.50	0.00-0.50	0.00-0.50	0.00-0.50	0.00-0.50	0.00-0.50
Volatiles (ug/kg)											
2-Hexanone	82,000,000	3,100,000	12 U	12 U	11 U	11 U	11 U	11 U	11 UJ	15 J	12 UJ
Semivolatiles (ug/kg)											
2,4-Dinitrotoluene	4,100,000	160,000	380 U	410 U	360 U	360 U	360 U	360 U	370 U	370 U	420 U
2,6-Dinitrotoluene	2,000,000	78,000	380 U	410 U	360 U	360 U	360 U	360 U	370 U	370 U	420 U
Acenaphthene	120,000,000	4,700,000	380 U	410 U	360 U	360 U	360 U	360 U	370 U	370 U	420 U
Acenaphthylene	120,000,000	4,700,000	380 U	410 U	360 U	360 U	360 U	360 U	370 U	370 U	44 J
Anthracene	610,000,000	23,000,000	380 U	410 U	360 U	360 U	360 U	360 U	370 U	370 U	63 J
Benzo(a)anthracene	7,800	880	700	140 J	80 J	61 J	360 U	290 J	52 J	370 U	340 J
Benzo(a)pyrene	780	88	**920**	**210 J**	**96 J**	72 J	360 U	**320 J**	87 J	61 J	**470**
Benzo(b)fluoranthene	7,800	880	**2,000**	400 J	210 J	140 J	360 U	720	200 J	120 J	**1,100**
Benzo(g,h,i)perylene	61,000,000	2,300,000	610	150 J	77 J	53 J	75 J	280 J	61 J	58 J	340 J
Benzo(k)fluoranthene	78,000	8,800	890	170 J	82 J	81 J	360 U	320 J	78 J	50 J	480
Bis(2-ethylhexyl)phthalate	410,000	46,000	380 U	74 J	55 J	360 U	360 U	62 J	45 J	38 J	92 J
Carbazole	290,000	32,000	380 U	410 U	360 U	360 U	360 U	360 U	370 U	370 U	52 J
Chrysene	780,000	88,000	1,300	210 J	130 J	97 J	360 U	520	120 J	73 J	760
Dibenzo(a,h)anthracene	780	88	**120 J**	410 U	360 U	360 U	360 U	62 J	370 U	370 U	83 J
Dibenzofuran	8,200,000	310,000	380 U	410 U	360 U	360 U	360 U	360 U	370 U	370 U	420 U
Dimethylphthalate	1,000,000,000	780,000,000	380 U	410 U	360 U	360 U	360 U	360 U	370 U	370 U	420 U
Di-n-butylphthalate	200,000,000	7,800,000	380 U	410 U	360 U	360 U	360 U	360 U	370 U	110 J	420 U
Fluoranthene	82,000,000	3,100,000	820	170 J	160 J	69 J	62 J	550	120 J	75 J	620
Fluorene	82,000,000	3,100,000	380 U	410 U	360 U	360 U	360 U	360 U	370 U	370 U	420 U
Indeno(1,2,3-cd)pyrene	7,800	880	610	200 J	82 J	70 J	72 J	300 J	61 J	55 J	380 J
Naphthalene	82,000,000	3,100,000	380 U	410 U	360 U	360 U	360 U	360 U	370 U	370 U	420 U
N-Nitrosodiphenylamine (1)	1,200,000	130,000	380 U	410 U	360 U	360 U	360 U	360 U	370 U	370 U	420 U
Phenanthrene	61,000,000	2,300,000	380 U	410 U	360 U	360 U	360 U	62 J	370 U	370 U	83 J
Pyrene	61,000,000	2,300,000	2,200	280 J	190 J	97 J	74 J	700	170 J	95 J	810
PCBs (ug/kg)											
Aroclor-1260	2,900	320	**30,000**	**16,000**	**1,600**	**410**	280 J	260	**410**	130	**2,200**

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.

TABLE 2-37

SUMMARY OF ORGANIC DETECTIONS IN SURFACE SOIL
AOC C (TRANSFORMER STORAGE PADS)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	EPA Region III Industrial Soil RBCs (ug/kg)	**EPA Region III Residential Soil RBCs** (ug/kg)	ACSS22 09/21/97 0.00-0.50	ACSS23 09/21/97 0.00-0.50	ACSS24 09/21/97 0.00-0.50	ACSS25 09/21/97 0.00-0.50	ACSS26 09/21/97 0.00-0.50	ACSS27 09/23/97 0.00-0.50	ACSS28 09/23/97 0.00-0.50	ACSS29 09/23/97 0.00-0.50	ACSS30 09/23/97 0.00-0.50
Volatiles (ug/kg)											
2-Hexanone	82,000,000	3,100,000	11 UJ	11 UJ	10 UJ	11 UJ	11 UJ	12 U	12 U	12 U	11 U
Semivolatiles (ug/kg)											
2,4-Dinitrotoluene	4,100,000	160,000	360 U	360 U	350 U	370 U	370 U	390 U	1,700	400 U	370 U
2,6-Dinitrotoluene	2,000,000	78,000	360 U	360 U	350 U	370 U	370 U	390 U	170 J	400 U	370 U
Acenaphthene	120,000,000	4,700,000	360 U	360 U	350 U	370 U	370 U	110 J	220 J	400 U	370 U
Acenaphthylene	120,000,000	4,700,000	360 U	360 U	150 J	370 U	370 U	390 U	410 U	400 U	370 U
Anthracene	610,000,000	23,000,000	360 U	360 U	100 J	37 J	370 U	260 J	480	400 U	370 U
Benzo(a)anthracene	7,800	880	360 U	68 J	**1,200**	670	370 U	830	**1,500**	61 J	370 U
Benzo(a)pyrene	780	88	360 U	85 J	**1,200**	**760**	37 J	**830**	**1,700**	**88 J**	370 U
Benzo(b)fluoranthene	7,800	880	360 U	230 J	**2,100**	**1,200**	78 J	**1,300**	**2,400** J	200 J	54 J
Benzo(g,h,i)perylene	61,000,000	2,300,000	360 U	72 J	620	440	370 U	400	1,000	400 U	370 U
Benzo(k)fluoranthene	78,000	8,800	360 U	74 J	860	500	370 U	530	1,000	84 J	370 U
Bis(2-ethylhexyl)phthalate	410,000	46,000	1,200	120 J	350 U	1,200	51 J	390 U	410 U	400 U	37 J
Carbazole	290,000	32,000	360 U	360 U	44 J	84 J	370 U	330 J	500	400 U	370 U
Chrysene	780,000	88,000	360 U	170 J	1,400	830	57 J	1,100	1,700	94 J	370 U
Dibenzo(a,h)anthracene	780	88	360 U	360 U	**170 J**	**120 J**	370 U	**100 J**	**230 J**	400 U	370 U
Dibenzofuran	8,200,000	310,000	360 U	360 U	350 U	370 U	370 U	390 U	110 J	400 U	370 U
Dimethylphthalate	1,000,000,000	780,000,000	360 U	360 U	350 U	37 J	370 U	390 U	410 U	400 U	370 U
Di-n-butylphthalate	200,000,000	7,800,000	360 U	38 J	350 U	94 J	370 U	390 U	72 J	400 U	370 U
Fluoranthene	82,000,000	3,100,000	360 U	160 J	1,100	980	65 J	1,700	3,000	97 J	370 U
Fluorene	82,000,000	3,100,000	360 U	360 U	350 U	370 U	370 U	100 J	200 J	400 U	370 U
Indeno(1,2,3-cd)pyrene	7,800	880	360 U	80 J	780 J	480	43 J	440	**1,100**	45 J	370 U
Naphthalene	82,000,000	3,100,000	360 U	360 U	350 U	370 U	370 U	390 U	140 J	400 U	370 U
N-Nitrosodiphenylamine (1)	1,200,000	130,000	360 U	360 U	350 U	370 U	370 U	390 U	82 J	400 U	370 U
Phenanthrene	61,000,000	2,300,000	360 U	360 U	100 J	250 J	370 U	1,100	2,100	400 U	370 U
Pyrene	61,000,000	2,300,000	360 U	160 J	1,800	1,200	61 J	1,800	3,600	300 J	49 J
PCBs (ug/kg)											
Aroclor-1260	2,900	320	270	**360**	**1,800**	160	62	**12,000**	**850 J**	140	**570 J**

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.

TABLE 2-37

SUMMARY OF ORGANIC DETECTIONS IN SURFACE SOIL
AOC C (TRANSFORMER STORAGE PADS)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	EPA Region III Industrial Soil RBCs (ug/kg)	**EPA Region III Residential Soil RBCs** (ug/kg)	ACSS31 09/23/97 0.00-0.50	ACSS32 09/23/97 0.00-0.50	ACSS33 09/23/97 0.00-0.50	ACSS34 09/23/97 0.00-0.50	ACSS35 09/23/97 0.00-0.50	ACSS36 09/23/97 0.00-0.50	ACSS37 09/23/97 0.00-0.50	ACSS38 09/23/97 0.00-0.50
Volatiles (ug/kg)										
2-Hexanone	82,000,000	3,100,000	13 U	12 UJ	11 UJ	13 U	12 U	12 U	13 U	12 U
Semivolatiles (ug/kg)										
2,4-Dinitrotoluene	4,100,000	160,000	420 U	400 U	360 U	430 U	390 U	390 U	410 U	420 U
2,6-Dinitrotoluene	2,000,000	78,000	420 U	400 U	360 U	430 U	390 U	390 U	410 U	420 U
Acenaphthene	120,000,000	4,700,000	420 U	400 U	360 U	430 U	390 U	390 U	410 U	420 U
Acenaphthylene	120,000,000	4,700,000	420 U	290 J	360 U	430 U	390 U	390 U	410 U	420 U
Anthracene	610,000,000	23,000,000	420 U	320 J	360 U	430 U	390 U	390 U	410 U	420 U
Benzo(a)anthracene	7,800	880	180 J	**2,100**	88 J	**900**	390 UJ	180 J	140 J	51 J
Benzo(a)pyrene	780	88	**240 J**	**2,600**	**120 J**	**920**	47 UJ	**200 J**	**220 J**	61 J
Benzo(b)fluoranthene	7,800	880	720	**5,500**	270 J	**1,300**	75 UJ	430	620	98 J
Benzo(g,h,i)perylene	61,000,000	2,300,000	170 J	1,500	79 J	420 J	390 UJ	110 J	140 J	420 U
Benzo(k)fluoranthene	78,000	8,800	260 J	1,900	120 J	650	390 UJ	170 J	220 J	42 J
Bis(2-ethylhexyl)phthalate	410,000	46,000	420 U	400 U	360 U	430 U	390 UJ	390 U	410 U	420 U
Carbazole	290,000	32,000	220 J	310 J	170 J	220 J	390 U	190 J	210 J	200 J
Chrysene	780,000	88,000	520	3,200	180 J	1,100	390 UJ	300 J	390 J	78 J
Dibenzo(a,h)anthracene	780	88	420 U	**440**	360 UJ	**130 J**	390 UJ	390 U	410 U	420 U
Dibenzofuran	8,200,000	310,000	420 U	400 U	360 U	430 U	390 U	390 U	410 U	420 U
Dimethylphthalate	1,000,000,000	780,000,000	420 U	400 U	360 U	430 U	390 U	390 U	410 U	420 U
Di-n-butylphthalate	200,000,000	7,800,000	420 U	400 U	360 U	430 U	390 U	390 U	410 U	420 U
Fluoranthene	82,000,000	3,100,000	470	2,500	110 J	1,100	390 U	250 J	270 J	88 J
Fluorene	82,000,000	3,100,000	420 U	400 U	360 U	430 U	390 U	390 U	410 U	420 U
Indeno(1,2,3-cd)pyrene	7,800	880	180 J	**1,900**	93 J	500	390 UJ	120 J	170 J	420 U
Naphthalene	82,000,000	3,100,000	420 U	400 U	360 U	430 U	390 U	390 U	410 U	420 U
N-Nitrosodiphenylamine (1)	1,200,000	130,000	420 U	400 U	360 U	430 U	390 U	390 U	410 U	420 U
Phenanthrene	61,000,000	2,300,000	420 U	350 J	360 U	220 J	390 U	43 J	410 U	420 U
Pyrene	61,000,000	2,300,000	530	4,200	200 J	1,000	52 J	370 J	360 J	100 J
PCBs (ug/kg)										
Aroclor-1260	2,900	320	**520 J**	**690**	**3,100**	**650**	**25,000**	**16,000**	**5,200**	**470**

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.

TABLE 2-37

SUMMARY OF ORGANIC DETECTIONS IN SURFACE SOIL
AOC C (TRANSFORMER STORAGE PADS)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	EPA Region III Industrial Soil RBCs (ug/kg)	**EPA Region III Residential Soil RBCs** (ug/kg)	Number Exceeding EPA Region III Industrial Soil RBCs	Range Exceeding EPA Region III Industrial Soil RBCs	**Number Exceeding EPA Region III Residential Soil RBCs**	**Range Exceeding EPA Region III Residential Soil RBCs**	Location Maximum Detect
Volatiles (ug/kg)							
2-Hexanone	82,000,000	3,100,000	0/26		0/26		ACSS20
Semivolatiles (ug/kg)					0/26		
2,4-Dinitrotoluene	4,100,000	160,000	0/26		0/26		ACSS28
2,6-Dinitrotoluene	2,000,000	78,000	0/26		0/26		ACSS28
Acenaphthene	120,000,000	4,700,000	0/26		0/26		ACSS28
Acenaphthylene	120,000,000	4,700,000	0/26		0/26		ACSS32
Anthracene	610,000,000	23,000,000	0/26		0/26		ACSS28
Benzo(a)anthracene	7,800	880	0/26		4/26	900-2,100	ACSS32
Benzo(a)pyrene	780	88	6/26	830-2,600	16/26	96J-2,600	ACSS32
Benzo(b)fluoranthene	7,800	880	0/26		8/26	1,100-5,500	ACSS32
Benzo(g,h,i)perylene	61,000,000	2,300,000	0/26		0/26		ACSS32
Benzo(k)fluoranthene	78,000	8,800	0/26		0/26		ACSS32
Bis(2-ethylhexyl)phthalate	410,000	46,000	0/26		0/26		ACSS22, ACSS25
Carbazole	290,000	32,000	0/26		0/26		ACSS28
Chrysene	780,000	88,000	0/26		0/26		ACSS32
Dibenzo(a,h)anthracene	780	88	0/26		7/26	92J-440	ACSS32
Dibenzofuran	8,200,000	310,000	0/26		0/26		ACSS28
Dimethylphthalate	1,000,000,000	780,000,000	0/26		0/26		ACSS25
Di-n-butylphthalate	200,000,000	7,800,000	0/26		0/26		ACSS20
Fluoranthene	82,000,000	3,100,000	0/26		0/26		ACSS28
Fluorene	82,000,000	3,100,000	0/26		0/26		ACSS28
Indeno(1,2,3-cd)pyrene	7,800	880	0/26		2/26	1,100-1,900	ACSS32
Naphthalene	82,000,000	3,100,000	0/26		0/26		ACSS28
			0/26		0/26		
N-Nitrosodiphenylamine (1)	1,200,000	130,000	0/26		0/26		ACSS28
Phenanthrene	61,000,000	2,300,000	0/26		0/26		ACSS28
Pyrene	61,000,000	2,300,000	0/26		0/26		ACSS32
PCBs (ug/kg)							
Aroclor-1260	2,900	320	7/26	3,100-30,000	19/26	360-30,000	ACSS13

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.

TABLE 2-38

SUMMARY OF INORGANIC DETECTIONS IN SURFACE SOIL
AOC C (TRANSFORMER STORAGE PADS)
NAVAL STATION ROOSEVELT ROADS,PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	2 x Average Detected Background (ug/kg)	**EPA Region III Industrial Soil RBCs** (ug/kg)	EPA Region III Residential Soil RBCs (ug/kg)	ACSS13 09/21/97 0.00-0.50	ACSS14 09/21/97 0.00-0.50	ACSS15 09/21/97 0.00-0.50	ACSS16 09/21/97 0.00-0.50	ACSS17 09/21/97 0.00-0.50	ACSS18 09/21/97 0.00-0.50	ACSS19 09/21/97 0.00-0.50	ACSS20 09/21/97 0.00-0.50	ACSS21 09/21/97 0.00-0.50
Inorganics (ug/kg)												
Antimony, Total	0	820,000	31,000	330 J	190 UJ	160 UJ	170 UJ	330 J	370 J	280 J	290 J	190 UJ
Arsenic, Total	2,425	3,800	430	**4,200 J**	3,700 J	**4,700 J**	1,600 J	**7,400 J**	**7,600 J**	**4,700 J**	3,700 J	**40,500 J**
Barium, Total	181,200	140,000,000	5,500,000	72,000	64,600	97,200 J	25,400 J	45,300	37,500	18,600	33,100	77,900
Beryllium, Total	450	1,300	150	160 J	130 J	130	70	110 J	100 J	40 J	60 J	220 J
Cadmium, Total	0	1,000,000	39,000	1,800	1,100	980	530	830	1,200	1,000	900	1,100
Chromium, Total	59,300	10,000,000	390,000	20,300 J	17,400 J	19,300 J	7,800 J	22,000 J	45,300 J	55,600 J	40,800 J	74,400 J
Cobalt, Total	43,950	120,000,000	4,700,000	13,800	8,900	11,000	12,800	13,200	11,800	13,700	11,000	19,500
Copper, Total	234,200	82,000,000	3,100,000	150,000	169,000	71,700	61,000	90,400	84,800	87,000	69,800	131,000
Lead, Total	15,250	NE	400,000	17,400	8,500	11,600	4,800	15,600	19,600	6,300	13,500	29,800
Mercury, Total	110	610,000	23,000	40 J	30 U	20 U	20 U	20 U	20 U	20 U	20 U	30 J
Nickel, Total	16,550	41,000,000	1,600,000	11,900	6,400	8,500	7,400	7,900	9,900	18,200	10,800	11,900
Selenium, Total	1,462.50	10,000,000	390,000	210 UJ	220 UJ	190 UJ	190 UJ	200 UJ	200 UJ	190 UJ	190 UJ	210 UJ
Silver, Total	0	10,000,000	390,000	190 J	110 J	170 J	170 J	170 J	170 J	130 J	120 J	210 J
Thallium, Total	115	NE	NE	80 UJ	100 J	110 J	80 UJ	80 UJ	90 UJ	80 UJ	90 J	100 UJ
Tin, Total	2,425	1,000,000,000	47,000,000	2,400 UJ	2,400 J	2,200 J	1,900 J	2,100 J	2,600 J	2,300 J	2,000 J	2,600 J
Vanadium, Total	354,500	14,000,000	550,000	91,800 J	84,400 J	74,400 J	65,600 J	85,500 J	97,700 J	87,200 J	78,800 J	150,000 J
Zinc, Total	125,150	610,000,000	23,000,000	142,000	88,200	65,300	51,900	75,100	85,300	53,400	65,000	119,000

Data Qualifiers:

J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.
UJ - Not detected, quantitation limit may be inaccurate or imprecise.
R - Unreliable result. Analyte may or may not be present in the sample. Supporting data necessary to confirm result.

Notes:

NE - Not established.
* - Residential action level for lead in soils.

TABLE 2-38

SUMMARY OF INORGANIC DETECTIONS IN SURFACE SOIL
AOC C (TRANSFORMER STORAGE PADS)
NAVAL STATION ROOSEVELT ROADS,PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	2 x Average Detected Background (ug/kg)	**EPA Region III Industrial Soil RBCs** (ug/kg)	EPA Region III Residential Soil RBCs (ug/kg)	ACSS22 09/21/97 0.00-0.50	ACSS23 09/21/97 0.00-0.50	ACSS24 09/21/97 0.00-0.50	ACSS25 09/21/97 0.00-0.50	ACSS26 09/21/97 0.00-0.50	ACSS27 09/23/97 0.00-0.50	ACSS28 09/23/97 0.00-0.50	ACSS29 09/23/97 0.00-0.50	ACSS30 09/23/97 0.00-0.50
Inorganics (ug/kg)												
Antimony, Total	0	820,000	31,000	1,400 J	170 UJ	260 J	5,800 J	380 J	540 J	840 J	200 UJ	540 J
Arsenic, Total	2,425	3,800	430	2,900 J	**18,200 J**	3,100 J	**9,600 J**	**6,100 J**	**8,400 J**	2,100 J	660 UJ	2,200 J
Barium, Total	181,200	140,000,000	5,500,000	67,400	55,800	59,900	134,000	50,600	49,800	82,100	211,000	72,800
Beryllium, Total	450	1,300	150	120 J	150 J	90 J	150 J	100 J	120 J	140 J	270 J	120 J
Cadmium, Total	0	1,000,000	39,000	1,500	1,100	2,100	3,800	1,500	340 J	40 U	40 U	30 U
Chromium, Total	59,300	10,000,000	390,000	20,700 J	21,100 J	22,300 J	41,000 J	28,000 J	34,000 J	17,100 J	21,800 J	14,700 J
Cobalt, Total	43,950	120,000,000	4,700,000	11,400	16,000	15,900	17,400	19,300	12,700	19,700	38,800	14,300
Copper, Total	234,200	82,000,000	3,100,000	181,000	110,000	88,600	160,000	89,400	95,000 R	98,300 R	98,900 R	121,000 R
Lead, Total	15,250	NE	400,000	28,600	40,600	30,600	276,000	57,100	40,500	78,900	7,600	7,100
Mercury, Total	110	610,000	23,000	30 J	30 J	20 U	250	30 J	20 U	20 U	30 U	20 U
Nickel, Total	16,550	41,000,000	1,600,000	7,700	10,100	13,300	17,500	13,400	12,100	11,200	14,200	9,000
Selenium, Total	1,462.50	10,000,000	390,000	210 UJ	200 UJ	930 UJ	200 UJ	200 UJ	190 UJ	640 J	1,000 J	160 UJ
Silver, Total	0	10,000,000	390,000	180 J	160 J	180 J	420 J	230 J	140 J	110 J	100 J	130 J
Thallium, Total	115	NE	NE	90 J	80 UJ	80 UJ	80 UJ	90 UJ	100 U	90 U	90 U	80 U
Tin, Total	2,425	1,000,000,000	47,000,000	2,500 J	2,500 J	3,200 J	5,000 J	3,200 J	2,400 J	3,000 J	2,900 J	2,300 J
Vanadium, Total	354,500	14,000,000	550,000	96,500 J	111,000 J	91,600 J	120,000 J	101,000 J	92,700	119,000	211,000	119,000
Zinc, Total	125,150	610,000,000	23,000,000	122,000	119,000	160,000	409,000	139,000	119,000	141,000	106,000	86,700

Data Qualifiers:

J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.
UJ - Not detected, quantitation limit may be inaccurate or imprecise.
R - Unreliable result. Analyte may or may not be present in the sample. Supporting data necessary to confirm result.

Notes:

NE - Not established.
* - Residential action level for lead in soils.

TABLE 2-38

SUMMARY OF INORGANIC DETECTIONS IN SURFACE SOIL
AOC C (TRANSFORMER STORAGE PADS)
NAVAL STATION ROOSEVELT ROADS,PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	2 x Average Detected Background (ug/kg)	**EPA Region III Industrial Soil RBCs** (ug/kg)	EPA Region III Residential Soil RBCs (ug/kg)	ACSS31 09/23/97 0.00-0.50	ACSS32 09/23/97 0.00-0.50	ACSS33 09/23/97 0.00-0.50	ACSS34 09/23/97 0.00-0.50	ACSS35 09/23/97 0.00-0.50	ACSS36 09/23/97 0.00-0.50	ACSS37 09/23/97 0.00-0.50	ACSS38 09/23/97 0.00-0.50
Inorganics (ug/kg)											
Antimony, Total	0	820,000	31,000	320 J	640 J	320 J	210 UJ	300 J	600 J	570 J	240 J
Arsenic, Total	2,425	3,800	430	**27,500 J**	1,000 J	2,000 J	720 U	1,900 J	2,800 J	**4,600 J**	1,100 J
Barium, Total	181,200	140,000,000	5,500,000	52,400	133,000	53,700	92,200	116,000	56,100	69,100	81,900
Beryllium, Total	450	1,300	150	130 J	160 J	100 J	170 J	230 J	120 J	190 J	140 J
Cadmium, Total	0	1,000,000	39,000	40 U	40 UJ	40 UJ	40 UJ	520 J	280 J	50 UJ	40 UJ
Chromium, Total	59,300	10,000,000	390,000	59,500 J	24,400	12,600	12,700	17,100	11,900	25,300	16,700
Cobalt, Total	43,950	120,000,000	4,700,000	10,200	20,700	11,600	21,100	15,100	7,700	18,200	19,200
Copper, Total	234,200	82,000,000	3,100,000	93,200 R	119,000 J	95,900 J	93,200 J	228,000 J	171,000 J	105,000 J	95,600 J
Lead, Total	15,250	NE	400,000	30,300	45,800 J	28,300 J	9,800 J	7,100 J	13,900 J	46,200 J	47,400 J
Mercury, Total	110	610,000	23,000	20 U	50	20 U	20 U	20 U	250	30 U	20 U
Nickel, Total	16,550	41,000,000	1,600,000	8,200	12,100	8,500	8,300	13,400	6,100	12,400	9,700
Selenium, Total	1,462.50	10,000,000	390,000	600 J	200 R	220 R	240 R	250 R	240 R	270 R	240 R
Silver, Total	0	10,000,000	390,000	80 J	140 J	150 J	150	230 J	70 J	140 J	130 J
Thallium, Total	115	NE	NE	100 U	90 UJ	80 U	100 U	90 UJ	90 UJ	100 U	100 U
Tin, Total	2,425	1,000,000,000	47,000,000	2,300 J	1,900 J	2,000 J	2,400 J	2,200 J	2,000 J	2,900 J	2,600 J
Vanadium, Total	354,500	14,000,000	550,000	67,000	127,000	81,300	122,000	110,000	75,500	139,000	126,000
Zinc, Total	125,150	610,000,000	23,000,000	113,000	192,000	75,000	103,000	165,000	115,000	155,000	90,700

Data Qualifiers:

J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.
UJ - Not detected, quantitation limit may be inaccurate or imprecise.
R - Unreliable result. Analyte may or may not be present in the sample. Supporting data necessary to confirm result.

Notes:

NE - Not established.
* - Residential action level for lead in soils.

TABLE 2-38

SUMMARY OF INORGANIC DETECTIONS IN SURFACE SOIL
AOC C (TRANSFORMER STORAGE PADS)
NAVAL STATION ROOSEVELT ROADS,PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	2 x Average Detected Background (ug/kg)	**EPA Region III Industrial Soil RBCs** (ug/kg)	EPA Region III Residential Soil RBCs (ug/kg)	Number Exceeding 2 x Average Detected Background	Range Exceeding 2 x Average Detected Background	**Number Exceeding EPA Region III Industrial Soil RBCs**	**Range Exceeding EPA Region III Industrial Soil RBCs**	Number Exceeding EPA Region III Residential Soil RBCs	Range Exceeding EPA Region III Residential Soil RBCs	Location Maximum Detect
Inorganics (ug/kg)										
Antimony, Total	0	820,000	31,000	19/26	240J-5,800J	0/26		0/26		ACSS25
Arsenic, Total	2,425	3,800	430	17/26	2,900J-40,500J	12/26	4,200J-40,500J	24/26	100J-40,500J	ACSS21
Barium, Total	181,200	140,000,000	5,500,000	1/6	211,000	0/26		0/26		ACSS29
Beryllium, Total	450	1,300	150	0/26		0/26		9/26	150J-270J	ACSS29
Cadmium, Total	0	1,000,000	39,000	17/26	280J-3,800	0/26		0/26		ACSS25
Chromium, Total	59,300	10,000,000	390,000	2/26	59,500J-74,400J	0/26		0/26		ACSS21
Cobalt, Total	43,950	120,000,000	4,700,000	0/26		0/26		0/26		ACSS29
Copper, Total	234,200	82,000,000	3,100,000	0/26		0/26		0/26		ACSS35
Lead, Total	15,250	NE	400,000	16/26	15,600-276,000	NE		0/26		ACSS25
Mercury, Total	110	610,000	23,000	2/26	250	0/26		0/26		ACSS25, ACSS36
Nickel, Total	16,550	41,000,000	1,600,000	2/26	17,500-18,200	0/26		0/26		ACSS19
Selenium, Total	1,462.50	10,000,000	390,000	0/26		0/26		0/26		ACSS29
Silver, Total	0	10,000,000	390,000	26/26	80J-420J	0/26		0/26		ACSS25
Thallium, Total	115	NE	NE	0/26		NE		NE		ACSS15
Tin, Total	2,425	1,000,000,000	47,000,000	11/26	2,500J-5,000J	0/26		0/26		ACSS25
Vanadium, Total	354,500	14,000,000	550,000	0/26		0/26		0/26		ACSS29
Zinc, Total	125,150	610,000,000	23,000,000	8/26	139,000-409,000	0/26		0/26		ACSS25

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.
UJ - Not detected, quantitation limit may be inaccurate or imprecise.
R - Unreliable result. Analyte may or may not be present in the sample. Supporting data necessary to confirm result.

Notes:
NE - Not established.
* - Residential action level for lead in soils.

TABLE 2-39

SUMMARY OF ORGANIC DETECTIONS IN SUBSURFACE SOIL
AOC C (TRANSFORMER STORAGE PADS)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID	EPA Region III	**EPA Region III**	ACSB13	ACSB14	ACSB15	ACSB16	ACSB17	ACSB18	ACSB19
Sample Date	Industrial	**Residential**	09/22/97	09/22/97	09/22/97	09/22/97	09/22/97	09/22/97	09/22/97
Depth Range (ft bgs)	Soil RBCs	**Soil RBCs**	2.50-3.00	2.50-3.00	2.50-3.00	2.50-3.00	2.50-3.00	2.50-3.00	2.50-3.00
	(ug/kg)	(ug/kg)							
Volatiles (ug/kg)									
Semivolatiles (ug/kg)									
2-Butanone	1,000,000,000	47,000,000	14 UJ	14 UJ	11 UJ	12 UJ	18 J	12 UJ	14 UJ
Benzo(b)fluoranthene	7,800	880	450 U	470 U	40 J	400 U	470 U	94 J	450 U
Bis(2-ethylhexyl)phthalate	410,000	46,000	450 U	470 U	360 U	400 U	470 U	400 U	450 U
Chrysene	780,000	88,000	450 U	470 U	67 J	400 U	470 U	400 U	450 U
Diethylphthalate	1,000,000,000	63,000,000	450 U	470 U	360 U	400 U	58 J	400 U	450 U
Phenanthrene	61,000,000	2,300,000	450 U	470 U	240 J	400 U	470 U	400 U	450 U
PCBS (ug/kg)									
Aroclor-1260	2,900	320	170	160	76	21 J	110 U	43 J	110 U

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.
UJ - Not detected, quantitation limit may be inaccurate or imprtecise.

TABLE 2-39

SUMMARY OF ORGANIC DETECTIONS IN SUBSURFACE SOIL
AOC C (TRANSFORMER STORAGE PADS)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID	EPA Region III	**EPA Region III**	ACSB20	ACSB21	ACSB22	ACSB23	ACSB24	ACSB25	ACSB26
Sample Date	Industrial	**Residential**	09/21/97	09/22/97	09/22/97	09/22/97	09/22/97	09/22/97	09/22/97
Depth Range (ft bgs)	Soil RBCs	**Soil RBCs**	2.50-3.00	2.50-3.00	2.50-3.00	2.50-3.00	2.50-3.00	2.50-3.00	2.50-3.00
	(ug/kg)	(ug/kg)							
Volatiles (ug/kg)									
Semivolatiles (ug/kg)									
2-Butanone	1,000,000,000	47,000,000	13 UJ	12 UJ	11 UJ	12 UJ	13 UJ	11 U	10 U
Benzo(b)fluoranthene	7,800	880	430 U	380 U	360 U	380 U	410 U	370 U	350 U
Bis(2-ethylhexyl)phthalate	410,000	46,000	430 U	380 U	44 J	46 J	410 U	370 U	350 U
Chrysene	780,000	88,000	430 U	380 U	360 U	380 U	410 U	370 U	350 U
Diethylphthalate	1,000,000,000	63,000,000	430 U	380 U	360 U	380 U	410 U	370 U	350 U
Phenanthrene	61,000,000	2,300,000	430 U	380 U	360 U	380 U	410 U	370 U	350 U
PCBS (ug/kg)									
Aroclor-1260	2,900	320	100 U	26 J	20 J	95 U	28 J	88 U	83 U

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.
UJ - Not detected, quantitation limit may be inaccurate or imprtecise.

TABLE 2-39

SUMMARY OF ORGANIC DETECTIONS IN SUBSURFACE SOIL
AOC C (TRANSFORMER STORAGE PADS)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	EPA Region III Industrial Soil RBCs (ug/kg)	**EPA Region III Residential Soil RBCs** (ug/kg)	Number Exceeding EPA Region III Industrial Soil RBCs	Range Exceeding EPA Region III Industrial Soil RBCs	**Number Exceeding EPA Region III Residential Soil RBCs**	**Range Exceeding EPA Region III Residential Soil RBCs**	Location Maximum Detect
Volatiles (ug/kg)							
Semivolatiles (ug/kg)							
2-Butanone	1,000,000,000	47,000,000	0/14		0/14		ACSB17
Benzo(b)fluoranthene	7,800	880	0/14		0/14		ACSB18
Bis(2-ethylhexyl)phthalate	410,000	46,000	0/14		0/14		ACSB23
Chrysene	780,000	88,000	0/14		0/14		ACSB15
Diethylphthalate	1,000,000,000	63,000,000	0/14		0/14		ACSB17
Phenanthrene	61,000,000	2,300,000	0/14		0/14		ACSB15
PCBS (ug/kg)							
Aroclor-1260	2,900	320	0/14		0/14		ACSB13

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.
UJ - Not detected, quantitation limit may be inaccurate or imprtecise.

TABLE 2-40

SUMMARY OF INORGANIC DETECTIONS IN SUBSURFACE SOIL
AOC C (TRANSFORMER STORAGE PADS)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	2 x Average Detected Background (ug/kg)	**EPA Region III Industrial Soil RBCs** (ug/kg)	EPA Region III Residential Soil RBCs (ug/kg)	ACSB13 09/22/97 2.50-3.00	ACSB14 09/22/97 2.50-3.00	ACSB15 09/22/97 2.50-3.00	ACSB16 09/22/97 2.50-3.00	ACSB17 09/22/97 2.50-3.00	ACSB18 09/22/97 2.50-3.00	ACSB19 09/22/97 2.50-3.00
Inorganics (ug/kg)										
Antimony, Total	0	820,000	31,000	0.36 J	0.22 UJ	0.22 J	0.2 UJ	0.22 J	0.31 J	0.21 UJ
Arsenic, Total	2,047.50	3,800	430	1.2 J	0.77 UJ	0.56 UJ	0.67 UJ	1 J	5.6 J	1.6 J
Barium, Total	222,125	140,000,000	5,500,000	68.2	87.6	67.3	253	47.2	137	96.4
Beryllium, Total	740	1,300	150	0.15 J	0.25 J	0.13 J	0.48 J	0.32 J	0.16 J	0.27
Cadmium, Total	740	1,000,000	39,000	0.05 U	0.05 U	0.13 J	0.44 J	0.53 J	0.04 U	0.74
Chromium, Total	132,575	10,000,000	390,000	34.1 J	34.7 J	33 J	21.2 J	34.9 J	19.5 J	50.1 J
Cobalt, Total	30,000	120,000,000	4,700,000	10.8	7.3	17.1	63.6	47.8	17.1	11.2
Copper, Total	193,075	82,000,000	3,100,000	71 R	80 R	118 R	109 R	92.7 R	74.6 R	85.6
Lead, Total	8,675	NE	400,000 *	3.7	4.6	4.4	2.2	4.5	6.7	2.2 J
Mercury, Total	93	610,000	23,000	0.03 J	0.03 U	0.02 U	0.02 U	0.09	0.03 U	0.03 J
Nickel, Total	31,900	41,000,000	1,600,000	9	7.7	17.3	24.8	14.9	10.8	19.9
Selenium, Total	570	10,000,000	390,000	2.3 J	1 J	0.16 UJ	1.2 J	2.7 J	0.16 UJ	1.6 J
Silver, Total	0	10,000,000	390,000	0.07 U	0.07 U	0.14 J	0.21 J	0.29 J	0.11 J	0.09 J
Thallium, Total	0	NE	NE	0.11 U	0.11 U	0.08 U	0.09 U	0.11 U	0.08 U	0.12 J
Tin, Total	2,962.50	1,000,000,000	47,000,000	3.1 J	3.1 J	2.3 J	2.8 J	2.7 J	3 J	3 J
Vanadium, Total	462,225	14,000,000	550,000	274	252	114	195	210	95.3	225 J
Zinc, Total	88,625	610,000,000	23,000,000	68.1	67.3	73.9	171	122	58.5	87.2

Data Qualifiers:

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UJ - Not detected, quantitation limit may be inaccurate or imprecise.
R - Unreliable result. Analyte may or may not be present in the sample. Supporting data necessary to confirm result.

Notes:

NE - Not established.
* - Residential action level for lead in soils.

TABLE 2-40

SUMMARY OF INORGANIC DETECTIONS IN SUBSURFACE SOIL
AOC C (TRANSFORMER STORAGE PADS)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	2 x Average Detected Background (ug/kg)	**EPA Region III Industrial Soil RBCs** (ug/kg)	EPA Region III Residential Soil RBCs (ug/kg)	ACSB20 09/21/97 2.50-3.00	ACSB21 09/22/97 2.50-3.00	ACSB22 09/22/97 2.50-3.00	ACSB23 09/22/97 2.50-3.00	ACSB24 09/22/97 2.50-3.00	ACSB25 09/22/97 2.50-3.00	ACSB26 09/22/97 2.50-3.00
Inorganics (ug/kg)										
Antimony, Total	0	820,000	31,000	0.2 UJ	0.4 J	0.23 J	0.18 UJ	0.26 J	0.49 J	0.23 J
Arsenic, Total	2,047.50	3,800	430	0.75 UJ	0.65 UJ	0.59 UJ	3 J	0.68 UJ	0.61 UJ	0.6 UJ
Barium, Total	222,125	140,000,000	5,500,000	101	94.1	87	199	31.9	127	68.4
Beryllium, Total	740	1,300	150	0.24 J	0.17 J	0.17 J	0.23 J	0.1 J	0.2 J	0.12 J
Cadmium, Total	740	1,000,000	39,000	1.1	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.03 U
Chromium, Total	132,575	10,000,000	390,000	19.3 J	13.7 J	14.6 J	29.6 J	10.7 J	14.2 J	7.9 J
Cobalt, Total	30,000	120,000,000	4,700,000	43	17.4	14.3	21.3	17.2	16.7	15.7
Copper, Total	193,075	82,000,000	3,100,000	105	91.6 R	69.3 R	72.6 R	82.7 R	87.6 R	73.7 R
Lead, Total	8,675	NE	400,000 *	1.4	5.3	3.2	5.4	1.7	9.2	2.8
Mercury, Total	93	610,000	23,000	0.03 U	0.02 U	0.02 U	0.02 U	0.02 U	0.06	0.02 U
Nickel, Total	31,900	41,000,000	1,600,000	21.8	7.6	7.5	10.7	10.7	7.3	6
Selenium, Total	570	10,000,000	390,000	0.23 UJ	0.18 UJ	0.16 UJ	1.7 J	0.93 UJ	0.85 UJ	0.17 UJ
Silver, Total	0	10,000,000	390,000	0.15 J	0.09 J	0.11 J	0.13 J	0.08 J	0.1 J	0.09 J
Thallium, Total	0	NE	NE	0.1 UJ	0.09 U	0.08 U	0.09 U	0.09 U	0.08 U	0.08 U
Tin, Total	2,962.50	1,000,000,000	47,000,000	3.2 J	1.8 J	2.3 J	2.7 J	2.3 J	2.6 J	2 J
Vanadium, Total	462,225	14,000,000	550,000	167 J	113	102	223	110	126	105
Zinc, Total	88,625	610,000,000	23,000,000	76.5	54.1	50.3	66.7	79.1	62.6	48.7

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R - Unreliable result. Analyte may or may not be present in the sample. Supporting data necessary to confirm result.

Notes:

NE - Not established.
* - Residential action level for lead in soils.

TABLE 2-40

SUMMARY OF INORGANIC DETECTIONS IN SUBSURFACE SOIL
AOC C (TRANSFORMER STORAGE PADS)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	2 x Average Detected Background (ug/kg)	**EPA Region III Industrial Soil RBCs** (ug/kg)	EPA Region III Residential Soil RBCs (ug/kg)	Number Exceeding 2 x Average Detected Background	Range Exceeding 2 x Average Detected Background	**Number Exceeding EPA Region III Industrial Soil RBCs**	**Range Exceeding EPA Region III Industrial Soil RBCs**	Number Exceeding EPA Region III Residential Soil RBCs	Range Exceeding EPA Region III Residential Soil RBCs	Location Maximum Detect
Inorganics (ug/kg)										
Antimony, Total	0	820,000	31,000	9/14	.22J-.49J	0/14		0/14		ACSB25
Arsenic, Total	2,047.50	3,800	430	0/14		0/14		0/14		ACSB18
Barium, Total	222,125	140,000,000	5,500,000	0/14		0/14		0/14		ACSB16
Beryllium, Total	740	1,300	150	0/14		0/14		0/14		ACSB16
Cadmium, Total	740	1,000,000	39,000	0/14		0/14		0/14		ACSB20
Chromium, Total	132,575	10,000,000	390,000	0/14		0/14		0/14		ACSB19
Cobalt, Total	30,000	120,000,000	4,700,000	0/14		0/14		0/14		ACSB16
Copper, Total	193,075	82,000,000	3,100,000	0/14		0/14		0/14		ACSB20
Lead, Total	8,675	NE	400,000 *	0/14		NE		0/14		ACSB25
Mercury, Total	93	610,000	23,000	0/14		0/14		0/14		ACSB17
Nickel, Total	31,900	41,000,000	1,600,000	0/14		0/14		0/14		ACSB16
Selenium, Total	570	10,000,000	390,000	0/14		0/14		0/14		ACSB17
Silver, Total	0	10,000,000	390,000	12/14	.08J-.29J	0/14		0/14		ACSB17
Thallium, Total	0	NE	NE	1/14	.12J	NE		NE		ACSB19
Tin, Total	2,962.50	1,000,000,000	47,000,000	5/14	3.2J	0/14		0/14		ACSB20
Vanadium, Total	462,225	14,000,000	550,000	0/14		0/14		0/14		ACSB13
Zinc, Total	88,625	610,000,000	23,000,000	0/14		0/14		0/14		ACSB16

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Notes:
NE - Not established.
* - Residential action level for lead in soils.

TABLE 2-41

SUMMARY OF SAMPLING AND ANALYTICAL PROGRAM
AOC D (STATION LANDFILL)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample Media	Sample ID	Sample Depth (ft bgs)	Sample Date	Analytical Parameters
Sediment	1SD01	0.00-1.00	10/22/96	Appendix IX List, Asbestos
	1SD02	0.00-1.00	10/22/96	Appendix IX List, Asbestos
	1SD03	0.00-1.00	11/10/96	Appendix IX List, Asbestos
	2SD01	0.00-1.00	11/11/96	Appendix IX List, Asbestos
	2SD02	0.00-1.00	11/11/96	Appendix IX List, Asbestos
	2SD03	0.00-1.00	11/11/96	Appendix IX List, Asbestos
	3SD01	0.00-1.00	10/29/95	Appendix IX List, Asbestos
	3SD02	0.00-1.00	10/29/95	Appendix IX List, Asbestos
	3SD03	0.00-1.00	10/29/95	Appendix IX List, Asbestos
	3SD04	0.00-1.00	10/27/95	Appendix IX List, Asbestos
	3SD05	0.00-1.00	10/27/95	Appendix IX List, Asbestos
	3SD06	0.00-1.00	10/27/95	Appendix IX List, Asbestos
	3SD07	0.00-1.00	10/27/95	Appendix IX List, Asbestos
	3SD08	0.00-1.00	10/28/95	Appendix IX List, Asbestos
	3SD09	0.00-1.00	10/28/95	Appendix IX List, Asbestos
	3SD10	0.00-1.00	10/27/95	Appendix IX List, Asbestos
	3SD11	0.00-1.00	10/28/95	Appendix IX List, Asbestos
	3SD12	0.00-1.00	10/28/95	Appendix IX List, Asbestos
	3SD13	0.00-1.00	10/28/95	Appendix IX List, Asbestos
	3SD14	0.00-1.00	10/28/95	Appendix IX List, Asbestos
	3SD15	0.00-1.00	10/28/95	Appendix IX List, Asbestos
	7SD02	0.00-1.00	10/27/95	Appendix IX List, Asbestos
	7SD03	0.00-1.00	10/27/95	Appendix IX List, Asbestos
	7SD04	0.00-1.00	10/27/95	Appendix IX List, Asbestos
	3-SD16	0.00-1.00	9/19/97	Appendix IX List, Explosives, Asbestos, TOC
	3-SD17	0.00-1.00	9/19/97	Appendix IX List, Explosives, Asbestos, TOC

TABLE 2-42

SUMMARY OF ORGANIC DETECTIONS IN SEDIMENT
AOC D (STATION LANDFILL)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	ERL Sediment Screening Value (ug/kg)	**ERM Sediment Screening Value** (ug/kg)	1SD01 10/30/95 0.00-1.00	1SD02 10/30/95 0.00-1.00	1SD03 10/30/95 0.00-1.00	2SD01 10/31/95 0.00-1.00	2SD02 10/31/95 0.00-1.00	2SD03 10/31/95 0.00-1.00	3SD01 10/29/95 0.00-1.00
Volatiles (ug/kg)									
Acetone	NE	NE	18 U	14 U	22 U	30 U	42 U	33 U	14 U
Tetrachloroethene	NE	NE	6 U	2 J	2 J	9 U	12 U	8 U	7 U
Semivolatiles (ug/kg)									
Anthracene	85	1,100	410 U	470 U	530 U	560 U	780 U	95 J	450 U
Benzo(a)anthracene	261	1,600	410 U	470 U	530 U	560 U	530 J	970	450 U
Benzo(a)pyrene	430	1,600	410 U	470 U	530 U	560 U	780 U	920	450 U
Benzo(b)fluoranthene	NE	NE	410 U	470 U	530 U	560 U	780 U	1,800	450 U
Benzo(g,h,i)perylene	NE	NE	410 U	470 U	530 U	560 U	780 U	540 U	450 U
Benzo(k)fluoranthene	NE	NE	410 U	470 U	530 U	560 U	780 U	140 J	450 U
Benzoic acid	NE	NE	2,100 U	2,300 U	2,700 U	2,800 U	3,900 U	2,700 U	2,300 U
Bis(2-ethylhexyl)phthalate	NE	NE	130 J	470 U	110 J	200 J	880	540 U	450 U
Chrysene	384	2,800	410 U	470 U	530 U	560 U	720 J	1,200	450 U
Fluoranthene	600	5,100	410 U	470 U	530 U	560 U	960	1,900	450 U
Indeno(1,2,3-cd)pyrene	NE	NE	410 U	470 U	530 U	560 U	780 U	90 J	450 U
Phenanthrene	NE	NE	410 U	470 U	530 U	560 U	290 J	630	450 U
Phenol	NE	NE	410 U	470 U	530 U	560 U	780 U	540 U	450 U
Pyrene	665	2,600	410 U	470 U	530 U	560 U	1,200	2,200	450 U

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.
UJ - Not detected, quantitation limit may be inaccurate or imprecise.

Notes:
NE - Not established.
NA - Not analyzed.

TABLE 2-42

SUMMARY OF ORGANIC DETECTIONS IN SEDIMENT
AOC D (STATION LANDFILL)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	ERL Sediment Screening Value (ug/kg)	**ERM Sediment Screening Value** (ug/kg)	1SD01 10/30/95 0.00-1.00	1SD02 10/30/95 0.00-1.00	1SD03 10/30/95 0.00-1.00	2SD01 10/31/95 0.00-1.00	2SD02 10/31/95 0.00-1.00	2SD03 10/31/95 0.00-1.00	3SD01 10/29/95 0.00-1.00
Pesticides/PCBs (ug/kg)									
4,4'-DDE	2.2	27	10 U	11 U	64 U	68 U	180 U	**29**	53 U
Herbicides (ug/kg)									
2,4,5-TP (Silvex)	NE	NE	83 U	93 U	110 U	110 U	150 U	110 U	84 U
Dioxins (ug/kg)									
Total HxCDD	NE	NE	0.15 U	0.19 U	0.24 U	0.2 U	0.23 U	2.5	0.19 U
Total HxCDF	NE	NE	0.13 U	0.13 U	0.22 U	0.19 U	0.2 U	0.91 J	0.17 U
Total Organic Carbon (ug/kg)	NE	NE	NA	NA	NA	NA	NA	NA	60,000,000
Total Organic Carbon (%)	NE	NE	NA	NA	NA	NA	NA	NA	NA
Sulfide (ug/kg)	NE	NE	31,100 U	33,800 UJ	45,200 J	41,900 UJ	296,000 J	34,800 UJ	33,900 U
Asbestos									

Data Qualifiers:
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U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.
UJ - Not detected, quantitation limit may be inaccurate or imprecise.

Notes:
NE - Not established.
NA - Not analyzed.

TABLE 2-42

SUMMARY OF ORGANIC DETECTIONS IN SEDIMENT
AOC D (STATION LANDFILL)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	ERL Sediment Screening Value (ug/kg)	**ERM Sediment Screening Value (ug/kg)**	3SD02 10/29/95 0.00-1.00	3SD03 10/29/95 0.00-1.00	3SD04 10/27/95 0.00-1.00	3SD05 10/27/95 0.00-1.00	3SD06 10/27/95 0.00-1.00	3SD07 10/27/95 0.00-1.00
Volatiles (ug/kg)								
Acetone	NE	NE	19 U	20 U	17 U	26 U	15 U	18 U
Tetrachloroethene	NE	NE	8 U	8 U	9 U	8 U	7 U	8 U
Semivolatiles (ug/kg)								
Anthracene	85	1,100	500 U	520 U	560 U	510 U	480 U	520 U
Benzo(a)anthracene	261	1,600	500 U	520 U	560 U	510 U	480 U	520 U
Benzo(a)pyrene	430	1,600	500 U	520 U	560 U	510 U	480 U	520 U
Benzo(b)fluoranthene	NE	NE	500 U	520 U	560 U	510 U	480 U	520 U
Benzo(g,h,i)perylene	NE	NE	500 U	520 U	560 U	510 U	480 U	520 U
Benzo(k)fluoranthene	NE	NE	500 U	520 U	560 U	510 U	480 U	520 U
Benzoic acid	NE	NE	2,500 U	2,600 U	3,600	770 J	770 J	570 J
Bis(2-ethylhexyl)phthalate	NE	NE	500 U	520 U	560 U	510 U	480 U	520 U
Chrysene	384	2,800	500 U	520 U	560 U	510 U	480 U	520 U
Fluoranthene	600	5,100	500 U	520 U	560 U	510 U	480 U	520 U
Indeno(1,2,3-cd)pyrene	NE	NE	500 U	520 U	560 U	510 U	480 U	520 U
Phenanthrene	NE	NE	500 U	520 U	560 U	510 U	480 U	520 U
Phenol	NE	NE	500 U	520 U	560 U	510 U	480 U	520 U
Pyrene	665	2,600	500 U	520 U	560 U	510 U	480 U	520 U

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.
UJ - Not detected, quantitation limit may be inaccurate or imprecise.

Notes:
NE - Not established.
NA - Not analyzed.

TABLE 2-42

SUMMARY OF ORGANIC DETECTIONS IN SEDIMENT
AOC D (STATION LANDFILL)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	ERL Sediment Screening Value (ug/kg)	**ERM Sediment Screening Value** (ug/kg)	3SD02 10/29/95 0.00-1.00	3SD03 10/29/95 0.00-1.00	3SD04 10/27/95 0.00-1.00	3SD05 10/27/95 0.00-1.00	3SD06 10/27/95 0.00-1.00	3SD07 10/27/95 0.00-1.00
Pesticides/PCBs (ug/kg)								
4,4'-DDE	2.2	27	60 U	63 U	66 U	61 U	57 U	64 U
Herbicides (ug/kg)								
2,4,5-TP (Silvex)	NE	NE	99 U	100 U	110 U	100 U	94 U	100 U
Dioxins (ug/kg)								
Total HxCDD	NE	NE	0.18 U	0.12 U	0.21 U	0.27 U	0.17 U	0.12 U
Total HxCDF	NE	NE	0.18 U	0.11 U	0.18 U	0.27 U	0.14 U	0.14 U
Total Organic Carbon (ug/kg)	NE	NE	14,500,000	73,500,000	90,100,000	24,900,000	38,600,000	96,700,000
Total Organic Carbon (%)	NE	NE	NA	NA	NA	NA	NA	NA
Sulfide (ug/kg)	NE	NE	90,800	139,000	42,200 U	37,100 U	35,500 U	37,700 U
Asbestos								

Data Qualifiers:
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Notes:
NE - Not established.
NA - Not analyzed.

TABLE 2-42

SUMMARY OF ORGANIC DETECTIONS IN SEDIMENT
AOC D (STATION LANDFILL)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	ERL Sediment Screening Value (ug/kg)	**ERM Sediment Screening Value** (ug/kg)	3SD08 10/28/95 0.00-1.00	3SD09 10/28/95 0.00-1.00	3SD10 10/27/95 0.00-1.00	3SD11 10/28/95 0.00-1.00	3SD12 10/28/95 0.00-1.00	3SD13 10/28/95 0.00-1.00
Volatiles (ug/kg)								
Acetone	NE	NE	26 U	18 U	22 U	16 U	93	26
Tetrachloroethene	NE	NE	10 U	9 U	9 U	8 U	10 U	12 U
Semivolatiles (ug/kg)								
Anthracene	85	1,100	660 U	590 U	630 U	520 U	620 U	810 U
Benzo(a)anthracene	261	1,600	660 U	590 U	630 U	520 U	620 U	810 U
Benzo(a)pyrene	430	1,600	660 U	590 U	630 U	520 U	620 U	810 U
Benzo(b)fluoranthene	NE	NE	660 U	590 U	630 U	520 U	620 U	810 U
Benzo(g,h,i)perylene	NE	NE	660 U	590 U	630 U	520 U	620 U	810 U
Benzo(k)fluoranthene	NE	NE	660 U	590 U	630 U	520 U	620 U	810 U
Benzoic acid	NE	NE	3,300 U	3,000 U	2,400 J	2,600 U	3,100 U	4,100 U
Bis(2-ethylhexyl)phthalate	NE	NE	660 U	590 U	630 U	130 J	64 J	200 J
Chrysene	384	2,800	660 U	590 U	630 U	520 U	620 U	810 U
Fluoranthene	600	5,100	660 U	590 U	630 U	520 U	620 U	810 U
Indeno(1,2,3-cd)pyrene	NE	NE	660 U	590 U	630 U	520 U	620 U	810 U
Phenanthrene	NE	NE	660 U	590 U	630 U	520 U	620 U	810 U
Phenol	NE	NE	660 U	590 U	420 J	160 J	800	810 U
Pyrene	665	2,600	660 U	590 U	630 U	520 U	620 U	810 U

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AOC D (STATION LANDFILL)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	ERL Sediment Screening Value (ug/kg)	**ERM Sediment Screening Value** (ug/kg)	3SD08 10/28/95 0.00-1.00	3SD09 10/28/95 0.00-1.00	3SD10 10/27/95 0.00-1.00	3SD11 10/28/95 0.00-1.00	3SD12 10/28/95 0.00-1.00	3SD13 10/28/95 0.00-1.00
Pesticides/PCBs (ug/kg)								
4,4'-DDE	2.2	27	79 U	71 U	75 U	63 U	74 U	97 U
Herbicides (ug/kg)								
2,4,5-TP (Silvex)	NE	NE	130 U	120 U	130 U	100 U	130 U	160 U
Dioxins (ug/kg)								
Total HxCDD	NE	NE	0.28 U	0.31 U	0.2 U	0.12 U	0.17 U	0.38 U
Total HxCDF	NE	NE	0.25 U	0.26 U	0.2 U	0.17 U	0.16 U	0.28 U
Total Organic Carbon (ug/kg)	NE	NE	66,400,000	18,600,000	72,800,000	51,000,000	18,700,000	31,800,000
Total Organic Carbon (%)	NE	NE	NA	NA	NA	NA	NA	NA
Sulfide (ug/kg)	NE	NE	69,400	44,900 U	69,100 J	69,900 J	242,000 J	58,400 UJ
Asbestos								

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TABLE 2-42

SUMMARY OF ORGANIC DETECTIONS IN SEDIMENT
AOC D (STATION LANDFILL)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	ERL Sediment Screening Value (ug/kg)	**ERM Sediment Screening Value** (ug/kg)	3SD14 10/28/95 0.00-1.00	3SD15 10/28/95 0.00-1.00	3SD16 09/19/97 0.00-3.00	3SD17 09/19/97 0.00-3.00	7SD01 10/27/95 0.00-1.00	7SD02 10/27/95 0.00-1.00
Volatiles (ug/kg)								
Acetone	NE	NE	18 U	19 U	13 UJ	16 UJ	120	50
Tetrachloroethene	NE	NE	8 U	8 U	6 UJ	8 UJ	8 U	8 U
Semivolatiles (ug/kg)								
Anthracene	85	1,100	520 U	530 U	420 U	530 U	500 U	500 U
Benzo(a)anthracene	261	1,600	520 U	530 U	420 U	530 U	69 J	500 U
Benzo(a)pyrene	430	1,600	520 U	530 U	420 U	530 U	150 J	64 J
Benzo(b)fluoranthene	NE	NE	520 U	530 U	420 U	530 U	390 J	150 J
Benzo(g,h,i)perylene	NE	NE	520 U	530 U	420 U	530 U	86 J	500 U
Benzo(k)fluoranthene	NE	NE	520 U	530 U	420 U	530 U	230 J	72 J
Benzoic acid	NE	NE	2,600 U	2,700 U	2,100 U	2,700 U	870 J	680 J
Bis(2-ethylhexyl)phthalate	NE	NE	520 U	59 J	420 U	530 U	500 U	500 U
Chrysene	384	2,800	520 U	530 U	420 U	530 U	470 J	140 J
Fluoranthene	600	5,100	520 U	530 U	420 U	530 U	230 J	120 J
Indeno(1,2,3-cd)pyrene	NE	NE	520 U	530 U	420 U	530 U	110 J	51 J
Phenanthrene	NE	NE	520 U	530 U	420 U	530 U	66 J	86 J
Phenol	NE	NE	100 J	530 U	420 U	530 U	500 U	500 U
Pyrene	665	2,600	520 U	530 U	420 U	530 U	270 J	150 J

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TABLE 2-42

SUMMARY OF ORGANIC DETECTIONS IN SEDIMENT
AOC D (STATION LANDFILL)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	ERL Sediment Screening Value (ug/kg)	**ERM Sediment Screening Value** (ug/kg)	3SD14 10/28/95 0.00-1.00	3SD15 10/28/95 0.00-1.00	3SD16 09/19/97 0.00-3.00	3SD17 09/19/97 0.00-3.00	7SD01 10/27/95 0.00-1.00	7SD02 10/27/95 0.00-1.00
Pesticides/PCBs (ug/kg)								
4,4'-DDE	2.2	27	62 U	63 U	51 U	130 U	120 U	120 U
Herbicides (ug/kg)								
2,4,5-TP (Silvex)	NE	NE	100 U	110 U	43 U	54 U	100 U	100 U
Dioxins (ug/kg)								
Total HxCDD	NE	NE	0.23 U	1 J	0.06 U	0.06 U	0.21 U	0.22 U
Total HxCDF	NE	NE	0.16 U	0.22 U	0.04 U	0.03 U	0.15 U	0.17 U
Total Organic Carbon (ug/kg)	NE	NE	95,400,000	11,200,000	NA	NA	33,600,000	58,100,000
Total Organic Carbon (%)	NE	NE	NA	NA	0.30 U	0.48 U	NA	NA
Sulfide (ug/kg)	NE	NE	102,000 J	59,300 J	NA	NA	44,200	445,000
Asbestos								

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TABLE 2-42

SUMMARY OF ORGANIC DETECTIONS IN SEDIMENT
AOC D (STATION LANDFILL)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	ERL Sediment Screening Value (ug/kg)	**ERM Sediment Screening Value** (ug/kg)	7SD03 10/27/95 0.00-1.00	7SD04 10/27/95 0.00-1.00	Number Exceeding Sediment Screening Value ERL	Range Exceeding Sediment Screening Value ERL	**Number Exceeding Sediment Screening Value ERM**	**Range Exceeding Sediment Screening Value ERM**	Location Maximum Detect
Volatiles (ug/kg)									
Acetone	NE	NE	43	15 U	NE		NE		7SD01
Tetrachloroethene	NE	NE	8 U	7 U	NE		NE		1SD02, 1SD03
Semivolatiles (ug/kg)									
Anthracene	85	1,100	520 U	480 U	1/27	95	0/27		2SD03
Benzo(a)anthracene	261	1,600	520 U	480 U	2/27	530-970	0/27		2SD03
Benzo(a)pyrene	430	1,600	520 U	480 U	1/27	920	0/27		2SD03
Benzo(b)fluoranthene	NE	NE	520 U	480 U	NE		NE		2SD03
Benzo(g,h,i)perylene	NE	NE	520 U	480 U	NE		NE		1SD01
Benzo(k)fluoranthene	NE	NE	520 U	480 U	NE		NE		7SD01
Benzoic acid	NE	NE	790 J	960 J	NE		NE		3SD04
Bis(2-ethylhexyl)phthalate	NE	NE	520 U	480 U	NE		NE		2SD02
Chrysene	384	2,800	520 U	480 U	3/27	470-1,200	0/27		2SD03
Fluoranthene	600	5,100	520 U	480 U	2/27	960-1,900	0/27		2SD03
Indeno(1,2,3-cd)pyrene	NE	NE	55 J	480 U	NE		NE		1SD01
Phenanthrene	NE	NE	520 U	480 U	NE		NE		2SD03
Phenol	NE	NE	520 U	480 U	NE		NE		3SD12
Pyrene	665	2,600	520 U	480 U	2/27	1,200-2,200	0/27		2SD03

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SUMMARY OF ORGANIC DETECTIONS IN SEDIMENT
AOC D (STATION LANDFILL)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	ERL Sediment Screening Value (ug/kg)	**ERM Sediment Screening Value** (ug/kg)	7SD03 10/27/95 0.00-1.00	7SD04 10/27/95 0.00-1.00	Number Exceeding Sediment Screening Value ERL	Range Exceeding Sediment Screening Value ERL	**Number Exceeding Sediment Screening Value ERM**	**Range Exceeding Sediment Screening Value ERM**	Location Maximum Detect
Pesticides/PCBs (ug/kg)									
4,4'-DDE	2.2	27	130 U	120 U	3/27	29-930	1/27	29	2SD03
Herbicides (ug/kg)									
2,4,5-TP (Silvex)	NE	NE	100 U	40 J	NE		NE		7SD04
Dioxins (ug/kg)									
Total HxCDD	NE	NE	0.1 U	0.13 U	NE		NE		2SD03
Total HxCDF	NE	NE	0.09 U	0.09 U	NE		NE		1SD02
Total Organic Carbon (ug/kg)	NE	NE	43,500,000	47,100,000	NE		NE		1SD02
Total Organic Carbon (%)	NE	NE	NA	NA	NE		NE		
Sulfide (ug/kg)	NE	NE	37,400 U	34,700 U	NE		NE		7SD02
Asbestos									

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TABLE 2-43

SUMMARY OF INORGANIC DETECTIONS IN SEDIMENT
AOC D (STATION LANDFILL)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	ERL Sediment Screening Value (ug/kg)	**ERM Sediment Screening Value** (ug/kg)	1SD01 10/30/95 0.00-1.00	1SD02 10/30/95 0.00-1.00	1SD03 10/30/95 0.00-1.00	2SD01 10/31/95 0.00-1.00	2SD02 10/31/95 0.00-1.00	2SD03 10/31/95 0.00-1.00	3SD01 10/29/95 0.00-1.00	3SD02 10/29/95 0.00-1.00	3SD03 10/29/95 0.00-1.00
Inorganics (ug/kg)											
Antimony, Total	NE	NE	2,200 UJ	2,500 UJ	2,900 UJ	2,600 UJ	5,000 UJ	3,100 UJ	7,400 U	7,700 U	8,200 U
Arsenic, Total	8,200	70,000	190 UJ	430 J	320 J	2,000 J	7,000 J	7,600 J	1,800	5,000 J	4,300
Barium, Total	NE	NE	122,000	147,000	129,000	12,100	55,900 J	59,400	9,300	9,100	9,100
Beryllium, Total	NE	NE	100 U	100 U	120 U	110 U	210 UJ	130 U	180 U	190 U	200 U
Cadmium, Total	1,200	9,600	400 U	440 U	520 U	460 U	1,200 J	550 U	2,500 U	2,600 U	2,800 U
Chromium, Total	81,000	370,000	15,100	38,900	18,300	6,600	18,700 J	34,700	5,100	14,700	15,300
Cobalt, Total	NE	NE	6,400	28,000	4,600	1,200	4,600 J	7,900	1,300	4,700	4,600
Copper, Total	34,000	270,000	14,500	110,000	21,500	8,200	**332,000 J**	**830,000**	13,800	28,000	29,100
Lead, Total	46,700	218,000	1,500	2,900	4,300	3,800	**339,000 J**	202,000 J	1,200 J	1,800 J	1,700 J
Mercury, Total	150	710	60 U	60 U	50 U	60 U	**800 J**	**2,700**	60 U	80 U	73 U
Nickel, Total	20,900	51,600	3,100	16,700	5,000	2,400	7,800 J	9,100	2,200 U	4,200	4,300
Selenium, Total	NE	NE	180 UJ	350 J	410 J	250 UJ	350 UJ	150 J	610 UJ	900 UJ	1,600 UJ
Silver, Total	1,000	3,700	310 U	370	390 U	350 U	690 UJ	420 U	1,900 UJ	2,000 UJ	2,100 UJ
Tin, Total	NE	NE	1,700 U	1,900 U	2,200 U	2,000 U	13,500 J	13,700	6,800 U	7,100 U	7,500 U
Vanadium, Total	NE	NE	65,300	220,000	101,000	15,000	37,100 J	79,200	6,200	33,600	27,700
Zinc, Total	150,000	410,000	9,900	32,300	21,600	9,600	**432,000 J**	401,000	2,900	18,400	20,200

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SUMMARY OF INORGANIC DETECTIONS IN SEDIMENT
AOC D (STATION LANDFILL)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	ERL Sediment Screening Value (ug/kg)	**ERM Sediment Screening Value** (ug/kg)	3SD04 10/27/95 0.00-1.00	3SD05 10/27/95 0.00-1.00	3SD06 10/27/95 0.00-1.00	3SD07 10/27/95 0.00-1.00	3SD08 10/28/95 0.00-1.00	3SD09 10/28/95 0.00-1.00	3SD10 10/27/95 0.00-1.00	3SD11 10/28/95 0.00-1.00	3SD12 10/28/95 0.00-1.00
Inorganics (ug/kg)											
Antimony, Total	NE	NE	8,500 U	8,800 U	6,600 U	7,100 U	7,800 U	8,400 U	3,600 UJ	3,700 UJ	4,300 UJ
Arsenic, Total	8,200	70,000	1,400	890 U	940 U	1,100	2,100	3,200	900	820	1,400
Barium, Total	NE	NE	7,500	8,200	6,300	8,400	8,300	8,600	7,000	9,000	13,200
Beryllium, Total	NE	NE	210 U	210 U	160 U	200	190 U	200 U	150 U	160 U	260
Cadmium, Total	1,200	9,600	2,900 U	3,000 U	2,300 U	2,400 U	2,600 U	2,900 U	330 U	330 U	380 U
Chromium, Total	81,000	370,000	5,000	5,800	3,700	8,200	3,900	3,100 U	7,600	5,000	13,000
Cobalt, Total	NE	NE	1,500 U	1,600	1,200 U	1,700	1,400 U	1,500 U	1,500	1,600	5,300
Copper, Total	34,000	270,000	19,300	14,800	11,400	20,900	16,600	15,200	7,900	9,400	18,700
Lead, Total	46,700	218,000	1,800 J	360 J	700 J	960 J	1,200 J	760 J	2,000	730	960
Mercury, Total	150	710	74 U	55 U	73 U	59 U	80 U	75 U	80 U	70 U	90 U
Nickel, Total	20,900	51,600	2,600 U	2,600 U	2,000 U	2,100 U	2,300 U	2,500 U	2,700	1,800	7,100
Selenium, Total	NE	NE	1,600 UJ	1,800 J	1,400 UJ	1,400 UJ	2,200 UJ	1,700 UJ	890	620 U	1,000 U
Silver, Total	1,000	3,700	2,200 UJ	2,300 UJ	1,700 UJ	1,800 UJ	2,000 UJ	2,200 UJ	450 U	450 U	530 U
Tin, Total	NE	NE	7,800 U	8,100 U	6,100 U	6,500 U	7,100 U	7,700 U	2,800 U	2,800 U	3,400
Vanadium, Total	NE	NE	7,200	5,000	7,100	19,700	12,700	13,400	20,200	19,600	29,000
Zinc, Total	150,000	410,000	7,900	3,000	3,600	8,300	6,400	6,800	9,600	6,800	15,200

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TABLE 2-43

SUMMARY OF INORGANIC DETECTIONS IN SEDIMENT
AOC D (STATION LANDFILL)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	ERL Sediment Screening Value (ug/kg)	**ERM Sediment Screening Value** (ug/kg)	3SD13 10/28/95 0.00-1.00	3SD14 10/28/95 0.00-1.00	3SD15 10/28/95 0.00-1.00	3SD16 09/19/97 0.00-3.00	3SD17 09/19/97 0.00-3.00	7SD01 10/27/95 0.00-1.00	7SD02 10/27/95 0.00-1.00	7SD03 10/27/95 0.00-1.00	7SD04 10/27/95 0.00-1.00
Inorganics (ug/kg)											
Antimony, Total	NE	NE	5,300 UJ	2,700 UJ	3,400 UJ	310 J	400 J	2,500 UJ	3,300 UJ	2,800 UJ	2,700 UJ
Arsenic, Total	8,200	70,000	570	970 J	3,800 J	2,000 J	2,400 J	8,500	9,800	3,200	3,400
Barium, Total	NE	NE	6,600	15,000	16,900	7,800 J	7,100 J	11,100	14,000	7,500	8,100
Beryllium, Total	NE	NE	230 U	120 U	140 U	50 U	50 U	110 U	140 U	120 U	120 U
Cadmium, Total	1,200	9,600	480 U	240 U	300 U	110 J	70 U	220 U	300 U	860	250 U
Chromium, Total	81,000	370,000	6,800	19,800	18,800	5,800	3,300	15,900	15,200	7,900	5,500
Cobalt, Total	NE	NE	930	6,800	7,300	1,600	110 U	4,600	3,100	1,800	1,400
Copper, Total	34,000	270,000	11,400	38,400	25,700	7,800 J	710 J	34,100	21,500	7,400	5,000
Lead, Total	46,700	218,000	1,100	2,100	1,600	730	1,000	13,800	17,600	1,200	850
Mercury, Total	150	710	120 U	60 U	80 U	20 U	30 U	110 U	50 U	80 U	70 U
Nickel, Total	20,900	51,600	3,200	7,600	10,600	1,200 J	130 U	4,500	4,100	2,700	2,200
Selenium, Total	NE	NE	1,100 U	740 U	680 U	450 UJ	900 UJ	630 U	740 U	740 U	790 U
Silver, Total	1,000	3,700	660 U	340 U	420 U	90 U	100 U	300 U	410 U	340 U	630
Tin, Total	NE	NE	4,200	2,100 U	2,600 U	1,000 J	1,900 J	1,900 U	2,600 U	3,300	2,100 U
Vanadium, Total	NE	NE	12,200	66,900	40,200	19,300	3,600 J	63,100	44,500	32,300	17,700
Zinc, Total	150,000	410,000	10,300	29,800	16,700	6,000	1,700 J	35,900 J	32,700 J	8,300 J	5,100 J

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Notes:
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TABLE 2-43

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AOC D (STATION LANDFILL)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID Sample Date Depth Range (ft bgs)	ERL Sediment Screening Value (ug/kg)	**ERM Sediment Screening Value** (ug/kg)	Number Exceeding Sediment Screening Value ERL	Range Exceeding Sediment Screening Value ERL	**Number Exceeding Sediment Screening Value ERM**	**Range Exceeding Sediment Screening Value ERM**	Location Maximum Detect
Inorganics (ug/kg)							
Antimony, Total	NE	NE					1SD01
Arsenic, Total	8,200	70,000	2/33	8,500-9,800	0/33		7SD02
Barium, Total	NE	NE	NE		NE		2SD02
Beryllium, Total	NE	NE	NE		NE		1SD02
Cadmium, Total	1,200	9,600	3/33	1,500-4,700	0/33		1SD01
Chromium, Total	81,000	370,000	0/33		0/33		1SD01
Cobalt, Total	NE	NE	NE		NE		2SD03
Copper, Total	34,000	270,000	10/33	34,100-1,020,000	5/33	332,000-1,020,000	1SD01
Lead, Total	46,700	218,000	6/33	49,700-966,000	4/33	339,000-966,000	1SD02
Mercury, Total	150	710	4/33	200-2,700	3/33	800-2,700	2SD03
Nickel, Total	20,900	51,600	3/33	24,100-63,300	1/33	63,300	1SD01
Selenium, Total	NE	NE	NE		NE		3SD05
Silver, Total	1,000	3,700	0/33		0/33		7SD04
Tin, Total	NE	NE	NE		NE		1SD01
Vanadium, Total	NE	NE	NE		NE		1SD02
Zinc, Total	150,000	410,000	5/33	401,000-1,780,000	4/33	432,000-1,780,000	1SD01

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J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.
UJ - Not detected, quantitation limit may be inaccurate or imprecise.

Notes:
NE - Not established.

TABLE 2-44

SUMMARY OF POSITIVE DETECTIONS - TRIP BLANKS
SWMU 06/AOC B (FORMER BUILDING 25 SITE)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID	BTB01	BTB02
Sample Date	09/20/97	09/30/97
Volatiles (ug/l)		
Methylene chloride	5 U	10

Data Qualifiers:
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.

TABLE 2-45

SUMMARY OF POSITIVE DETECTIONS - QA/QC GROUNDWATER, ORGANIC COMPOUNDS
SWMU 10 (SUBSTATION 2 - BUILDING 90)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID	10ER01	10TB01
Sample Date	09/21/97	09/21/97
Volatiles (ug/l)		
Methylene chloride	6	5 U
Semivolatiles (ug/l)		
Bis(2-ethylhexyl)phthalate	140	NA
PCBs (ug/l)		

Data Qualifiers:
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.

Notes:
NA - Not analyzed.

TABLE 2-46

SUMMARY OF POSITIVE QA/QC DETECTIONS - ORGANIC COMPOUNDS
SWMU 13 (PEST CONTROL SHOP)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID	13ER01	13ER02	13ER03	13TB01	13TB02	13TB03a	13TB03b	13TB04
Sample Date	09/16/97	09/18/97	10/02/97	09/16/97	09/18/97	10/02/97	10/02/97	10/01/97
Volatiles (ug/l)								
Acetone	10 UJ	10 J	10 U	10 UJ	11 J	10 U	10 U	10 U
Methylene chloride	13	10	5 U	5 U	5 U	5 U	5 U	5 U
Semivolatiles (ug/l)								
Bis(2-ethylhexyl)phthalate	130	11	51	NA	NA	NA	NA	NA
Pesticides/PCBs (ug/l)								

Data Qualifiers:
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.
J - Analyte present. Reported value may not be accurate or precise.
UJ - Not detected, quantitation limit may be inaccurate or imprecise.

Notes:
NA - Not Analyzed.

TABLE 2-47

SUMMARY OF POSITIVE GROUNDWATER DETECTIONS - QA/QC RESULTS
AOC C (TRANSFORMER STORAGE PADS)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID	ACER01	ACER02
Sample Date	10/02/97	10/02/97
Volatiles (ug/l)		
Semivolatiles (ug/l)		
Bis(2-ethylhexyl)phthalate	46	16 U
PCBs (ug/l)		
TPH (ug/l)		
Inorganics (ug/l)		
Chromium, Total	1.6 J	1.6 J
Lead, Total	3.5	1.5 U
Nickel, Total	8.5 J	0.8 U
Silver, Total	2.1 J	0.6 U
Tin, Total	3.3 J	1.8 U
Zinc, Total	28.7	8.7 J

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.

TABLE 2-48

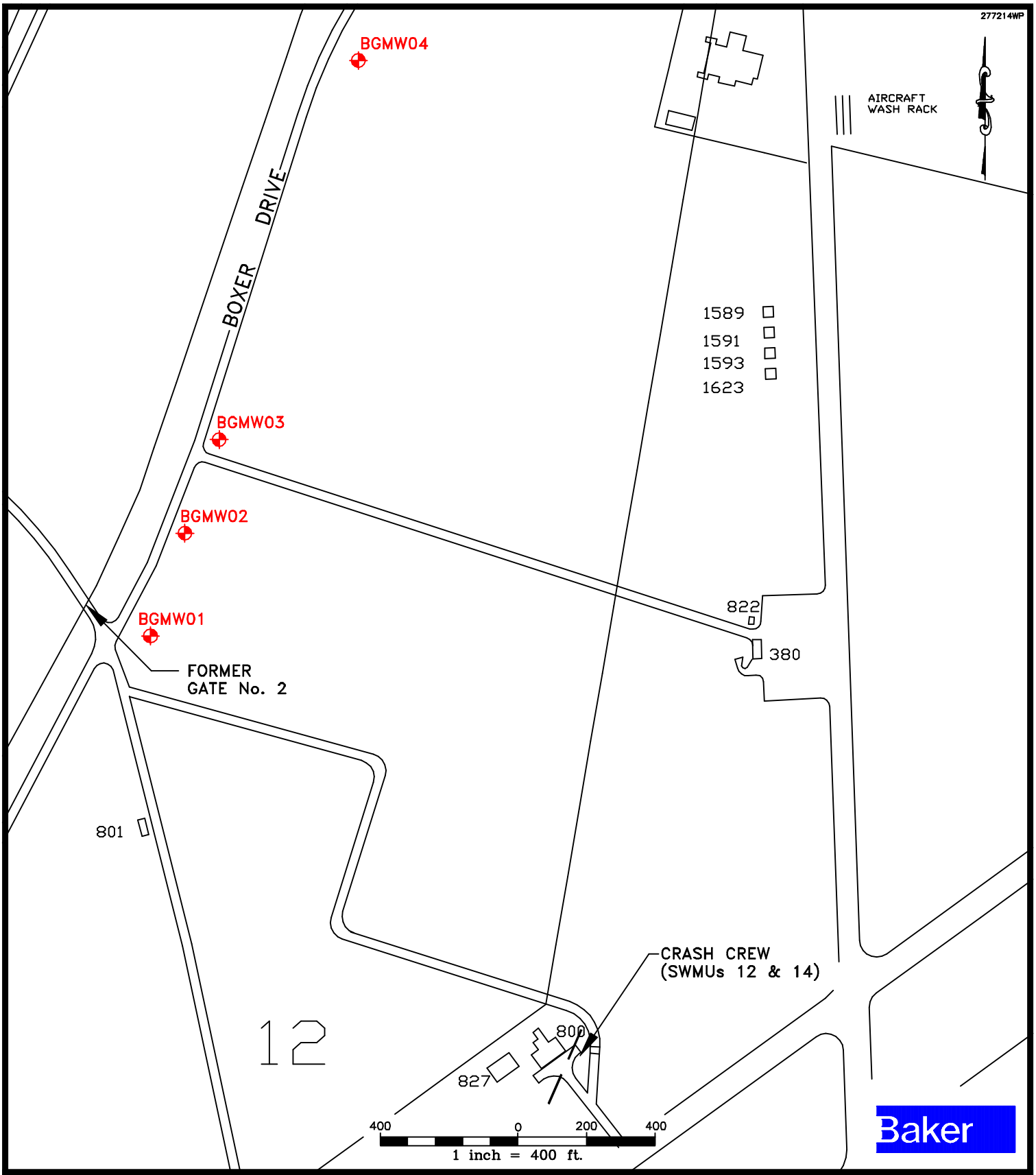
SUMMARY OF ANALYTICAL QA/QC RESULTS - ORGANICS
AOC D (STATION LANDFILL)
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO

Sample ID	3ER01	3TB01	FB01	TB01	Location Maximum
Sample Date	10/02/97	10/02/97	09/19/97	09/18/97	Detect
Volatiles (ug/kg)					
Acetone	10 U	10 U	20 J	10 UJ	FB01
Chloroform	5 U	5 U	160 J	5 UJ	FB01
Bromodichloromethane	5 U	5 U	13 J	5 U	FB01
Semivolatiles (ug/kg)					
Acetophenone	10 U	NA	2 J	NA	FB01
Bis(2-ethylhexyl)phthalate	1 J	NA	10 U	NA	3ER01
Phenol	10 U	NA	3 J	NA	FB01
Pesticides/PCBs (ug/kg)					
Dioxins (ug/kg)					
Chlorinated Herbicides (ug/kg)					
Explosives (ug/kg)					
Asbestos					
TPH (ug/kg)					
Gasoline Range Organics	NA	NA	25 J	NA	FB01
Inorganics (ug/kg)					
Barium, Total	0.3 U	NA	3.3 J	NA	FB01
Chromium, Total	2 J	NA	2.1 J	NA	FB01
Vanadium, Total	0.8 U	NA	1.7 J	NA	FB01
Zinc, Total	1.9 J	NA	10.7 J	NA	FB01

Data Qualifiers:
J - Analyte present. Reported value may not be accurate or precise.
U - Not detected. The associate number indicates the approximate sample concentration necessary to be detected.

Notes:
NA - Not Analyzed.

FIGURES



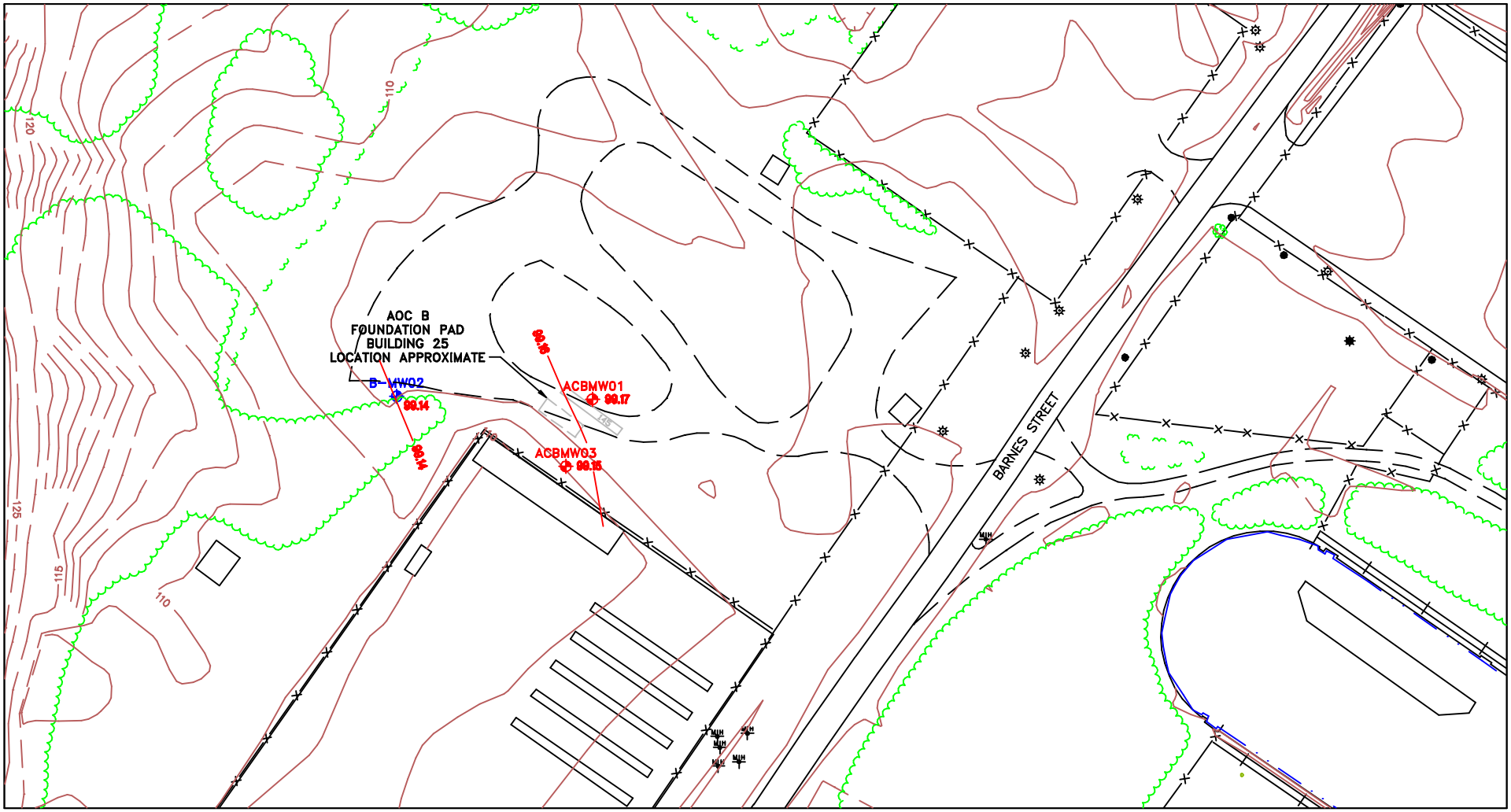
LEGEND

BGMW01 – BACKGROUND MONITORING WELL

FIGURE 2-1
BACKGROUND SAMPLE LOCATIONS
RCRA FACILITY INVESTIGATION

NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

277222WP



Baker
Baker Environmental, Inc.

LEGEND

- MONITORING WELL LOCATION (PHASE I RFI)
- MONITORING WELL LOCATION (PHASE II RFI)
- 99.16 — GROUNDWATER ELEVATION AND CONTOUR LINE

SOURCE: LANTDIV, FEB. 1992/1997

80 0 40 80
1 inch = 80 ft.

FIGURE 2-2
SWMU 6 AND AOC B SAMPLE LOCATION MAP
AND GROUNDWATER CONTOUR MAP
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

277199WP

AOC B
FOUNDATION PAD
BUILDING 25
LOCATION APPROXIMATE

B-MW02

ACBMW01

ACBMW03

Sample ID	BGW02-03
Sample Date	09/30/97
Inorganics (ug/kg)	
Antimony	180 J
Silver	200 J

Sample ID	BGW02-04
Sample Date	09/30/97
Inorganics (ug/kg)	
Chromium	270,000
Silver	180 J

BARNES STREET

120
110
125
115
110

Notes:
Exceeds 2 x Average Detected Background

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LEGEND

- MONITORING WELL LOCATION (PHASE I RFI)
- MONITORING WELL LOCATION (PHASE II RFI)

SOURCE: LANTDIV, FEB. 1992/1997

80 0 40 80
1 inch = 80 ft.

FIGURE 2-3
SUBSURFACE SOIL DETECTIONS ABOVE SCREENING CRITERIA
SWMU 6 AND AOC B
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

277220WP

AOC B
FOUNDATION PAD
BUILDING 25
LOCATION APPROXIMATE

B-MW02

ACBMW01

ACBMW03

Sample ID	BGW02
Sample Date	09/30/97
Inorganics Total (ug/l)	
Beryllium	1.1 J
Vanadium	269

Sample ID	ACBMW01
Sample Date	03/30/96
Inorganics Total (ug/l)	
Arsenic	5.8 J
Barium	2,210
Beryllium	5.9
Chromium	168
Copper	2,480
Nickel	199
Vanadium	790
Inorganics Soluble (ug/l)	
Beryllium	1.9

Sample ID	ACBMW03
Sample Date	03/30/96
Inorganics Total (ug/l)	
Arsenic	3.6
Lead	19.1 J
Vanadium	328
Inorganics Soluble (ug/l)	
Lead	17.5 J

BARNES STREET

Notes:
Exceeds Tap Water RBC
Exceeds Primary MCL
Exceeds Tap Water RBC and Primary MCL

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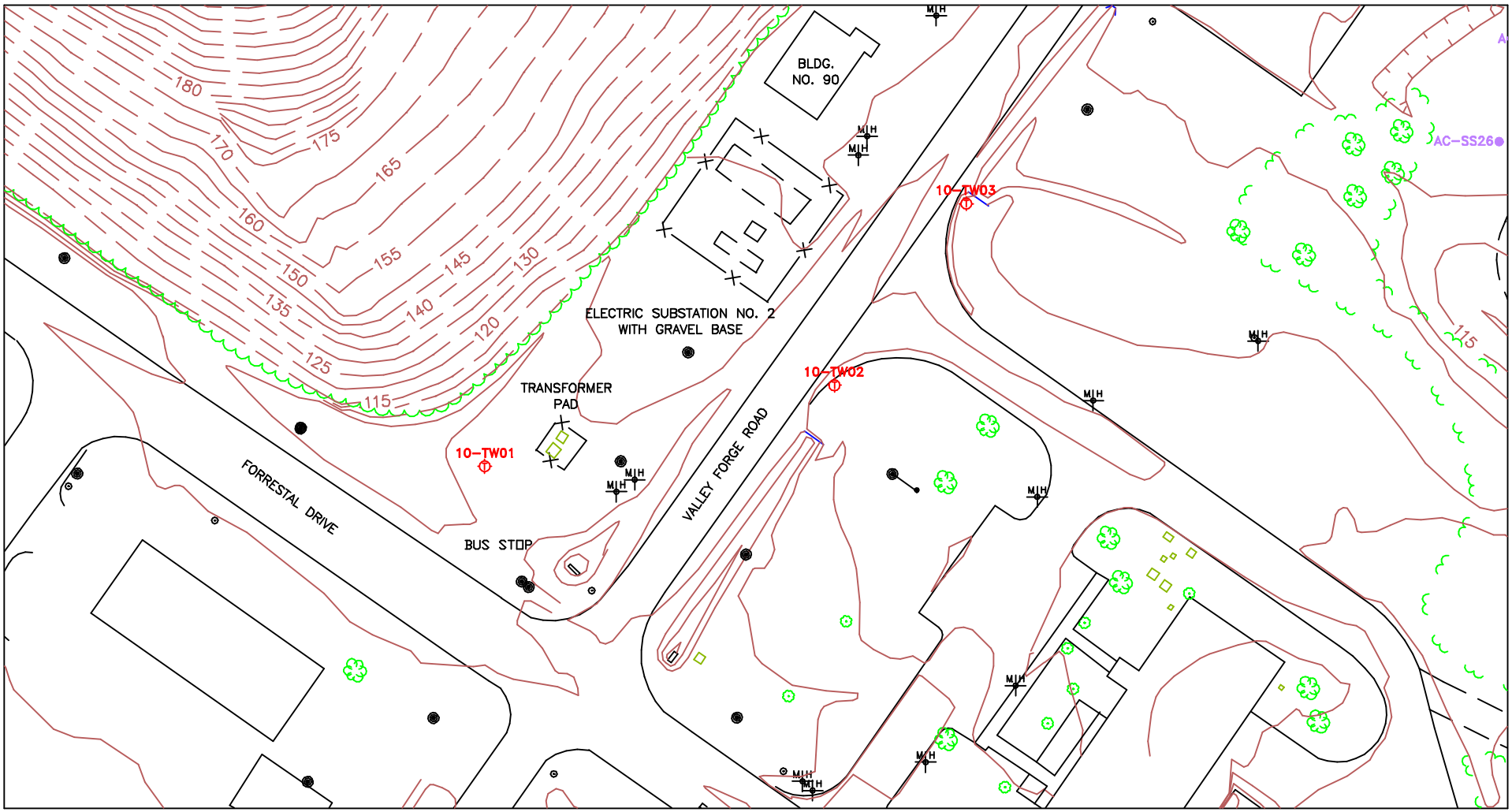
LEGEND
- MONITORING WELL LOCATION (PHASE I RFI)
- MONITORING WELL LOCATION (PHASE II RFI)

SOURCE: LANTDIV, FEB. 1992/1997

80 0 40 80
1 inch = 80 ft.

FIGURE 2-4
GROUNDWATER DETECTIONS ABOVE SCREENING CRITERIA
SWMU 6 AND AOC B
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

277191WP



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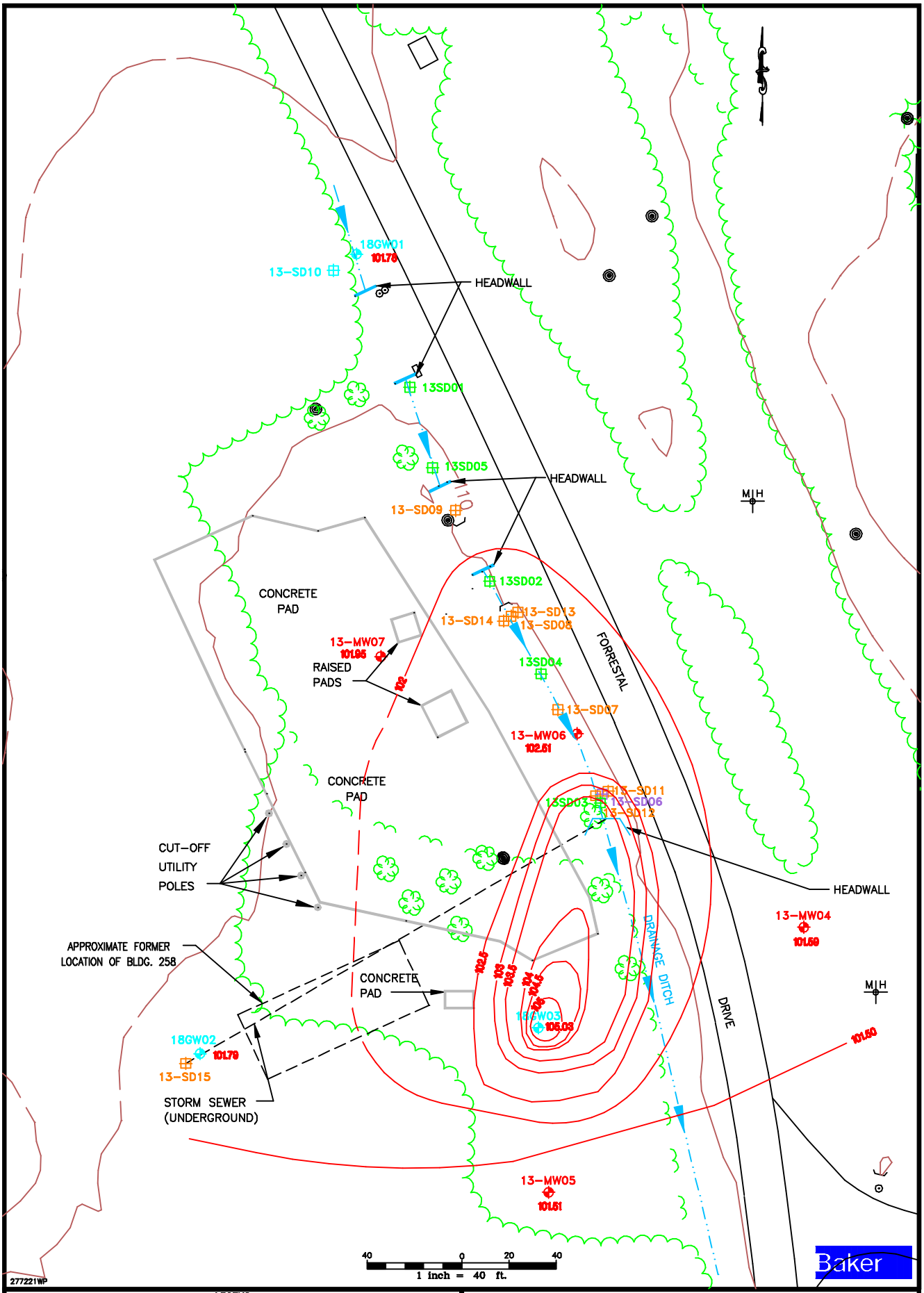
LEGEND

TEMPORARY MONITORING WELL (PHASE II RFI)
BUILDING OR STRUCTURE
115 SURFACE ELEVATION CONTOUR

SOURCE: LANTDIV, FEB. 1992/1997

50 0 25 50
1 inch = 50 ft.

FIGURE 2-5
SWMU 10 SAMPLE LOCATION MAP
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

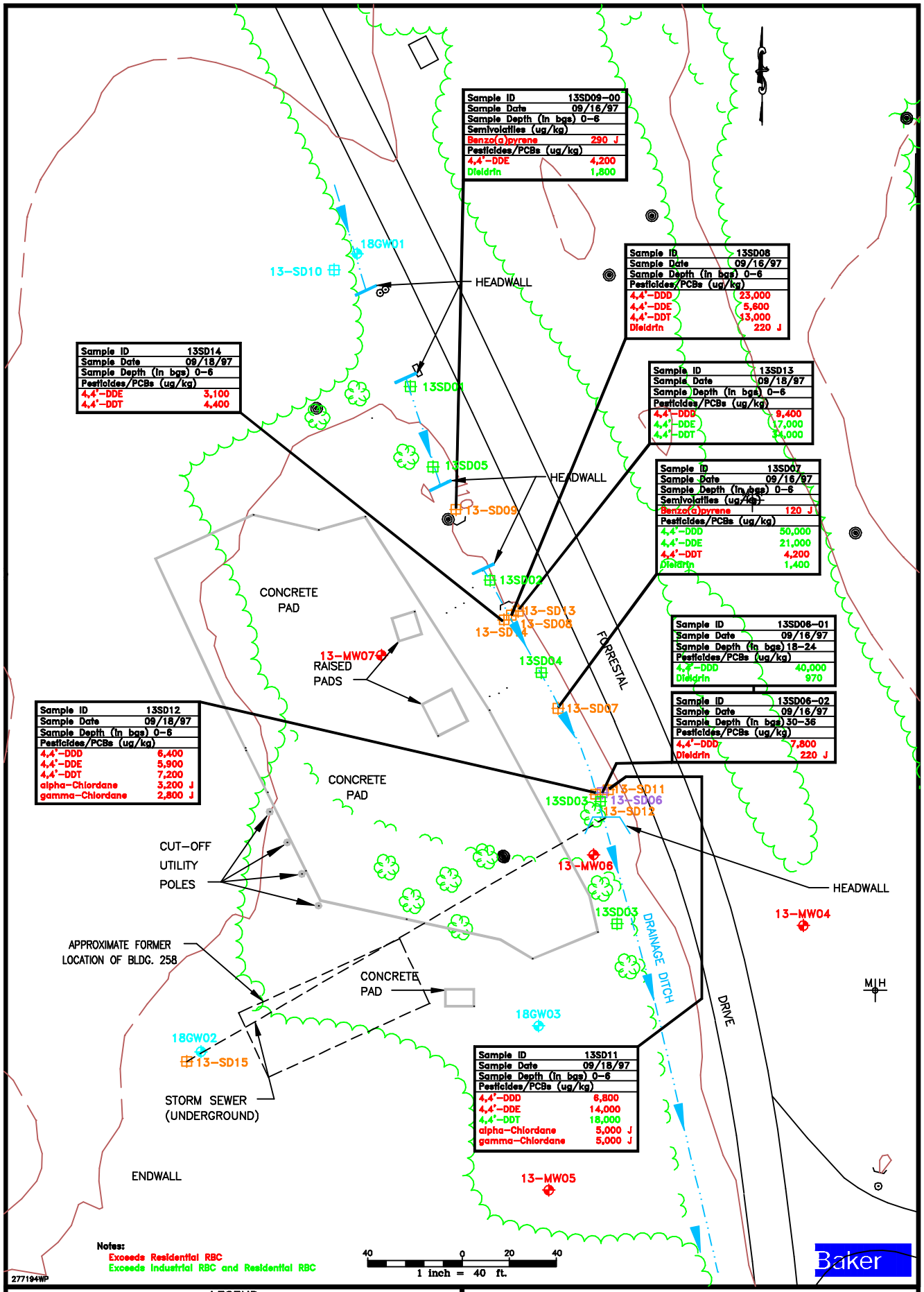


LEGEND

- EXISTING MONITORING WELL LOCATION (CONFIRMATION STUDY)
- PREVIOUS SEDIMENT SAMPLE LOCATION
- SEDIMENT SAMPLE LOCATION (PHASE II RFI)
- DEEP SEDIMENT SAMPLE LOCATION (PHASE II RFI)
- BACKGROUND SEDIMENT SAMPLE LOCATION (PHASE II RFI)
- MONITORING WELL LOCATION (PHASE II RFI)
- DRAINAGE DITCH/SURFACE DRAINAGE FLOW DIRECTION
- 99.18 GROUNDWATER ELEVATION AND CONTOUR LINE

SOURCE: LANDIV. FEB. 1992/1997.

FIGURE 2-6
SWMU 13 SAMPLE LOCATION MAP
AND GROUNDWATER CONTOUR MAP
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO



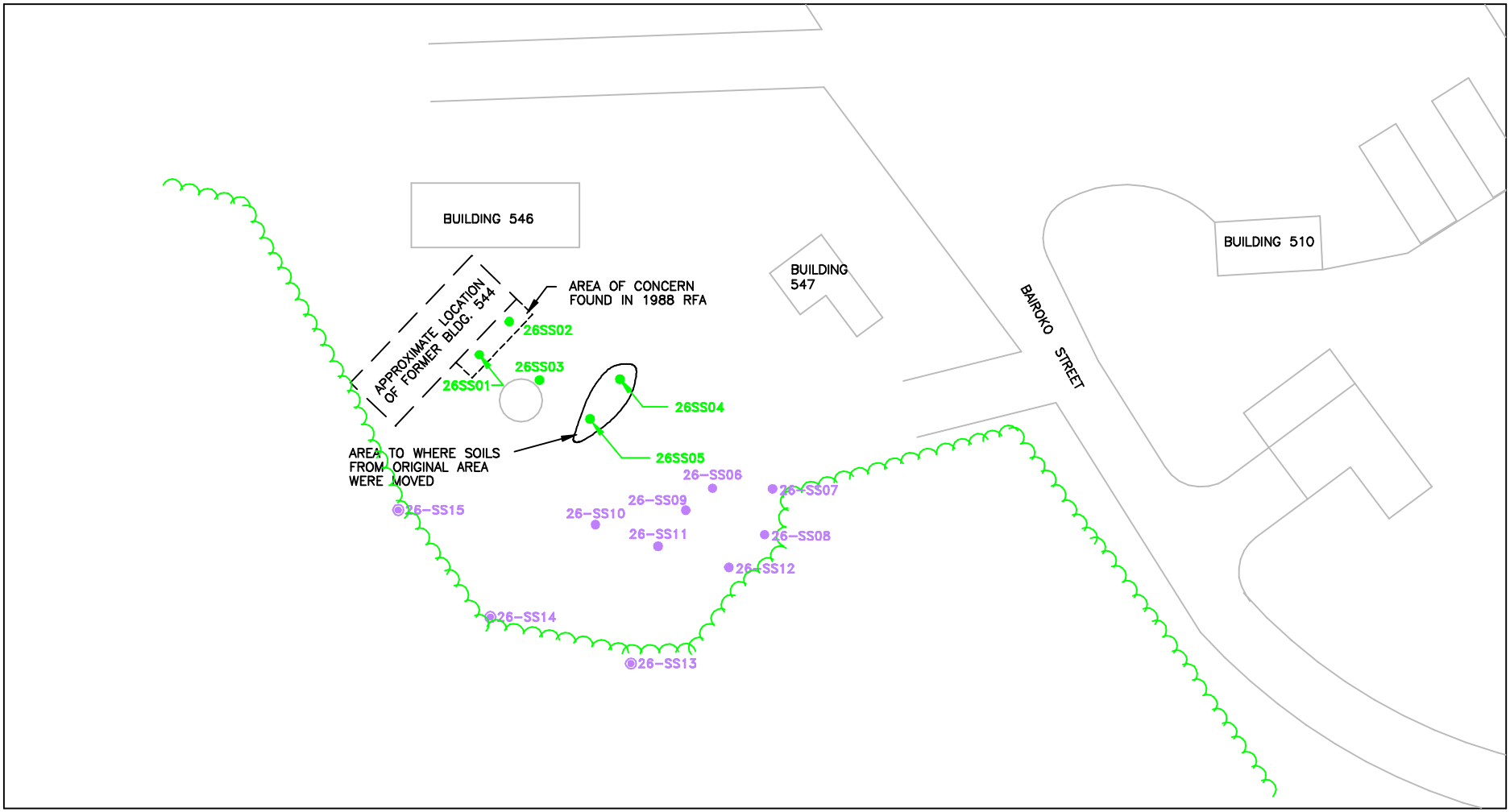
LEGEND

- EXISTING MONITORING WELL LOCATION (CONFIRMATION STUDY)
- PREVIOUS SEDIMENT SAMPLE LOCATION
- SEDIMENT SAMPLE LOCATION (PHASE II RFI)
- DEEP SEDIMENT SAMPLE LOCATION (PHASE II RFI)
- BACKGROUND SEDIMENT SAMPLE LOCATION (PHASE II RFI)
- MONITORING WELL LOCATION (PHASE II RFI)
- DRAINAGE DITCH/SURFACE DRAINAGE FLOW DIRECTION

SOURCE: LANTDIV, FEB. 1992/1997

FIGURE 2-7
SEDIMENT DETECTIONS ABOVE SCREENING CRITERIA
SWMU 13
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

277217WP



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LEGEND

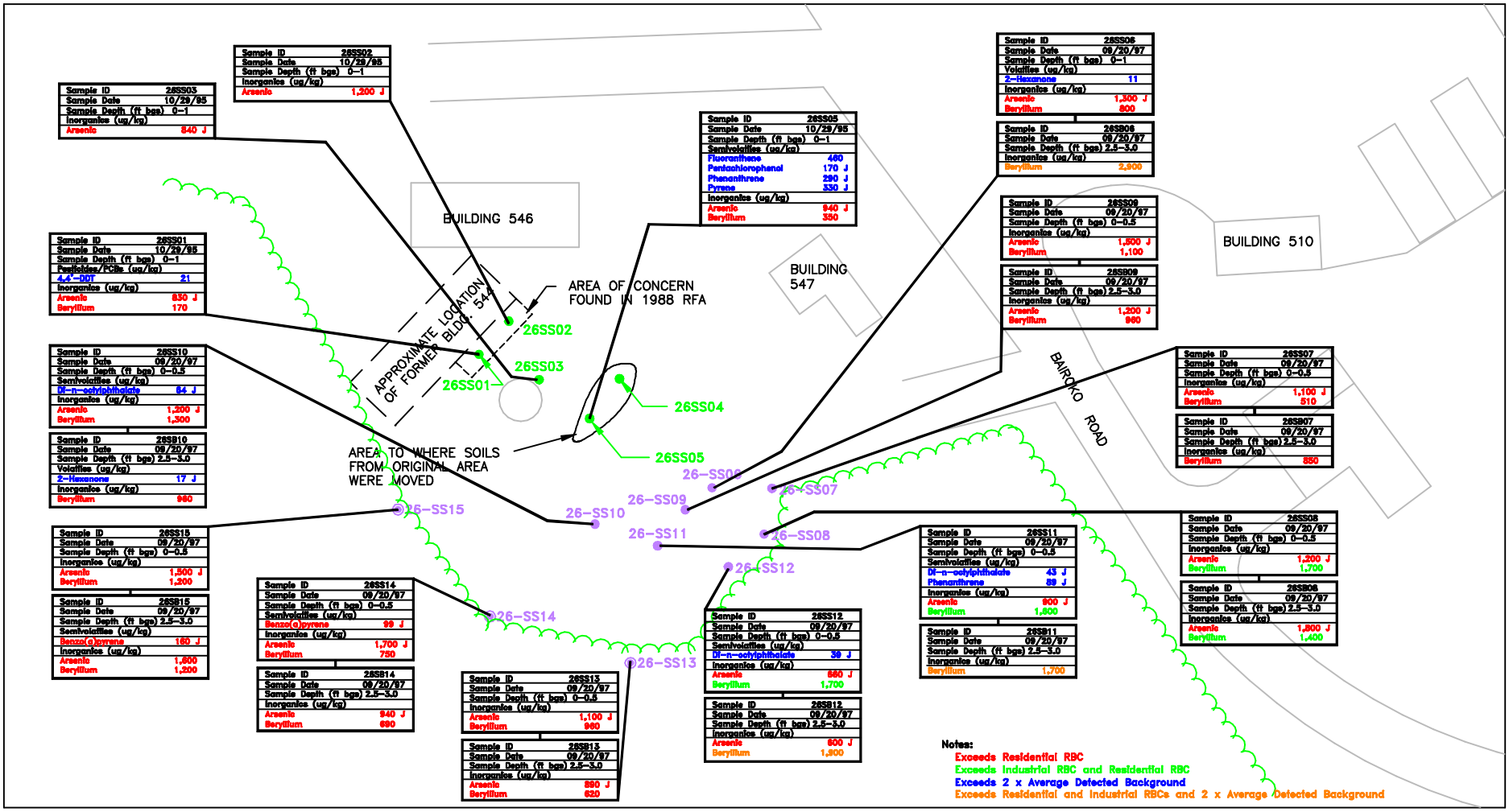
- PHASE I RFI SAMPLING LOCATION
- 110 SURFACE ELEVATION CONTOURS
- PHASE II RFI SAMPLING LOCATION
- BACKGROUND SAMPLING LOCATION

SOURCE: LANTDIV, FEB. 1992/1997

50 0 25 50
1 inch = 50 ft.

FIGURE 2-8
SWMU 26 SAMPLE LOCATION MAP
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

277187WP



Baker
Baker Environmental, Inc.

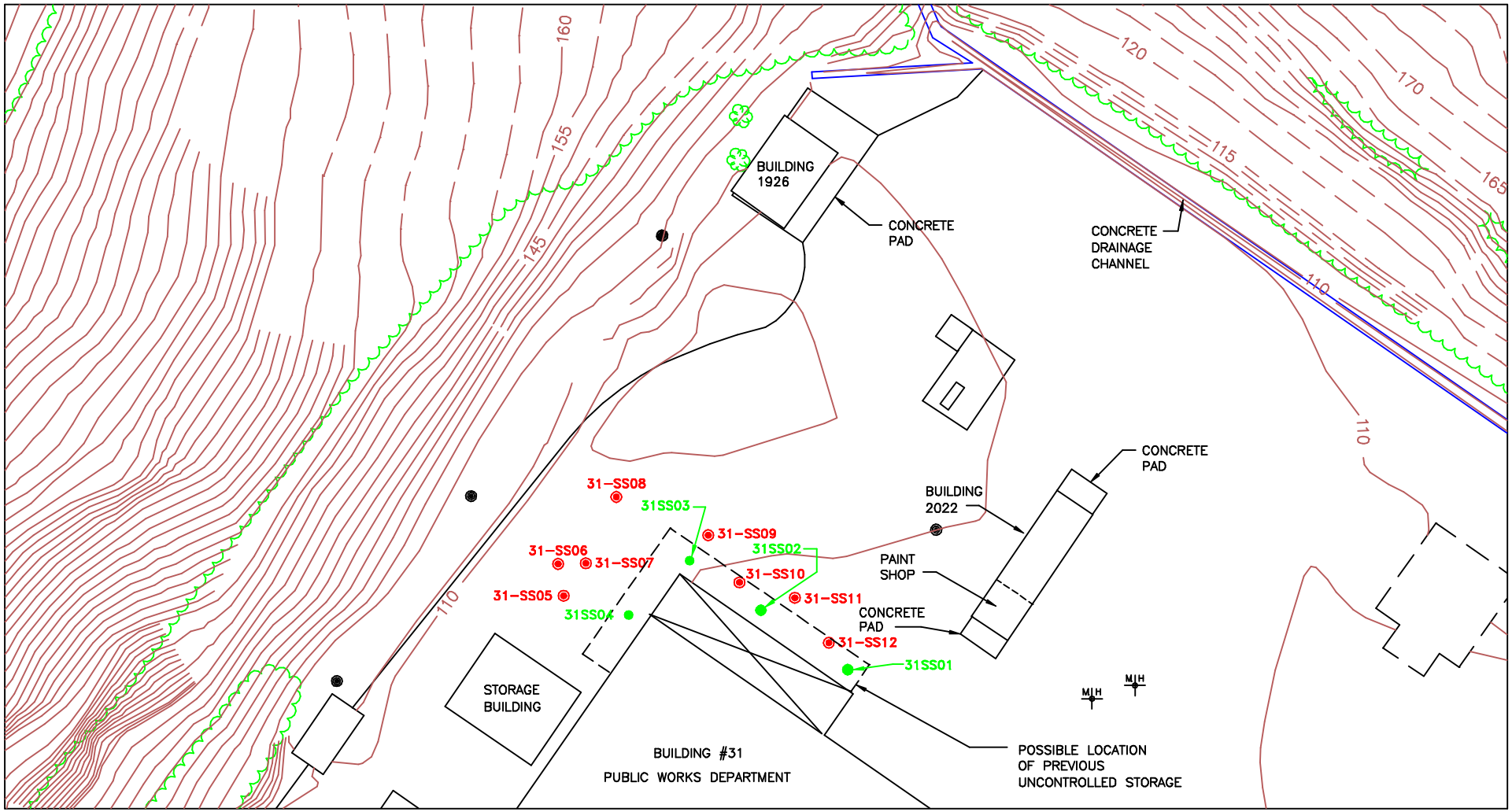
LEGEND

- PHASE I RFI SAMPLING LOCATION
- 110 SURFACE ELEVATION CONTOURS
- PHASE II RFI SAMPLING LOCATION
- BACKGROUND SAMPLING LOCATION

SOURCE: LANTDIV, FEB. 1992/1997

50 0 25 50
1 inch = 50 ft.

FIGURE 2-9
SURFACE AND SUBSURFACE SOIL DETECTIONS ABOVE SCREENING CRITERIA – SWMU 26
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO



Baker
Baker Environmental, Inc.

LEGEND

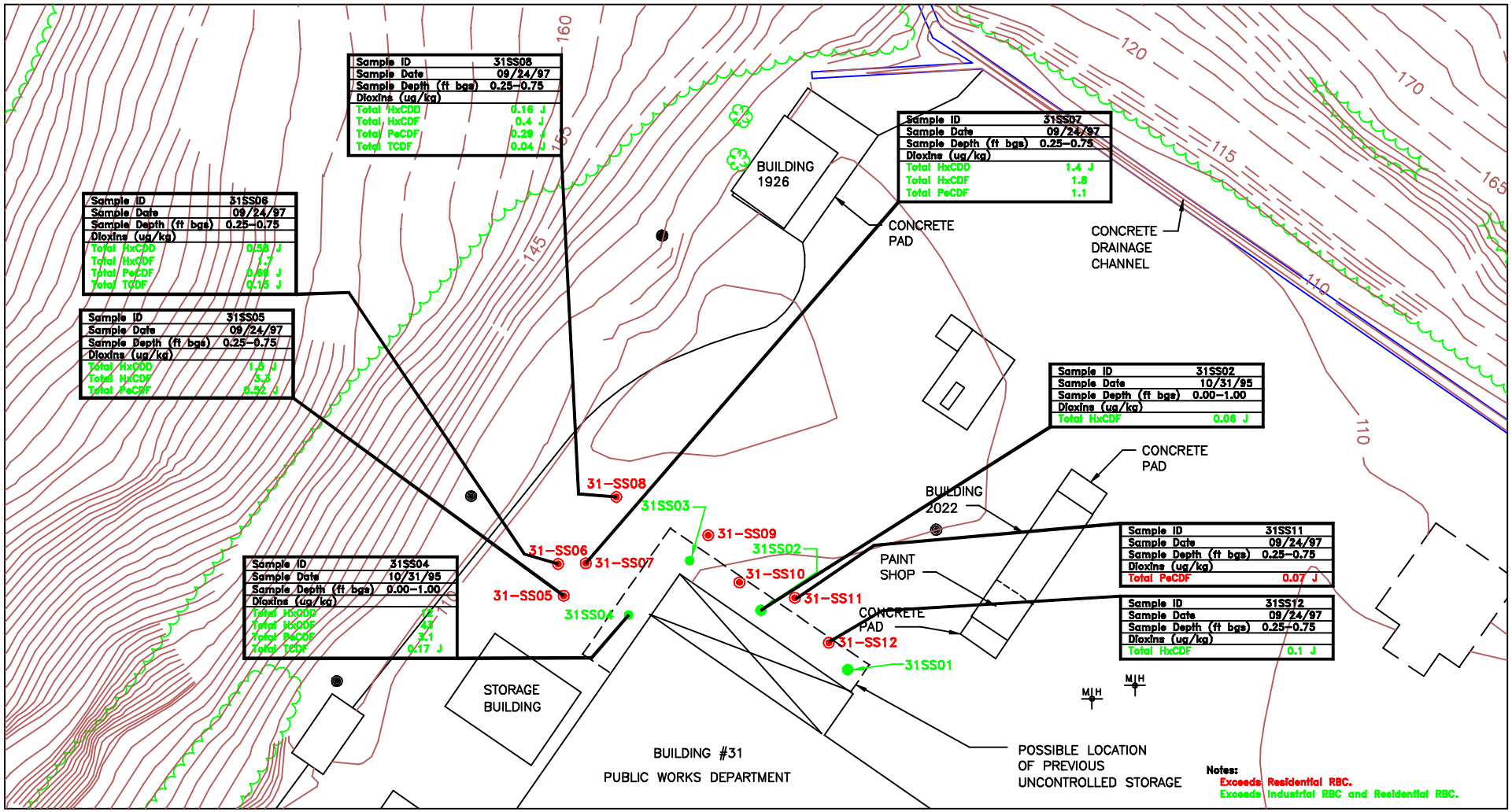
- PREVIOUS SOIL SAMPLING LOCATION (PHASE I RFI)
- SURFACE SOIL SAMPLING LOCATION (PHASE II RFI)
- 110 SURFACE ELEVATION CONTOUR

SOURCE: LANTDIV, FEB. 1992/1997

50 0 25 50
1 inch = 50 ft.

FIGURE 2–10
SWMU 31/32 SAMPLE LOCATION MAP
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

277198WP



Sample ID	31SS08
Sample Date	09/24/97
Sample Depth (ft bgs)	0.25–0.75
Dioxins (ug/kg)	
Total HxCDD	0.16 J
Total HxCDF	0.4 J
Total PeCDF	0.29 J
Total TCDF	0.04 J

Sample ID	31SS07
Sample Date	09/24/97
Sample Depth (ft bgs)	0.25–0.75
Dioxins (ug/kg)	
Total HxCDD	1.4 J
Total HxCDF	1.8
Total PeCDF	1.1

Sample ID	31SS06
Sample Date	09/24/97
Sample Depth (ft bgs)	0.25–0.75
Dioxins (ug/kg)	
Total HxCDD	0.58 J
Total HxCDF	1.7
Total PeCDF	0.69 J
Total TCDF	0.15 J

Sample ID	31SS05
Sample Date	09/24/97
Sample Depth (ft bgs)	0.25–0.75
Dioxins (ug/kg)	
Total HxCDD	1.5 J
Total HxCDF	3.3
Total PeCDF	0.52 J

Sample ID	31SS02
Sample Date	10/31/95
Sample Depth (ft bgs)	0.00–1.00
Dioxins (ug/kg)	
Total HxCDF	0.06 J

Sample ID	31SS11
Sample Date	09/24/97
Sample Depth (ft bgs)	0.25–0.75
Dioxins (ug/kg)	
Total PeCDF	0.07 J

Sample ID	31SS12
Sample Date	09/24/97
Sample Depth (ft bgs)	0.25–0.75
Dioxins (ug/kg)	
Total HxCDF	0.1 J

Sample ID	31SS04
Sample Date	10/31/95
Sample Depth (ft bgs)	0.00–1.00
Dioxins (ug/kg)	
Total HxCDD	12
Total HxCDF	43
Total PeCDF	3.1
Total TCDF	0.17 J

Notes:
Exceeds Residential RBC.
Exceeds Industrial RBC and Residential RBC.

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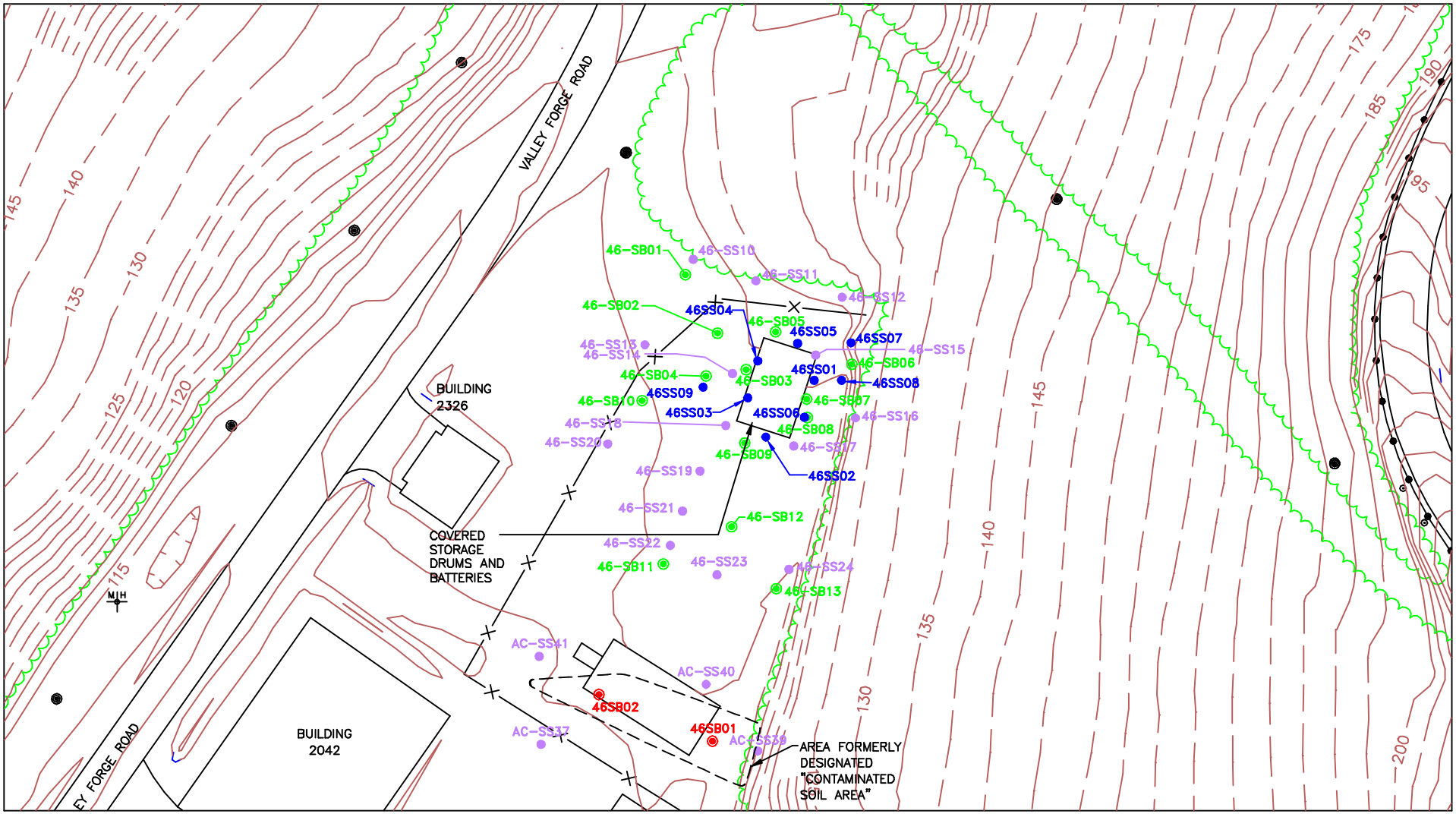
LEGEND

- PREVIOUS SOIL SAMPLING LOCATION (PHASE I RFI)
- SURFACE SOIL SAMPLING LOCATION (PHASE II RFI)
- 110 SURFACE ELEVATION CONTOUR

SOURCE: LANTDIV, FEB. 1992/1997

50 0 25 50
1 inch = 50 ft.

FIGURE 2-11
SOIL DETECTIONS ABOVE SCREENING CRITERIA
SWMU 31/32
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO



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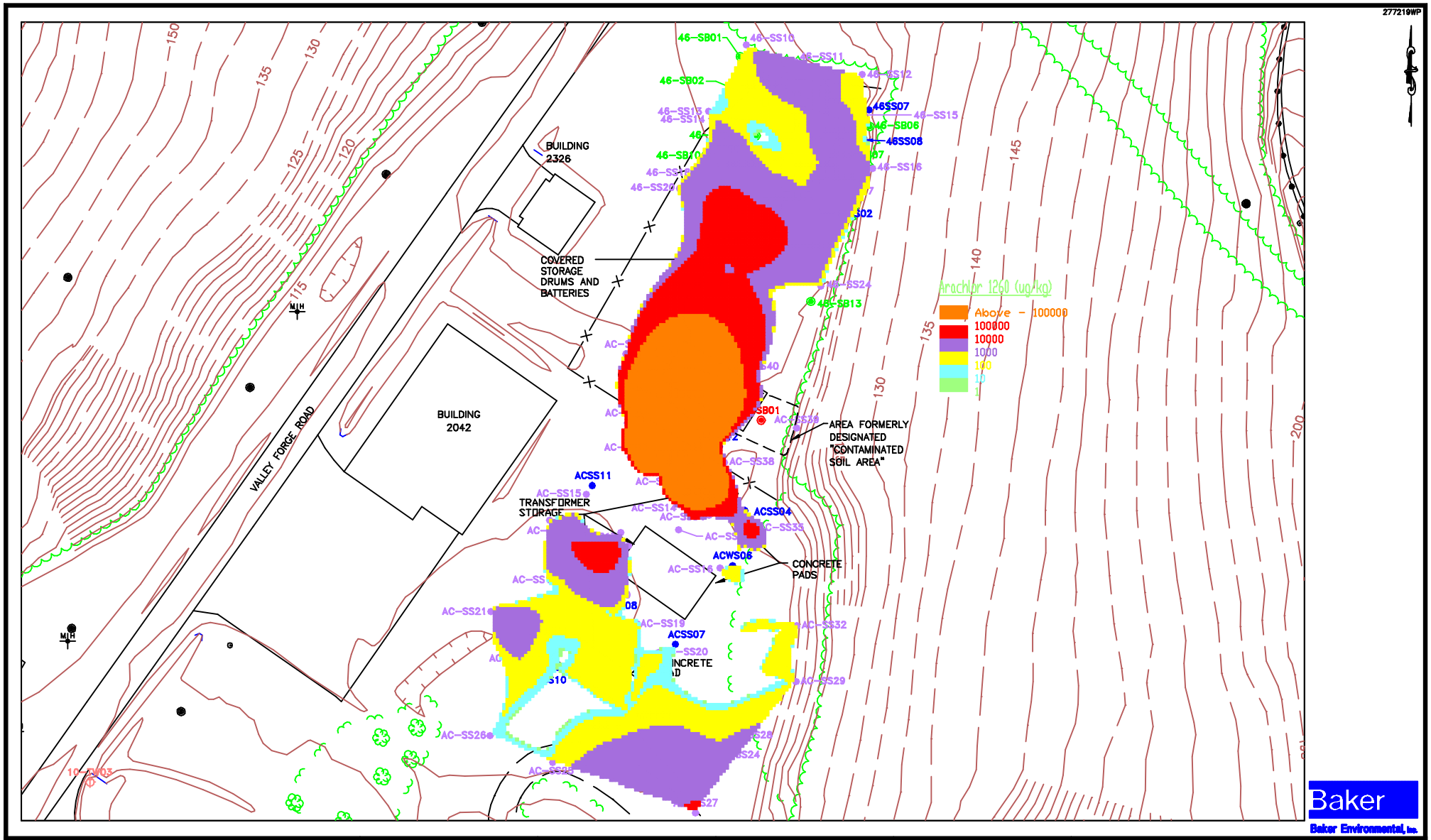
LEGEND

- SOIL BORING LOCATIONS (PHASE I RFI)
- SOIL SAMPLING LOCATIONS (PHASE I RFI)
- SURFACE SOIL SAMPLING LOCATIONS (PHASE II RFI)
- SUBSURFACE SOIL SAMPLING LOCATION (PHASE II RFI)
- 115 SURFACE ELEVATION CONTOUR

SOURCE: LANTDIV, FEB. 1992/1997

50 0 25 50
1 inch = 50 ft.

FIGURE 2-12
SWMU 46 SAMPLE LOCATION MAP
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO



Baker
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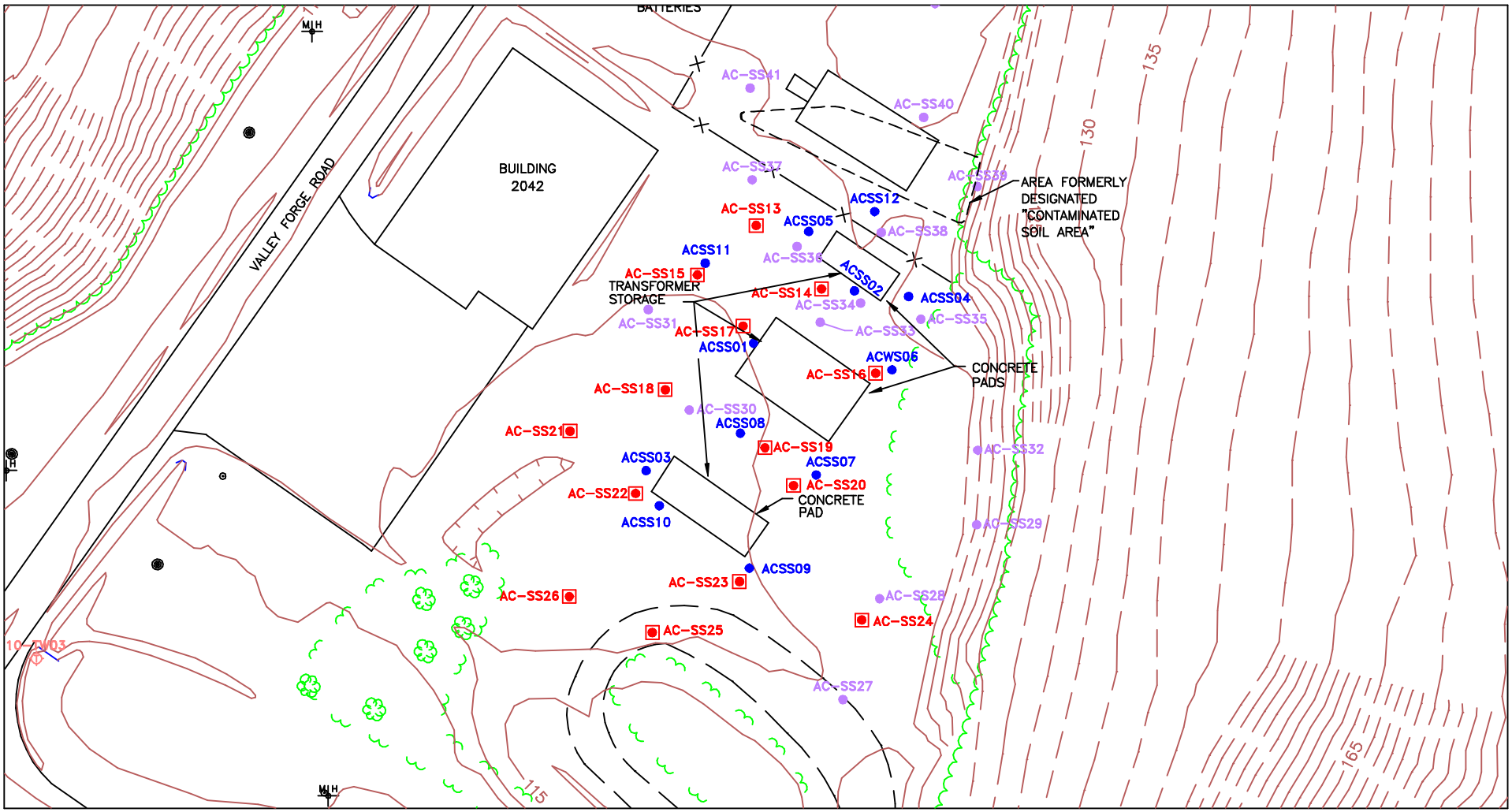
LEGEND

- SOIL BORING LOCATIONS (PHASE I RFI)
- SOIL SAMPLING LOCATIONS (PHASE I RFI)
- SURFACE SOIL SAMPLING LOCATIONS (PHASE II RFI)
- SUBSURFACE SOIL SAMPLING LOCATION (PHASE II RFI)
- 115 SURFACE ELEVATION CONTOUR

SOURCE: LANTDIV, FEB. 1992/1997

60 0 30 60
1 inch = 60 ft.

FIGURE 2-13
AROCLOR 1260 ISOCONCENTRATION MAP
SWMU 46 AND AOC C
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO



Baker
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LEGEND

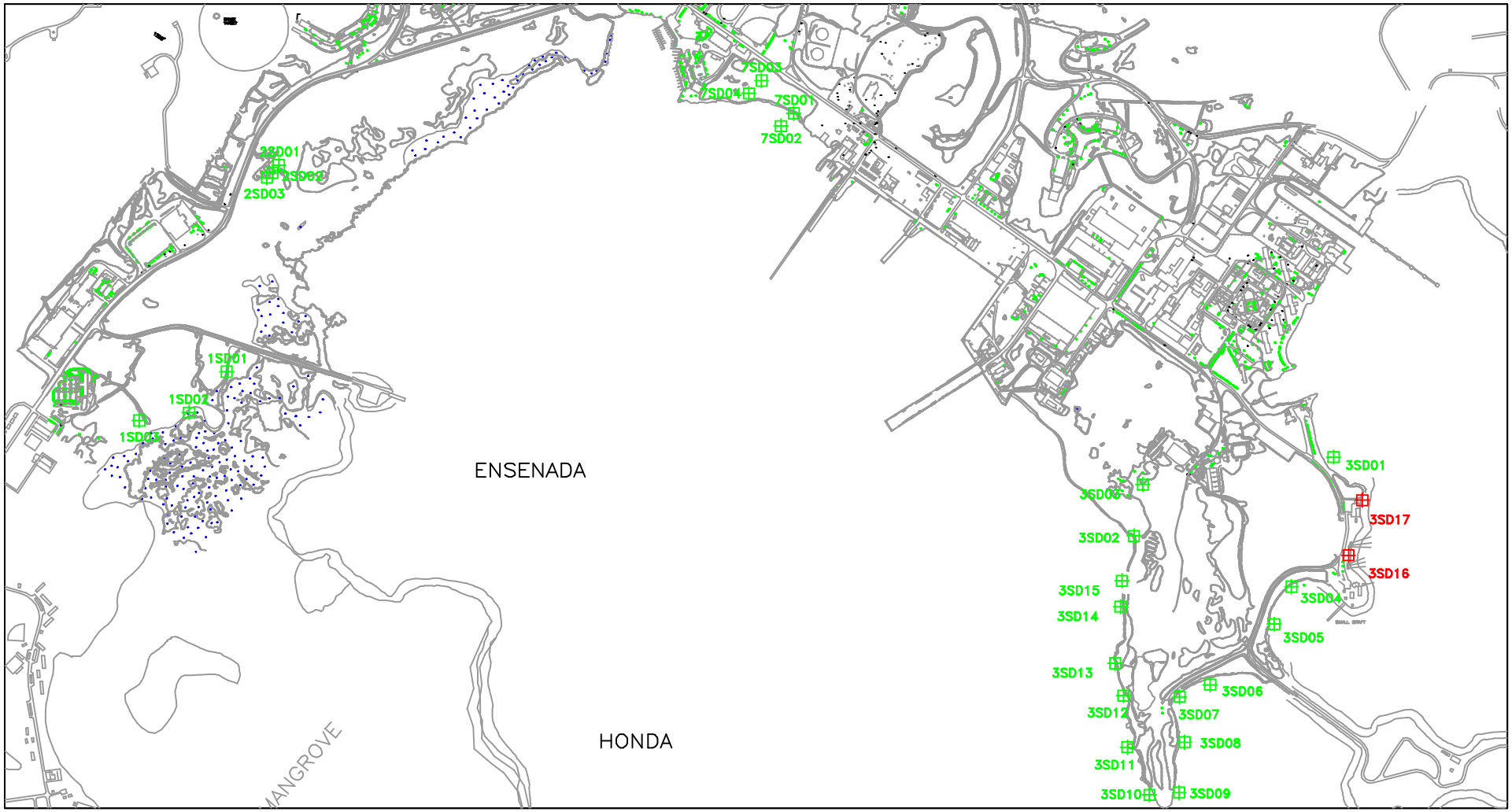
- SURFACE SOIL SAMPLING LOCATIONS (PHASE I RFI)
- SURFACE SOIL SAMPLING LOCATIONS (PHASE II RFI)
- SURFACE AND SUBSURFACE SOIL SAMPLING LOCATIONS (PHASE II RFI)
- 115 SURFACE ELEVATION CONTOUR

SOURCE: LANTDIV, FEB. 1992/1997

50 0 25 50
1 inch = 50 ft.

FIGURE 2-14
AOC C SAMPLE LOCATION MAP
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

277213WP



Baker
Baker Environmental, Inc.

LEGEND

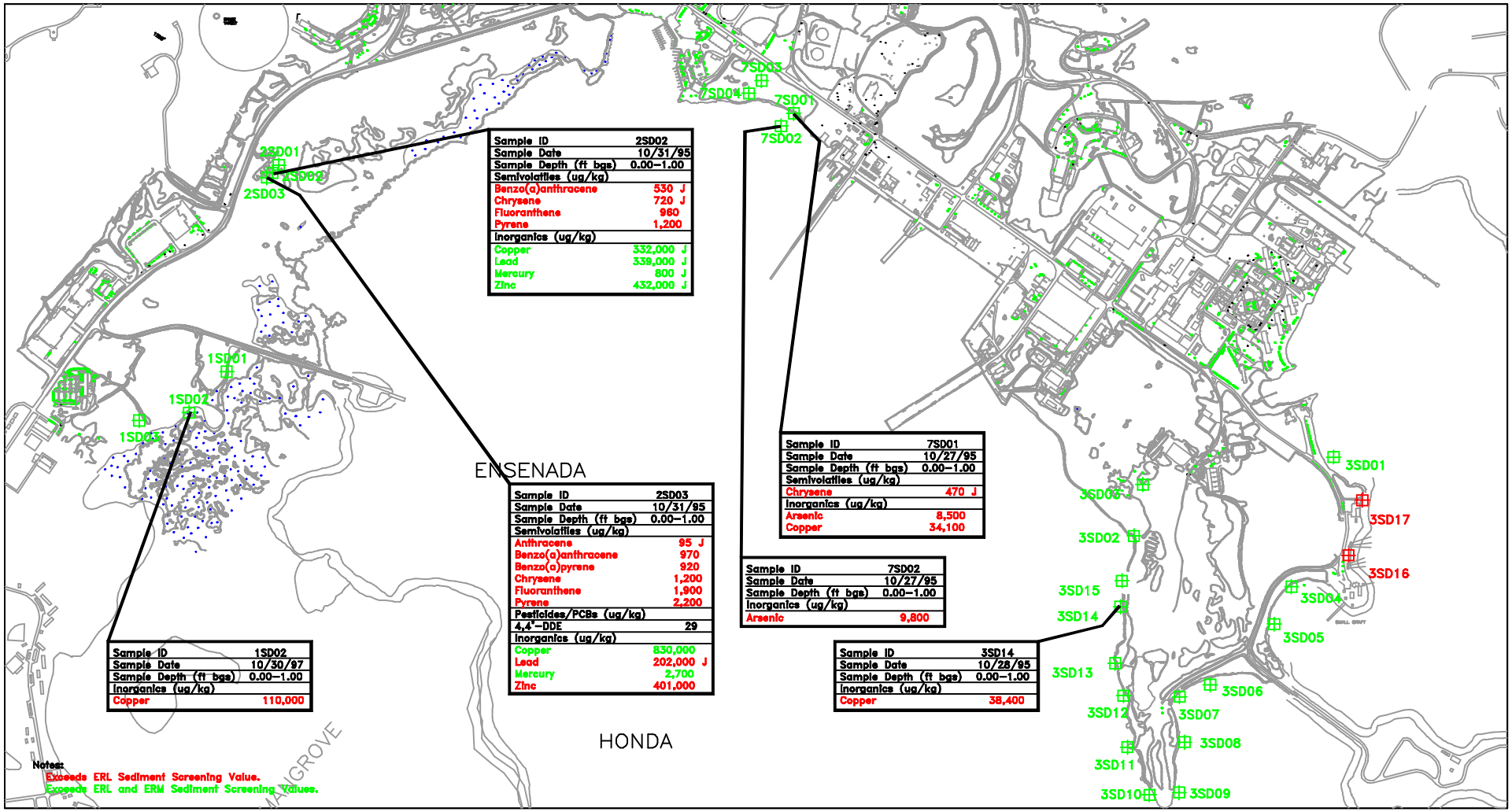
⊞ – SEDIMENT SAMPLE LOCATION (PHASE I RFI)
⊞ – SEDIMENT SAMPLE LOCATION (PHASE II RFI)

SOURCE: LANTDIV, FEB. 1992/1997

1200 0 600 1200
1 inch = 1200 ft.

FIGURE 2–15
AOC D SAMPLE LOCATION MAP
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

277212WP



Sample ID	2SD02
Sample Date	10/31/95
Sample Depth (ft bgs)	0.00–1.00
Semivolatiles (ug/kg)	
Benzo(a)anthracene	530 J
Chrysene	720 J
Fluoranthene	960
Pyrene	1,200
Inorganics (ug/kg)	
Copper	332,000 J
Lead	339,000 J
Mercury	800 J
Zinc	432,000 J

Sample ID	2SD03
Sample Date	10/31/95
Sample Depth (ft bgs)	0.00–1.00
Semivolatiles (ug/kg)	
Anthracene	95 J
Benzo(a)anthracene	970
Benzo(a)pyrene	920
Chrysene	1,200
Fluoranthene	1,900
Pyrene	2,200
Pesticides/PCBs (ug/kg)	
4,4'-DDE	29
Inorganics (ug/kg)	
Copper	830,000
Lead	202,000 J
Mercury	2,700
Zinc	401,000

Sample ID	1SD02
Sample Date	10/30/97
Sample Depth (ft bgs)	0.00–1.00
Inorganics (ug/kg)	
Copper	110,000

Sample ID	7SD01
Sample Date	10/27/95
Sample Depth (ft bgs)	0.00–1.00
Semivolatiles (ug/kg)	
Chrysene	470 J
Inorganics (ug/kg)	
Arsenic	8,500
Copper	34,100

Sample ID	7SD02
Sample Date	10/27/95
Sample Depth (ft bgs)	0.00–1.00
Inorganics (ug/kg)	
Arsenic	9,800

Sample ID	3SD14
Sample Date	10/28/95
Sample Depth (ft bgs)	0.00–1.00
Inorganics (ug/kg)	
Copper	38,400

Notes:
Exceeds ERL Sediment Screening Value.
Exceeds ERL and ERM Sediment Screening Values.

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LEGEND

⊞ – SEDIMENT SAMPLE LOCATION (PHASE I RFI)
⊞ – SEDIMENT SAMPLE LOCATION (PHASE II RFI)

1200 0 600 1200
1 inch = 1200 ft.

FIGURE 2–16
SEDIMENT DETECTIONS ABOVE SCREENING CRITERIA – AOC D
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

SOURCE: LANTDIV, FEB. 1992/1997

3.0 BASELINE RISK ASSESSMENT

A baseline human health risk assessment (RA) was performed, as part of the additional investigations conducted at OUs 1, 6, and 7 at NSRR, Puerto Rico. This RA focused on the evaluation of data acquired for SWMU 6/AOC B, AOC C and SWMUs 26, 31, 46, and 13 in those operable units during the Phase II (1997) investigation, as they supplemented those acquired during the Phase I investigations (1995 and 1996). Data acquired for these SWMUs/AOCs during the Phase I investigations were evaluated in a Health and Environmental Assessment that was conducted as part of a previous RFI report and addendum prepared for OUs 1, 6 and 7 (Baker, 1997b). The purpose of the baseline RA is to evaluate the potential risks associated with exposure to environmental media resulting from existing conditions at the site if no additional remedial action is undertaken. The baseline RA considers the most likely routes of potential human exposure for both current and future risk scenarios and was conducted in accordance with the following documentation: Interim Final RCRA Facility Investigation Guidance, Volume I of IV: Development of an RFI Work Plan and General Considerations for the RCRA Facility Investigations, May 1989 (USEPA, 1989c); Risk Assessment Guidance for Superfund (RAGS), Volume I. Human Health Evaluation Manual (Part A), Interim Final, December 1989 (USEPA, 1989b); Selecting Exposure Routes and Contaminants of Concern, by Risk-Based Screening (SCCRBS), dated January 1993 (USEPA, 1993) and the USEPA Region III Risk-Based Concentration Table, March 1997 (USEPA, 1997a).

This baseline RA is comprised of seven sections: Section 3.1 presents the selection of COPCs; Sections 3.2 and 3.3 present the exposure assessment and toxicity assessment, respectively; the risk characterization is presented in Section 3.4; Section 3.5 presents sources of uncertainty inherent in the estimation of inferential potential human health effects; and a summary of the baseline RA is provided in Section 3.6.

3.1 Identification of Chemicals of Potential Concern

The selection of COPCs was based primarily on comparisons of analytical results acquired for OUs 1, 6, and 7, i.e., detected sample concentrations, with appropriate human health-based standards and criteria. In addition, the prevalence of each detected chemical was also used as a selection criterion. An exceedence of a standard/criterion by a chemical concentration resulted in

the consideration of that chemical as a COPC in the given medium and SWMU/AOC for further quantitative risk evaluation in this baseline RA. A more detailed discussion of COPC selection criteria is provided in the following section. The environmental media investigated at OUs 1, 6, and 7 include surface (0 - 1 foot bgs) and subsurface (deeper than 1 foot bgs) soil, groundwater, and sediment. A discussion of laboratory analytical results associated with these media is presented in Section 5.0 of this report.

3.1.1 COPC Selection Criteria

The primary criterion used in selecting a chemical as a COPC at OUs 1, 6, and 7 included comparing the maximum detected soil, groundwater, and sediment concentrations to corresponding risk-based USEPA Region III chemicals of concern (COC) screening values, as presented in the Region III COC Screening Table (USEPA, 1994a), in accordance with USEPA Region III SCCRBS guidance (USEPA, 1993). In addition, in the absence of COC screening values, detected groundwater concentrations were also compared with corresponding USEPA Federal Safe Drinking Water Act maximum contaminant levels (MCLs). Sediment concentrations were compared with corresponding industrial and residential soil COC screening values. It is important to note that the comparison criteria/standards do not necessarily represent clean-up target levels that must be achieved through the implementation of corrective measures, but rather, they establish presumptive levels that indicate whether or not a closer examination of a particular SWMU/AOC is necessary.

In conjunction with concentration comparisons to the USEPA Region III COC screening values, a comparison to concentrations detected in field and laboratory blanks was conducted, to ensure that only site-related contaminants were evaluated in the quantitative estimation of human health effects. The prevalence of a chemical detected in a given environmental medium, as well as the history of site-related activities were other important criteria applied in selecting COPCs at OUs 1, 6, and 7. Each of the aforementioned selection criteria is discussed in the paragraphs that follow.

USEPA Region III COC Screening Concentrations - Risk-Based COC Screening Concentrations (COC screening concentrations) were derived by USEPA Region III in January of 1993, and provided in tabular format to support selection of COPCs and address two major limitations in the COPC selection process presented in RAGS. First, using COC screening concentrations prioritizes

chemical toxicity and focuses the risk assessment on those COPCs and potential exposure routes. Second, using the COC screening concentrations provides an absolute comparison of potential risks associated with the presence of a COPC in a given medium.

The principle of using risk-based criteria such as COC screening values is consistent with methodologies described in Interim Final RCRA Facility Investigation Guidance, Volume I of IV: Development of an RFI Work Plan and General Considerations for the RCRA Facility Investigations, May 1989 (USEPA, 1989c). COC screening concentrations were derived using conservative, USEPA-promulgated, default values and the most recent toxicological criteria available. COC screening concentrations for potentially carcinogenic and noncarcinogenic chemicals were individually derived based on a target incremental lifetime cancer risk (ILCR) of 1×10^{-6} and a target hazard quotient (HQ) of 0.1, respectively. An HQ of 0.1, rather than 1.0, is targeted for derivation of noncarcinogenic COC screening values for protection from cumulative effects of multiple chemical exposures. For potential carcinogens, the toxicity criteria applicable to the derivation of COC screening concentrations are chronic oral and inhalation cancer slope factors; for noncarcinogens, they are oral and inhalation reference doses. These toxicity criteria are subject to change as more updated information and results from the most recent toxicological/epidemiological studies become available. Therefore, the use of toxicity criteria in the derivation of COC screening concentrations requires that the screening concentrations be updated periodically to reflect changes in the toxicity criteria.

In March of 1994, the USEPA Region III published a second COC Screening Table which was also based on an ICR of 1×10^{-6} and a target HQ of 0.1. Subsequent semi-annual publications of the table (i.e., Risk-Based Concentration [RBC] Tables) have included an ILCR of 1×10^{-6} but an HQ of 1.0, rather than 0.1. However, since the RBCs are derived using similar equations and USEPA promulgated default exposure assumptions that were used to derive the original sets of COC screening concentrations, updated COC values can be obtained by using the carcinogenic RBCs issued semi-annually by USEPA Region III and dividing the accompanying noncarcinogenic RBCs by a factor of 10. An updated set of COC values can, therefore, be obtained each time the RBC Tables are updated. The COC values used in this baseline RA were derived from the RBC values issued by the USEPA Region III for October 22, 1997 (USEPA, 1997a). COC values for dioxins and furans were derived from the value for 2,3,7,8-tetrachlorinated dibenzo-p-dioxin (2378-TCDD) using the toxic equivalence factors as described in section 3.3.4.

Region III COC screening values used in this baseline RA include those derived for tap water (based on ingestion and inhalation pathways), soil (based on the ingestion pathway under residential and industrial land use scenarios). Both the residential and industrial soil COC screening values are presented in this baseline RA; however, in text, the residential values were actually used in selecting COPCs, since they are lower, and consequently, more conservative than the industrial values. Industrial COC screening values are presented since future land use at OUs 1, 6, and 7 is expected to remain industrial. The soil RBCs protective of direct contact exposures under both industrial and residential scenarios were derived by Region III using methodologies and assumptions similar to those presented in USEPA's Soil Screening Guidance (USEPA, 1996b).

Maximum Contaminant Levels (MCLs) - Federal USEPA MCLs are potentially enforceable standards for public water supplies promulgated under the Safe Drinking Water Act and are designed for the protection of human health. MCLs have been adopted as enforceable standards for public drinking water systems and apply to drinking water supplies consumed by a minimum of 25 persons. They have been developed for the prevention of human health effects associated with lifetime exposure (70 year lifetime) of an average adult (70 kg) consuming 2 liters of water per day. MCLs also consider the technical and economic feasibility of removing the constituent from a public water supply. The MCLs applied in this baseline RA for OUs 1, 6, and 7 were published in February 1996 (USEPA, 1996a).

Prevalence - The prevalence of a chemical in an environmental medium can be described by the frequency and concentration with which it is detected. A detection frequency greater than, or equal to 5 percent (e.g., 1 positive detection in 20 samples) was considered the minimum criteria for the selection of a COPC in data sets comprised of 20 or more samples. Data sets with fewer than 20 samples were evaluated for any positive detections to determine whether the chemical should be included as a COPC.

Blank Concentrations - If a chemical is detected in both the environmental sample and a blank sample, it may not be retained as a COPC in accordance with RAGS depending on the concentration of the chemical in the media. Therefore, blank data were compared with results from environmental samples. If the blanks contained detectable results for common laboratory contaminants (i.e., acetone, 2-butanone, methylene, chloride, toluene, and phthalate esters),

environmental sample results were considered as positive results only if they exceed 10 times the maximum amount detected in the associated blank. If the chemical detected in the blank(s) is not a common laboratory contaminant, environmental sample results were considered as positive results only if they exceeded five times the maximum amount detected in the associated blank(s). Furthermore, the elimination of an environmental sample result would directly correlate to a reduction in the prevalence of the contaminant in that media.

When assessing soil and sediment concentrations, the Contract Required Quantitation Limits (CRQLs) and percent moisture are accounted for in order to correlate solid and aqueous quantitation limits. For example, when assessing semivolatile, pesticide, PCB, and nitramine contaminants the CRQL for solid samples is 33 to 66 times (depending on the contaminant) that of the aqueous samples; this correction is not necessary for the evaluation of volatile COPCs. Therefore, in order to assess contaminant levels in solid samples using an aqueous blank concentration, the concentration was multiplied by 5 or 10 (noncommon or common laboratory contaminants, respectively) and then multiplied by 33 to correct for the variance in the CRQL. Accounting for multipliers greater than 33 or the percent moisture was not necessary for this data set. Associated blanks for OUs 1, 6, and 7 included: field blanks, trip blanks, and rinsate blanks. It is important to note that the aforementioned methodologies for evaluating blanks are usually implemented during third party analytical data validation prior to the selection of COPCs in the RA.

3.1.2 Selection of COPCs

Environmental media in the following SWMUs/AOCs were investigated during the 1997 RFI and are being evaluated in this risk assessment: SWMU 06/AOC B, SWMU 26, SWMU 31, SWMU 46, AOC C, and SWMU 13. Data and COPC selection summaries for groundwater, surface soil, subsurface soil, and sediment at these SWMUs/AOCs are presented in Tables 3-1 through 3-11. Samples were previously collected from OUs 1, 6, and 7 by Baker during 1995 and 1996 investigations and were analyzed for Appendix IX VOCs and SVOCs, TPH, and RCRA inorganics. The additional data acquired during the 1997 investigation supplement those acquired during the 1995 and 1996 investigations. Samples collected during investigations prior to 1995 were analyzed primarily for BTEX compounds (i.e., benzene, toluene, ethylbenzene, and xylene) and TPH (total petroleum hydrocarbons) and were not included in this evaluation. Information presented in Tables 3-1 through 3-11 is only for those constituents detected at least once, in the medium of

interest. It should be noted that, due to a lack of toxicity criteria, TPH was not evaluated in the selection of COPCs, nor was it evaluated in the risk assessment. In addition to the tables, the following paragraphs present the rationale for selecting COPCs at OUs 1, 6, and 7 at NSRR. Frequencies of detection (i.e., the number of positive detects / the number of samples analyzed) are also provided in the following paragraphs in parentheses. It should also be noted that, although background values (representing two times the arithmetic mean concentration for each chemical) are presented in the tables, they were not used to select COPCs, as a conservative measure. Sample locations, analytical results, and corresponding figures are presented in previous sections of this RFI report.

SWMU 06/AOC B

Groundwater

Table 3-1 shows that three groundwater samples were collected from SWMU 06/AOC B during the Phase I and Phase II investigations. One SVOC, benzoic acid (1/3), was detected in the groundwater samples; however, the concentration did not exceeded corresponding tap water COC or MCL screening values. Therefore, SVOCs were not retained as surface soil COPCs at SWMU 06/AOC B.

Twelve total (unfiltered) inorganics were detected in the groundwater samples collected. These included arsenic (2/3), barium (3/3), beryllium (2/3), chromium (3/3), cobalt (3/3), copper (3/3), lead (3/3), mercury (2/3), nickel (3/3), tin (1/3), vanadium (3/3) and zinc (3/3). Detected concentrations of arsenic, barium, beryllium, chromium, copper, nickel, vanadium, and zinc exceeded their corresponding COC screening levels for tap water. In addition, detected concentrations of barium, beryllium, chromium, copper, lead, and nickel exceeded MCL values. Therefore, arsenic, barium, beryllium, chromium, copper, lead, nickel, vanadium, and zinc were retained as total groundwater COPCs.

Dissolved (filtered) inorganics, namely barium (1/3), beryllium (1/3), chromium (1/3), cobalt (1/3), copper (2/3), lead (1/3), tin (1/3), vanadium (1/3), and zinc (1/3) were also detected in the groundwater samples collected at SWMU 06/AOC B. The detected concentrations of barium and beryllium exceeded the corresponding tapwater COC values. In addition, the detected concentration

of lead exceeded the corresponding MCL value. Therefore, barium, beryllium, and lead were retained as dissolved groundwater COPCs for quantitative evaluation in the baseline RA.

SWMU 26

Surface Soil

Table 3-2 shows that twelve surface soil samples were collected from the 0- to 1-foot depth interval during the Phase I and Phase II investigations. 2-Hexanone was the only VOC detected in surface soil samples collected at SWMU 26; however, the concentration did not exceed corresponding industrial or residential soil COC screening values. Therefore, VOCs were not retained as surface soil COPCs at SWMU 26.

Thirteen SVOCs were detected in the SWMU 26 surface soil samples. These included benzo(a)anthracene (3/12), benzo(b)fluoranthene (5/12), benzo(k)fluoranthene (4/12), benzo(a)pyrene (5/12), benzo(g,h,i)pyrene (2/12), bis(2-ethylhexyl)phthalate (9/12), chrysene (5/12), di-n-octylphthalate (2/10), fluoranthene (3/12), indeno(1,2,3-cd)pyrene (2/12), pentachlorophenol (1/12), phenanthrene (2/12), and pyrene (1/10). None of the detected concentrations exceeded their corresponding industrial or residential soil COC screening values. Therefore, SVOCs were not retained as surface soil COPCs at SWMU 26.

One pesticide, 4,4'-DDT (1/5) was detected in the surface soil samples from SWMU 26; however, the concentration did not exceed corresponding industrial or residential soil COC screening values. Therefore, pesticides were not retained as surface soil COPCs at SWMU 26.

Fourteen total inorganics, arsenic (12/12), antimony (1/5), barium (5/5), beryllium (11/12), cadmium (1/5), chromium (5/5), cobalt (5/5), copper (5/5), lead (5/5), nickel (5/5), selenium (3/5), tin (3/5), vanadium (5/5), and zinc (5/5) were also detected in each of the surface soil samples collected. The concentrations of arsenic, beryllium, and vanadium exceeded the corresponding residential soil COC values. In addition, the concentration of beryllium exceeded the corresponding industrial COC value. Arsenic, beryllium, and vanadium were therefore retained as surface soil COPCs for quantitative evaluation in the baseline RA.

Subsurface Soil

Table 3-3 shows that all seven subsurface soil samples were collected during the Phase II investigation from SWMU 26 and analyzed. The subsurface soil samples used for evaluation in the human health risk assessment included those collected from the two to three foot depth interval. The only VOC detected in these subsurface soil samples was 2-hexanone (1/7). It did not, however, exceed its corresponding industrial or residential soil COC screening values; therefore it was not retained as subsurface soil COPCs.

The SVOC diethylphthalate (2/7) was detected in SWMU 26 subsurface soil. It did not exceed its residential or industrial soil COC screening values; therefore, SVOCs were not retained as subsurface soil COPCs.

Two total inorganics, arsenic (3/7) and beryllium (7/7), were detected in the subsurface soil samples collected at SWMU 26. Of these, three detected concentrations of arsenic and seven detected concentrations of beryllium exceeded the corresponding residential soil COC value; and four detected concentrations of beryllium exceeded the corresponding industrial soil COC value. Therefore, arsenic and beryllium were retained as subsurface soil COPCs for quantitative evaluation in the baseline RA for SWMU 26.

SWMU 31

Surface Soil

Table 3-4 shows that twelve surface soil samples were collected from the 0- to 1-foot depth interval during the Phase I and Phase II investigations from SWMU 31. Five dioxins, total TCDF (3/12), total PeCDF (6/12), total HxCDD (5/12), total PeCDD (1/12), and total HxCDF (7/12) were detected. All of these exceeded their corresponding residential soil COC screening values, and total PeCDF, total HxCDD, total PeCDD, and total HxCDF exceeded their corresponding industrial screening values. Therefore, total TCDF, total PeCDF, total HxCDD, total PeCDD, and total HxCDF were retained as surface soil COPCs for quantitative evaluation in the baseline RA for SWMU 31.

SWMU 46

Surface Soil

Table 3-5 shows that twenty-four surface soil samples were collected from the 0- to 1-foot depth interval during the Phase I and Phase II investigations from SWMU 46. Two VOCs, carbon disulfide (1/9) and total xylenes (2/9), were detected. Neither of these exceeded their corresponding residential or industrial COC screening values; therefore, VOCs were not retained as surface soil COPCs for quantitative evaluation in the baseline RA.

Eighteen SVOCs were detected in the surface soil samples taken from SWMU 46. These include 2,4-dimethylphenol (2/24), acenaphthylene (1/24), anthracene (4/24), benzo(a)anthracene (21/24), benzo(b)fluoranthene (21/24), benzo(k)fluoranthene (20/24), benzo(a)pyrene (21/24), benzo(g,h,i)perylene (18/24), bis(2-ethylhexyl)phthalate (1/24), butylbenzylphthalate (2/24), carbazole (4/17), chrysene (21/24), dibenzo(a,h)anthracene (6/24), diethylphthalate (1/24), fluoranthene (21/24), indeno(1,2,3-cd)pyrene (19/24), phenanthrene (9/24), and pyrene (21/24). The concentrations of benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene exceeded the corresponding residential soil COC screening values. In addition, the concentrations of benzo(a)pyrene and dibenzo(a,h)anthracene exceeded the corresponding industrial COC values. Therefore, benzo(b)fluoranthene, benzo(a)pyrene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene were retained as surface soil COPCs for quantitative evaluation in the baseline RA for SWMU 46.

One PCB, Aroclor-1260 (23/24), was detected in the surface soil samples in SWMU 46. The detected concentrations exceeded both the residential and industrial COC screening values; therefore, Aroclor-1260 was retained as a surface soil COPC for quantitative evaluation in the baseline RA.

Twelve total inorganics were detected in the surface soils collected from SWMU 46. These included arsenic (22/24), barium (9/9), beryllium (16/17), cadmium (2/9), chromium (9/9), cobalt (2/2), copper (2/2), lead (9/9), nickel (2/2), tin (1/2), vanadium (2/2), and zinc (2/2). Arsenic, beryllium, and vanadium exceeded the corresponding residential soil COC screening values. In

addition, arsenic and beryllium exceeded the corresponding industrial COC screening values. Therefore, arsenic, beryllium, and vanadium were retained as surface soil COPCs for quantitative evaluation in the baseline RA for SWMU 46.

Subsurface Soil

Table 3-6 shows that seventeen subsurface soil samples were collected from the 2.5 to 11 foot depth interval during the Phase I and Phase II investigations for SWMU 46. Four SVOCs, bis(2-ethylhexyl)phthalate (2/17), diethylphthalate (3/17), phenol (1/17), and pyrene (1/17), were detected. None of these exceeded the corresponding industrial or residential soil COC screening values; therefore, SVOCs were not retained as subsurface soil COPCs for quantitative evaluation in the baseline RA.

One PCB, Aroclor-1260 (1/17) was detected in the subsurface soils from SWMU 46. Its concentrations did not exceed the corresponding residential or industrial COC screening values; therefore, PCBs were not retained as subsurface soil COPCs for quantitative evaluation in the baseline RA.

Twelve total inorganics, arsenic (11/17), barium (4/4), beryllium (13/15), chromium (4/4), cobalt (2/2), copper (2/2), lead (4/4), nickel (2/2), selenium (1/4), silver (1/4), vanadium (2/2), and zinc (2/2) were detected in the subsurface soils from SWMU 46. Arsenic, beryllium, and vanadium exceeded the corresponding residential soil COC screening values. In addition, beryllium exceeded the corresponding industrial COC screening value. Therefore, arsenic, beryllium, and vanadium were retained as subsurface soil COPCs for quantitative evaluation in the baseline RA for SWMU 46.

AOC C

Surface Soil

Table 3-7 shows that twenty-nine surface soil samples were collected from the 0- to 1-foot depth interval during the Phase I and Phase II investigations from AOC C. One VOC, 2-hexanone (1/29) was detected. The concentration did not exceed the corresponding residential or industrial COC

screening values; therefore, VOCs were not retained as surface soil COPCs for quantitative evaluation in the baseline RA.

Twenty-four SVOCs were detected in AOC C. These include 2,4-dinitrotoluene (1/29), 2,6-dinitrotoluene (1/29), acenaphthene (2/29), acenaphthylene (3/29), anthracene (6/29), benzo(a)anthracene (22/29), benzo(b)fluoranthene (26/29), benzo(k)fluoranthene (23/29), benzo(a)pyrene (24/29), benzo(g,h,i)perylene (22/29), bis(2-ethylhexyl)phthalate (11/29), carbazole (13/29), chrysene (24/29), dibenzo(a,h)anthracene (10/29), dibenzofuran (1/29), dimethylphthalate (1/29), di-n-butylphthalate (4/29), fluoranthene (25/29), fluorene (2/29), indeno(1,2,3-cd)pyrene (24/29), naphthalene (1/29), n-nitrosodiphenylamine(1) (1/29), phenanthrene (10/29), and pyrene (27/29). The concentrations of benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene exceeded the corresponding residential soil COC screening values. In addition, the concentration of benzo(a)pyrene exceeded the corresponding industrial COC screening value. Therefore, benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene were retained as surface soil COPCs for quantitative evaluation in the baseline RA for AOC C.

One PCB, Aroclor-1260 (29/29), was detected in the surface soils from AOC C. The concentrations exceeded both the residential and industrial COC screening values. Therefore, Aroclor-1260 was retained as a surface soil COPCs for quantitative evaluation in the baseline RA.

Seventeen total inorganics were detected in the surface soils from AOC C. These include antimony (21/29), arsenic (26/29), barium (29/29), beryllium (29/29), cadmium (17/29), chromium (29/29), cobalt (29/29), copper (24/24), lead (29/29), mercury (8/29), nickel (29/29), selenium (3/19), silver (29/29), thallium (4/29), tin (28/29), vanadium (29/29), and zinc (29/29). The concentrations of antimony, arsenic, beryllium, chromium, and vanadium exceeded the corresponding residential soil COC screening values. In addition, the concentration of arsenic exceeded the industrial COC screening value. Therefore, antimony, arsenic, beryllium, chromium, and vanadium were retained as surface soil COPCs for quantitative evaluation in the baseline RA for AOC C.

Subsurface Soil

Table 3-8 shows that fourteen subsurface soil samples were collected from the 2.5 to 3 foot depth

interval during the Phase II investigations from AOC C. Six SVOCs, 2-butanone (1/14), benzo(b)fluoranthene (2/14), bis(2-ethylhexyl)phthalate (2/14), chrysene (1/14), diethylphthalate (1/14), and phenanthrene (1/14) were detected in the subsurface soils. None of these concentrations exceeded the corresponding residential or industrial COC screening value; therefore, SVOCs were not retained as subsurface soil COPCs for quantitative evaluation in the baseline RA.

One PCB, Aroclor-1260 (8/14), was detected in the subsurface soil from AOC C. The concentrations did not exceeded the corresponding residential or industrial COC screening value; therefore, PCBs were not retained as subsurface soil COPCs for quantitative evaluation in the baseline RA.

Seventeen total inorganics were detected in the subsurface soils from AOC C. These include antimony (9/14), arsenic (5/14), barium (14/14), beryllium (14/14), cadmium (5/14), chromium (14/14), cobalt (14/14), copper (2/2), lead (14/14), mercury (4/14), nickel (14/14), selenium (6/14), silver (12/14), thallium (1/14), tin (14/14), vanadium (14/14), and zinc (14/14). The concentrations of arsenic, beryllium, chromium, and vanadium exceeded the corresponding residential soil COC screening values. In addition, the concentration of arsenic exceeded the industrial COC screening value. Therefore, arsenic, beryllium, chromium, and vanadium were retained as subsurface soil COPCs for quantitative evaluation in the baseline RA for AOC C.

SWMU 13

Groundwater

Table 3-9 shows that seven groundwater samples were collected from SWMU 13 during the Phase II investigation. One pesticide, 4,4'-DDD (1/7) was detected in the groundwater samples. The concentration did not exceed the corresponding tapwater COC or MCL screening values; therefore, pesticides were not retained as groundwater COPCs for quantitative evaluation in the baseline RA.

Sediment

Table 3-10 shows that nine sediment samples were collected during the Phase II investigation from

SWMU 13. One VOC, 2-chloro-1,3-butadiene (1/11), was detected in the sediment samples. Because its concentration did not exceed the corresponding industrial or residential soil COC screening values, it was not retained as a sediment COPC.

Eleven SVOCs were detected in the samples. These include benzo(a)anthracene (2/11), benzo(b)fluoranthene (4/11), benzo(k)fluoranthene (1/11), benzo(a)pyrene (2/11), benzo(g,h,i)perylene (2/11), bis(2-ethylhexyl)phthalate (2/11), chrysene (3/11), fluoranthene (3/11), indeno(1,2,3-cd)pyrene (2/11), phenanthrene (1/11), and pyrene (3/11). Only the concentration of benzo(a)pyrene exceeded the corresponding residential soil COC screening values; therefore, benzo(a)pyrene was retained as a sediment COPC for quantitative evaluation in the baseline RA.

Six pesticides were detected in the sediment samples from SWMU 13. These include 4,4'-DDD (10/11), 4,4'-DDE (10/11), 4,4'-DDT (9/11), alpha-chlordane (5/11), dieldrin (5/11), and gamma-chlordane (5/11). The concentrations of all these exceeded the corresponding residential soil COC screening values. In addition, 4,4,'-DDD, 4,4'-DDE, 4,4'-DDT, and dieldrin exceeded the corresponding industrial soil COC screening values Therefore, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, alpha-Chlordane, gamma-Chlordane, and dieldrin were retained as sediment COPCs for quantitative evaluation in the baseline RA for SWMU 13.

AOC D

Sediment data were acquired for two samples collected from AOC D during the Phase II investigation in order to further delineate the presence of constituents characterized during the Phase I RFI; however, for the purposes of this baseline RA, the COPC selection process was not applied to the Phase II data. Rather, risks that could be estimated for the Phase II data were qualitatively derived from a comparison between the Phase I and Phase II data. In the Phase I HEA, potentially unacceptable risks were estimated for recreational users and future residents who may be dermally exposed to sediments in AOC D. In addition, the ecological risk assessment conducted in the HEA indicated that a slight potential for risk to the aquatic environment exists in the SWMUs that were evaluated in AOC D.

Table 3-11 shows that the general magnitude of the detected concentrations from the Phase II investigation are lower than those detected during the Phase I investigation. Therefore, it can be

concluded that the overall risks to be derived from the phase II data are less than those that were estimated in the previous HEA for the Phase I data (Baker, 1997). Since no additional risks are shown to exist from the new sampling, a comparison of Phase I to Phase II data was presented in lieu of a risk assessment.

3.1.3 Summary of COPCs

The following summarizes the COPCs identified for OUs 1, 6, and 7 to be quantitatively evaluated in this baseline RA. Table 3-12 summarizes the locations of the surface and subsurface soil COPCs. Table 3-13 summarizes the locations of the groundwater and sediment COPCs. It should be noted that since COPCs were not selected for the Phase II acquired for AOC D sediment, none are summarized in Table 3-13. The COPCs that are less than corresponding background values are italicized.

SWMU 06/AOC B

Unfiltered Groundwater:	Arsenic, Barium, Beryllium, Chromium, Copper, Lead, Nickel, Vanadium, Zinc
Filtered Groundwater:	Barium, Beryllium, Lead

SWMU 26

Surface Soil:	Arsenic, Beryllium, Vanadium
Subsurface Soil:	Arsenic, Beryllium

SWMU 31

Surface Soil:	Total TCDF, Total PeCDF, Total HxCDD, Total PeCDD, Total HxCDF

SWMU 46

Surface Soil:	Benzo(b)fluoranthene, Benzo(a)pyrene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene, Aroclor-1260, Arsenic, Beryllium, *Vanadium*
Subsurface Soil:	*Arsenic*, Beryllium, *Vanadium*

AOC C

Surface Soil:	Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(a)pyrene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene, Aroclor-1260, Antimony, Arsenic, *Beryllium*, Chromium, *Vanadium*
Subsurface Soil:	Arsenic, *Beryllium*, *Chromium*, *Vanadium*

SWMU 13

Groundwater:	None
Sediment:	Benzo(a)pyrene, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, alpha-Chlordane, gamma-Chlordane, Dieldrin

3.2 Exposure Assessment

The exposure assessment addresses each potential current and future exposure pathway in soil, groundwater, surface water, sediment, and air. To determine whether human exposure could occur at OUs 1, 6, and 7 in the absence of remedial action, an exposure assessment was conducted to identify potential exposure pathways and receptors. The following four elements were considered to ascertain whether a complete exposure pathway was present (USEPA, 1989b):

- A source and potential mechanism of chemical release
- An environmental retention or transport medium
- A point of potential human contact with the contaminated medium
- An exposure route (e.g., ingestion) at the contact point

The exposure scenarios presented in the following sections are used to estimate individual risks. The reasonable maximum exposure (RME) was evaluated for each scenario utilized in this baseline RA. Relevant equations for assessing intakes and exposure factors were obtained from RAGS (USEPA, 1989b), Exposure Factors Handbook (USEPA, 1989a), Dermal Exposure Assessment: Principles and Applications, Interim Report (USEPA, 1992a), and Standard Default Exposure Factors. Interim Final (USEPA, 1991a). Unless otherwise noted, all the statistical data associated with the factors used in the dose evaluation equations for assessing exposure were obtained from the Exposure Factors Handbook (USEPA, 1989b) and the accompanying guidance manuals.

3.2.1 Chemical Fate and Transport

This section discusses the potential release and migration of COPCs between or within media. The potential for a chemical to migrate spatially and persist in environmental media is important in the estimation of exposure.

The distribution relationships for a chemical between the environmental compartments of air, water, and soil can be evaluated using a series of equilibrium constants. By utilizing the physiochemical properties of a constituent, it is possible to estimate a chemical's expected environmental distribution and its ultimate environmental fate.

The environmental mobility and persistence of a chemical will be influenced primarily by its physical and chemical properties and the chemistry of the medium in which it occurs. Table 3-14 presents the physical and chemical properties associated with the organic COPCs including: vapor pressure, water solubility, octanol-water partition coefficient, soil adsorption coefficient, specific gravity, Henry's Law constant, and mobility index. Calculated values, obtained using approximation methods, are presented when literature values are unavailable. A discussion of the environmental significance of each of these properties follows.

- Vapor pressure is an indication of the rate at which a chemical will volatilize. It is of primary significance as a removal mechanism at environmental interfaces such as shallow (surface) soil-air and surface water-air. In general, vapor pressures for volatile organics, would be higher than vapor pressures for semivolatiles or pesticides. Chemicals with higher vapor pressures are expected to enter the atmosphere more readily than chemicals with lower vapor pressures. Therefore, volatilization can be a significant loss process for VOCs in shallow (surface) soil and surface water.

- Water solubility measures how much of a chemical can be solubilized and potentially leached from soil by infiltrating precipitation. In general, more soluble chemicals, such as VOCs, are more readily leached than less soluble chemicals.

- The octanol-water partition coefficient (K_{ow}) is a measure of the equilibrium

partitioning of chemicals between octanol and water. The coefficient also is useful in characterizing the sorption of compounds by organic soil where experimental values are not available. The octanol water partition coefficient also is used to estimate BCFs in aquatic organisms.

- The organic carbon adsorption coefficient (K_{oc}) is an indication of the tendency of a chemical to adhere to soil particles containing organic carbon. Chemicals with high soil or sediment adsorption coefficients generally have low water solubilities (and vice versa), as evidenced by the semivolatiles. For example, chemicals such as PAHs are preferentially bound to the soil and are not subject to aqueous transport to the extent as compounds with higher water solubilities, such as VOCs.

- Specific gravity is the ratio of the weight of a given volume of pure chemical at a specified temperature to the weight of the same volume of water at a given temperature. Its primary use is to determine whether a constituent will have a tendency to float or sink (as an immiscible liquid) in water if it is present as a pure compound or at concentrations which exceed its water solubility.

Both vapor pressure and water solubility are of use in determining volatilization rates from surface water bodies and from groundwater. The ratio of these two parameters (Henry's Law constant) is used to calculate the equilibrium constituent concentrations in the vapor (air) phase versus the liquid (water) phase for the dilute solutions commonly encountered in environmental settings.

A quantitative assessment of mobility has been developed that uses water solubility (S), vapor pressure (VP), and organic carbon partition coefficient (K_{oc}) (Laskowski, 1983). This value is referred to as the <u>Mobility Index</u> (MI) and defined as:

$$MI = \log((S*VP)/K_{oc})$$

A scale to evaluate MI is presented by Ford and Gurba (1984):

Relative MI	Mobility Description
> 5	extremely mobile
0 to 5	very mobile
-5 to 0	slightly mobile
-10 to -5	immobile
< -10	very immobile

The MIs for the COPCs area also presented in Table 3-14. The following paragraphs summarize the fate and transport data for the chemical classes of COPCs identified at OUs 1, 6, and 7.

3.2.1.1 Semivolatile Organic Compounds

SVOCs were identified as COPCs in SWMU 06/AOC B, SWMU 26, SWMU 46, AOC C, SWMU 13, and AOC D. In general, SVOCs are less mobile than the VOCs by virtue of their lower vapor pressures and lower water solubilities. K_{oc} and K_{ow} values for SVOCs are generally greater in magnitude than those for the VOCs, indicating the tendency for this class of compounds to adsorb strongly to soil. The semivolatile COPCs identified for OUs 1, 6, and 7 were all PAHs. SVOCs are ubiquitous in the environment since they are produced naturally by plants, and are products of the incomplete combustion of fossil fuels. SVOCs tend not to migrate appreciable distances through groundwater, as indicated by low water solubilities and high Koc values. The MIs calculated for the SVOCs retained as COPCs for OUs 1, 6, and 7 range from -14 to -20, indicating that they are very immobile in the environment.

Transport of soil particulates containing SVOCs is, most likely, the primary migration mechanism. The overland flow of surface water carrying entrained particles and with subsequent sedimentation, resuspension, and settling throughout is possible. SVOCs generally lack adequate vapor pressures to be transmitted via vaporization and subsequent airborne transport. However, SVOCs adsorbed to particulates can be transported by wind as fugitive dust.

SVOCs are somewhat persistent in the environment, although several processes do contribute to their in-situ degradation. Generally, photolysis and oxidation may be important removal mechanisms in surface water and shallow (surface) soil, while biodegradation is an important fate process in groundwater and soil.

3.2.1.2 Dioxins/Furans

Dioxins and furans were identified as COPCs in SWMU 31 and AOC D. Based on information available for 2,3,7,8-TCDD, the fate of dioxins and furans in air, water, and soil is not understood with certainty. In general, dioxins and furans are very immobile by virtue of their lower vapor pressures and lower water solubilities (MI= -16). In addition, K_{oc} and K_{ow} values for dioxins are generally large in magnitude, indicating the tendency for this class of compounds to adsorb strongly to soil.

Dioxin-like compounds are assumed to have a half-life of 10-15 years. Dioxins can be delivered to an exposure site via air deposition of contaminated particulate matter, or via erosion from a contaminated soil site. Some empirical evidence suggests, however, that delivered contaminants may be more persistent and that the 10-15 year half-life may be a low half-life estimation.

Because of their affinity for organic carbon, the fate and transport of dioxin-like compounds in water bodies is likely to be more a function of sediment related processes rather than water-related processes. Because of this strong sorption to soils/sediments, the occurrence of these compounds in groundwater is expected to be minimal. However, dioxin-like compounds have been found in groundwater beneath and near sites of industrial contamination due to its co-occurrence with other organic compounds, co-occurrence with solvents, and transport associated with oils.

The air transfer of dioxin-like compounds, as vapor or sorbed onto particulate matter, to vegetation, which animals consume, is thought to be the principle cause for the terrestrial animal food chain impact. Some studies have suggested that photodegradation may occur under natural conditions. However, this process is not expected to occur for sorbed dioxins, and there is limited data on degradation of dioxins while airborne in the vapor phase. Laboratory studies have demonstrated that dioxins and furans undergo photolysis in the presence of a suitable hydrogen donor such as oil or an organic solvent. There is also some evidence of reductive dechlorination (transformation of dioxins of higher chlorine content to dioxins of lower chlorine content) which suggests the possibility that photodegradation can be both a destruction and a formation mechanism.

Dioxins are very stable chemicals which resist natural breakdown processes for extremely long periods of time. In addition, because they are powerfully attracted to fats and oils, dioxins tend to accumulate in the tissues of living things and multiply in concentrations as they move up the food chain.

3.2.1.3 Pesticides/PCBs

Pesticides and/or PCBs were identified as COPCs in SWMU 26, SWMU 46, AOC C, SWMU 13, and AOC D. Pesticides, such as DDD, DDT, DDE, chlordane, and dieldrin, are common environmental contaminants due to their wide spread use in insect control. DDT can no longer be used in the United States except in cases of public health emergency. Studies have shown prolonged persistence of these pesticides in soil. These compounds undergo extensive adsorption to soil particulates, as predicted by their K_{oc} values. These compounds are only slightly soluble in water. Therefore, loss of these compounds in runoff is primarily due to transport of particulates to which these compounds are bound. Since they are bound strongly to soil, they are not easily displaced from their site of application, nor do they tend to leach to groundwater. The MIs calculated for the pesticides and PCBs which were retained as COPCs range from -10 to -13, also indicating that they are immobile to very immobile in the environment. DDD, DDT, and DDE are highly lipid soluble, as reflected by their log K_{ow} values. This property, combined with an extremely long half-life, has resulted in bioaccumulation.

The Aroclors, such as Aroclor-1260, are no longer produced or used in the production of new products in the United States and industrial effluent discharges from production sources no longer occur. Current sources of PCB release to the environment include releases from landfills containing transformers, capacitors, and other PCB wastes. The environmental persistence of PCBs generally increases with an increase in the degree of chlorination of the congener. The Aroclors with a high degree of chlorination (1248, 1254, and 1260) are resistant to biodegradation and appear to be degraded very slowly in the environment. Volatilization is an important environmental fate process for the PCBs that exist in natural water in the dissolved state. The values of the estimated Henry's law constants for the Aroclors are indicative of significant volatilization from environmental waters. The low water solubility, high octanol-water partition coefficients of the PCBs and demonstrated strong adsorption of PCBs to soils and sediment indicate that significant leaching should not occur in soil under most conditions.

3.2.1.4 Inorganics

Inorganics were identified as COPCs in SWMU 06/AOC B, SWMU 26, SWMU 46, AOC C, and AOC D. Different inorganic species behave differently in various environmental media. In general, inorganics can be transported through air, adhering to blowing dust, or move through surface water and

groundwater as dissolved salts. Inorganics can also be carried with flowing water on suspended solids or attached to colloidal materials. The most complicated pathway for inorganic chemicals is migration in subsurface soil and groundwater, where oxidation reduction potential (Eh) and pH play critical roles.

3.2.2 Potential Migration Pathways

This section identifies the potential migration routes of COPCs at OUs 1, 6, and 7. These mechanisms were identified through an evaluation of the analytical results and known site characteristics.

3.2.2.1 Soil and Sediment

Inorganic COPCs were identified in both shallow and subsurface soil at OUs 1, 6, and 7. COPCs present in soil can migrate by leaching of infiltrating precipitation, advective transport in the direction of surface drainage (runoff), or by suspension of soil particulates in ambient air (dust).

The factors which control contaminant migration through soil, and then to groundwater, are dependent on the chemical and physical nature of the contaminants and of the soil and site hydrology. Some of the factors which influence the migration of chemicals in soil include: pH, Eh, particle size distribution, pore size or voids volume, lime content, content of organic matter, concentration of ions or salts, oxic and anoxic conditions, presence or absence of hydrous oxides, vegetative cover, topography, and climate.

3.2.2.2 Groundwater

Organic and inorganic COPCs were identified in groundwater samples collected from OUs 1, 6, and 7. Contaminants which come into contact with groundwater can migrate under the influence of groundwater flow. Migration through groundwater is dependent on the chemical nature of the contaminant and the chemical and physical nature of the aquifer. Groundwater flow velocity (a function of hydraulic gradient and conductivity), groundwater chemistry, porosity of the aquifer, and the chemical make up of the aquifer are all factors which affect contaminant migration. Mobility of a contaminant in groundwater is particularly influenced by its water solubility and the organic carbon content of the substrate, as well as the nature of the aquifer materials (subsurface soil) through which the groundwater flows. In general, compounds that have high solubility and low K_{oc} values tend to be more mobile in groundwater than those with low solubility and high K_{oc} values.

3.2.3 Potential Human Receptors and Exposure Pathways

NSRR currently operates, and will continue to operate, as a key Naval Station providing full support for Atlantic Fleet Weapons training and development activities. Current potential human receptors being evaluated in this Human Health RA for possible exposures to COPCs detected in environmental media are limited to on-site adult workers. The on-site workers are assumed to be civilian and/or military personnel who may perform various maintenance and manual labor activities at NSRR. These activities may result in direct contact exposures to surface soil (0 to 1 foot) and sediment at OUs 1, 6, and 7. Potential exposures to COPCs in the surface soil may occur via the pathways of accidental ingestion, dermal contact and the inhalation of fugitive dusts emanating from areas of low vegetative cover and no pavement. Potential exposures to COPCs in the sediment may occur via the pathways of accidental ingestion and dermal contact. On-site workers were evaluated in SWMUs 26, 31, 46, 13, and AOC C.

In addition to the on-site workers, future construction workers that may perform excavation and related construction activities, were evaluated as potential receptors. Generally, it was assumed that the majority of COPC exposures to this receptor would be due to direct contact with excavated subsurface soil. It was also assumed that direct contact exposures to surface soil COPCs would occur; however, the amount of surface soil exposures was assumed to be insignificant, relative to the subsurface soil exposures. Therefore, future construction workers were only evaluated for subsurface soil exposures, via the pathways of accidental ingestion, dermal contact and the inhalation of fugitive dusts emanating from excavated subsurface soils at a construction site. The subsurface soil exposures were evaluated for construction workers at SWMU 26, SWMU 46, and AOC C.

Current adult and adolescent recreational users were also evaluated in this RA as potential receptors. Because of base restrictions and areas of dense vegetation, it was generally assumed that the majority of COPC exposures to this receptor would be due to direct contact with sediment. Sediment exposures were evaluated for recreational users at SWMU 13.

Currently, there are no facilities for personnel housing located at any of the sites included in this study. The area will not be developed for personnel housing in the future because of the Station's mission and the need to keep the area in close proximity to the Ensenada Honda as “industrial” for continued support of the fleet. Although future residential development of any SWMU/AOC is highly unlikely,

future residential exposures to adult and young child (ages 1 through 6 years old) receptors were evaluated as the most conservative (worst-case) scenario. Future residents are being evaluated for accidental ingestion, dermal and inhalation (fugitive dusts) exposures to surface soil, and ingestion and dermal exposures to sediment and groundwater used as drinking water. It should be noted that currently, groundwater at NSRR is not being utilized as potable water due to poor quality and low yields; however, it will be conservatively assumed that child and adult residents will be exposed to organic and dissolved inorganic COPCs identified in the groundwater at OUs 1, 6, and 7. Total inorganic results were not evaluated since dissolved inorganic results are considered to be more representative of drinking water conditions at the tap.

Table 3-15 offers a tabulated summary of the media and receptors evaluated at each SWMU/AOC. Based on information available regarding the physical features, site setting, site historical activities, and current and expected land uses, the following potential human receptor groups and exposure pathways were evaluated in this Human Health RA:

Current on-site adult workers:

- Accidental ingestion of surface soil (SWMUs 26, 31, 46, and AOC C)
- Dermal contact with surface soil (SWMUs 26, 31, 46, and AOC C)
- Inhalation of fugitive dusts emanating from surface soil (SWMUs 26, 31, 46, and AOC C)
- Accidental ingestion of sediment (SWMU 13)
- Dermal contact with sediment (SWMU 13)

Future on-site adult construction workers:

- Accidental ingestion of subsurface soil (SWMUs 26, 46, and AOC C)
- Dermal contact with subsurface soil (SWMUs 26, 46, and AOC C)
- Inhalation of fugitive dust emanating from excavated subsurface soil (SWMUs 26, 46, and AOC C)

Current adult and adolescent recreational users:

- Accidental ingestion of sediment (SWMU 13)
- Dermal contact with sediment (SWMU 13)

Future on-site adult and child (1-6 years old) residents:

Accidental ingestion of surface soil (SWMUs 26, 31, 46, and AOC C)

Dermal contact with surface soil (SWMUs 26, 31, 46, and AOC C)

Inhalation of fugitive dusts emanating from surface soil (SWMUs 26, 31, 46, and AOC C)

Ingestion of groundwater used as drinking water (SWMU 06/AOC B and SWMU 13)

Dermal contact with groundwater while bathing (SWMU 06/AOC B and SWMU 13)

Accidental ingestion of sediment (SWMU 13)

Dermal contact with sediment (SWMU 13)

3.2.4 Conceptual Site Model

Development of a conceptual site model of potential exposure is critical in evaluating all potential exposures for the aforementioned human receptors. The conceptual site model describes the area of concern in terms of potential sources of contamination, release mechanisms, affected media, and all potential routes of migration of the contaminants present.

The primary sources of contamination are the possible spills and releases into the environment that occurred at OUs 1, 6, and 7. The primary current and future release mechanisms assumed to result in the exposure concentrations of COPCs identified in the environmental media being evaluated in this baseline RA include: surface runoff from SWMU/AOCs to surface soil and sediment in other areas, leaching and vertical migration of contaminants from surface to subsurface soils and groundwater; horizontal contaminant migration through groundwater; and fugitive dust generation from surface soil and future excavated subsurface soil (though current surface generation of fugitive dusts may be hindered to a great extent by existing vegetation); volatilization of organic contaminants from groundwater.

3.2.5 Quantification of Exposure

3.2.5.1 Concentrations Used in the Estimate of Exposure

The chemical concentrations used in the estimation of chronic daily intakes (CDIs) and dermally absorbed doses (DADs) for each medium are considered to be representative of the types of potential exposure encountered by each receptor.

Exposure can occur discretely or at a number of sampling locations depending on the type of scenario considered for a given receptor. Furthermore, certain environmental media such as groundwater are migratory and chemical concentrations detected in this medium change frequently over time. Soil, by nature, is less transitory. The manner in which environmental data are represented also depends on the number of samples and sampling locations available for a given area and a given medium.

To quantify exposure, analytical data must be evaluated to determine its distributional nature. In general, two types of distributions are applied to environmental data; these are the normal and log-normal distributions. For example, most large data sets from soil sampling are log-normally distributed rather than normally distributed. The geometric mean is the best estimator of central tendency for a log-normal data set (USEPA, 1992c). However, most Agency health criteria are based on the long-term average exposure which is expressed as the sum of all daily intakes divided by the total number of days in the averaging period. The geometric mean of a set of sampling results may not adequately represent random exposure and the cumulative intake that would result from long-term contact with site contaminants.

Potential exposure to soil and groundwater at OUs 1, 6, and 7, regardless of location, is considered as having an equal probability of occurrence as an individual moves randomly across the site. Therefore, for these media, the exposure point concentration for a constituent in the intake equation can be reasonably estimated as the arithmetic average concentration of site sampling data. USEPA supplemental risk assessment guidance (USEPA, 1992c) states that the average concentration is an appropriate estimator of the exposure concentration for two reasons: 1) carcinogenic and chronic noncarcinogenic toxicity criteria are based on lifetime average exposures; and 2) the average concentration is most representative of the concentration that would be contacted over time. However, uncertainty is inherent in the estimation of the true average constituent concentration at the site.

In order to account for this uncertainty and to be health protective, USEPA risk assessment guidance (USEPA, 1989b) requires the use of an upper bound estimate of the arithmetic mean concentration to calculate the CDI. This estimate, which should be in the high end of the concentration frequency distribution, is called the RME concentration. The RME concentration is defined as the highest concentration that could reasonably be expected to be contacted via a given pathway over a long-term exposure period.

A conservative estimate that best represents the RME is the 95-percent upper confidence limit of the arithmetic mean concentration (95% UCL). In order to estimate the 95% UCL for soil and groundwater data sets, a normal distribution was assumed to represent the occurrence of all COPC-detected concentrations for sample data sets greater than or equal to five. However, if the 95% UCL concentration exceeded the maximum detected concentration in a given data set, the maximum detected concentration was used to represent the concentration term for that COPC.

The USEPA recommended use of the 95%UCL (normal or lognormal) as the RME concentration (in addition to RME assumptions) is designed to overestimate actual risks expected to result from "real-world" exposures. For this RA, the lognormal 95%UCLs are generally greater in value than the normal 95%UCLs. The normal 95%UCL was used as the exposure concentration, rather than the lognormal 95%UCL, in order to further reduce the potential for the overestimation of risks.

The 95% UCL for a normally distributed data set was calculated using the following equation (USEPA, 1992c):

$$95\%\ UCL\ '\ \bar{x}\ \%\ t(s/\sqrt{n})$$

Where:

0 = mean

t = Student t-statistic (Gilbert, 1987)

s = standard deviation

n = number of samples

Maximum detected values and 95%UCLs derived for data sets acquired for OUs 1, 6, and 7 are presented in Appendix F.

Under the residential groundwater use scenario, exposures to organic and dissolved inorganic COPCs were evaluated. Dissolved inorganic COPCs were evaluated, rather than the total inorganic COPCs, since evaluation of the dissolved more closely approximates exposure conditions at the tap. An examination of total versus dissolved inorganic groundwater concentrations indicates that the measured total concentrations generally exceed the measured dissolved concentrations. This is most likely due to the presence of sedimentation in the unfiltered samples, which, upon acid digestion in the laboratory during sample preparation, results in elevated metals concentrations in the analyzed samples. Therefore, since sedimentation is usually not observed at the tap, the dissolved, rather than the total inorganics concentrations were used to evaluate the residential potable use scenario. Groundwater inhalation was not evaluated because there were no VOC COPCs retained.

For results reported as "nondetect" (i.e., results flagged with the following validation qualifiers: U, UJ, UL, and UK), a value of one half of the sample-specific detection limit was used to calculate the 95% UCL. A value of half the detection limit was assigned to nondetects when estimating the 95% UCL because the actual value could be between zero and a value just below the detection limit. Ninety-five percent UCLs were calculated only for the constituents detected in at least one sample collected from the environmental medium of interest. Estimated concentrations also were used to calculate the 95% UCL, such as "J"-qualified (estimated), "L"-qualified (estimated, biased low) and "K"-qualified (estimated, biased high) data. "N"-qualified (tentatively identified) data were also used to estimate the exposure concentration. Reported concentrations qualified with an "R" (rejected) were not used in the risk assessment.

For constituents considered by RAGS to be common laboratory blanks, chemicals were deemed positive detects only if their concentration exceeded 10 times the maximum blank concentration. For constituents not considered to be laboratory blanks, chemicals were considered as positive detects only if their concentration exceeded 5 times the maximum blank concentration.

3.2.5.2 Calculation of Chronic Daily Intakes

In order to numerically estimate the risks for current and future human receptors at OUs 1, 6, and 7, a CDI or DAD must be estimated for each COPC in every retained exposure pathway. Both the CDI and DAD are chemical intakes, expressed in terms of dose; however, the different terms refer to different pathways of exposure. The CDI term is used to describe chemical intake via the oral and

inhalation pathways; the DAD term is used to describe chemical intake via dermal absorption. The CDI/DAD for each COPC is calculated by combining the concentration term with assumed or known conservative exposure factors that describe the rates, frequency and duration of exposure. Since the CDI/DAD is a dose term, body weight of the receptor is also incorporated into the calculation, and the long-term exposure is divided by the total number of days in the averaging period. Thus, the unit obtained for the CDI/DAD resulting from chemical exposure is mg/kg/day. Appendix G contains the specific CDI/DAD calculations for each exposure scenario of interest. These equations were adopted from USEPA's Risk Assessment Guidance for Superfund, Volume I (USEPA, 1989b).

CDIs/DADs for potential carcinogens, which tend exhibit non-threshold effects (e.g., tumor development) following long-term exposure, were calculated so that the duration of exposure is averaged over the course of a lifetime (70 years, or 25,550 days).

Exposures to noncarcinogens, on the other hand, tend to result in observable threshold effects. Therefore, CDIs/DADs for noncarcinogens were estimated using the concept of an average annual exposure. The intake incorporates terms describing the exposure time and/or frequency that represent the number of hours per day and the number of days per year that exposure occurs. In general, noncarcinogenic risks for many exposure routes (e.g., soil ingestion) are greater for children than adults because of the differences in body weights, similar exposure frequencies, and higher ingestion rates.

The subsections which follow present the equations and input parameters used in the calculation of CDIs/DADs for each potential exposure pathway being evaluated for the various SWMUs/AOCs. Input parameters were taken from USEPA's default exposure factors guidelines where available and applicable. All inputs not defined by USEPA were derived from USEPA documents concerning exposure or were the result of best professional judgment.

3.2.5.2.1 *Surface Soil, Subsurface Soil, and Sediment*

Accidental Ingestion of Soil

The daily intake associated with the potential accidental ingestion of COPCs detected in soil and sediment was calculated using the following equation (USEPA, 1989b):

$$CDI = \frac{Cs \times IR \times FI \times CF \times EF \times ED}{BW \times AT}$$

Where:

CDI	=	Chronic Daily Intake, milligram per kilogram day (mg/kg-day)
Cs	=	Chemical concentration in soil or sediment, mg/kg
IR	=	Ingestion rate, mg/day
FI	=	Fraction Ingested, unitless
CF	=	Conversion factor, 10^{-6} kg/mg
EF	=	Frequency of exposure, days/year
ED	=	Exposure duration, years
BW	=	Average body weight, kg
AT	=	Averaging time, days

CDI calculations using the above equation are presented in Appendix G.

Dermal Contact with Soil and Sediment

The absorbed dose associated with the potential dermal contact of COPCs in soil and sediment was calculated using the following equation (USEPA, 1989b):

$$DAD = \frac{CS \times AF \times ABS \times CF \times SA \times EF \times ED}{BW \times AT}$$

Where:

DAD	=	Dermally absorbed dose, mg/kg-day
CS	=	Chemical concentration in the soil or sediment, mg/kg
AF	=	Adherence factor, milligram per square centimeter day (mg/cm^2-d)
ABS	=	Absorbed fraction, unitless
CF	=	Conversion factor, 10^{+6} mg/kg
SA	=	Surface area of exposed skin, cm^2
EF	=	Exposure frequency, days/year
ED	=	Exposure duration, years

BW	=	Average body weight, kg
AT	=	Averaging time, days

CDI calculations using the above equation are presented in Appendix G.

Inhalation of Fugitive Dust

The daily intake resulting from the inhalation of soil COPCs adsorbed onto fugitive dust particulates was estimated using the following equation (USEPA, 1989b):

$$CDI = \frac{Ca \times RR \times ET \times EF \times ED}{BW \times AT}$$

Where:

CDI	=	Chronic Daily Intake, mg/kg-day
Ca	=	Chemical concentration in air as fugitive dust,(mg/m^3)
RR	=	Respiration rate, m^3/day
ET	=	Exposure time, hours/day
EF	=	Frequency of exposure, days/year
ED	=	Exposure duration, years
BW	=	Average body weight, kg
AT	=	Averaging time, days

The air concentration (Ca) of a chemical in fugitive dust emissions was estimated from the following equation, as determined by Cowherd (1985), and provided by the USEPA (1991b).

$$Ca = Cs \times 1/PEF$$

Where:

Cs	=	Concentration of chemical in the soil, mg/kg
PEF	=	Particulate emission factor, $6.79 \times 10^{+8}$ m^3/kg

CDI calculations using the above equations are presented in Appendix G.

3.2.5.2.2 <u>*Groundwater*</u>

Ingestion of Potable Groundwater

The daily intake associated with the direct potential ingestion of the COPCs in groundwater under a potable use scenario was calculated using the following equation (USEPA, 1989b):

$$CDI = \frac{Cw \times IR \times EF \times ED}{BW \times AT}$$

Where:

CDI	=	Chronic Daily Intake, mg/kg-day
Cw	=	Chemical concentration in groundwater, mg/L
IR	=	Ingestion rate, L/day
EF	=	Frequency of exposure, days/year
ED	=	Exposure duration, years
BW	=	Average body weight, kg
AT	=	Averaging time, days

Dermal Contact with Groundwater

The absorbed dose associated with potential dermal contact with COPCs in groundwater (while bathing) was calculated using the following equation (USEPA, 1989b):

$$DAD = \frac{Cw \times SA \times PC \times ET \times EF \times ED \times CF}{BW \times AT}$$

Where:

DAD	=	Dermally absorbed dose, mg/kg-day
Cw	=	Concentration in water, mg/L
SA	=	Surface area of exposed skin, cm^2
PC	=	Permeability constant, cm/hr

ET	=	Exposure time, hours/day
EF	=	Exposure frequency, days/year
ED	=	Exposure duration, years
CF	=	Conversion factor, 1 L/1000 cm^3
BW	=	Average body weight, kg
AT	=	Averaging time, days

3.2.5.3 Exposure Factors Used To Derive Chronic Daily Intakes

Tables 3-16, 3-17, 3-18, and 3-19 present the exposure factors used in the estimation of potential CDIs/DADs for COPCs retained for current on-site workers, future construction workers, current adult and adolescent recreational users, and future on-site adult and child residents, respectively. USEPA promulgated exposure factors are used in conjunction with USEPA standard default exposure factors for the RME scenarios. Furthermore, when USEPA exposure factors are not available, best professional judgment and site-specific information are used to derive a conservative and defensible value.

3.3 Toxicity Assessment

Section 3.3 presented potential exposure pathways and receptors for this baseline RA. This section will review the available toxicological information for COPCs retained for quantitative evaluation.

An important component of the RA process is the relationship between the dose of a compound (amount to which an individual or population is potentially exposed) and the potential for adverse health effects resulting from exposure to that dose. Dose-response relationships provide a means by which potential public health impacts may be evaluated. Standard reference doses (RfDs) and/or carcinogenic slope factors (CSFs) have been developed for many of the COPCs. This section provides a brief description of these parameters.

3.3.1 Reference Doses

The RfDs and Reference Concentrations (RfCs for inhalation) are developed for chronic and/or subchronic human exposure to chemicals and are based solely on the noncarcinogenic effects of

chemical substances. These values presented in Table 3-20 and are defined as an estimate of a daily exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of adverse effects during a lifetime. The RfD is expressed as dose (mg) per unit body weight (kg) per unit time (day). The RfC is expressed as dose (mg) per cubic meter of air (m^3).

3.3.2 Carcinogenic Slope Factors

CSFs are used to estimate an upper bound lifetime probability of an individual developing cancer as a result of exposure to a particular level of a potential carcinogen (USEPA, 1989b). These factors are presented in Table 3-20 and is reported in units of $(mg/kg/day)^{-1}$. It is derived through an assumed low-dosage linear multistage model and an extrapolation from high to low dose-responses determined from animal studies. The value used in reporting the slope factor is the 95% UCL.

CSFs can also be derived from USEPA promulgated unit risk values for air and/or water. CSFs derived from unit risks cannot, however, be applied to environmental media other than the medium considered in the unit risk estimate.

Slope factors are also accompanied by weight-of-evidence (WOE) classifications which designate the strength of the evidence that the COPC is a potential human carcinogen. The following presents the WOE classifications, as well as descriptions for each category:

USEPA Category	Description of Group	Description of Evidence
Group A	Human Carcinogen	Sufficient evidence of carcinogenicity in humans from epidemiological studies to support a casual association between exposure and carcinogenicity
Group B1	Probable Human Carcinogen	Limited evidence of carcinogenicity in humans from epidermiological studies
Group B2	Probable Human Carcinogen	Sufficient evidence of carcinogenicity in animals, inadequate or lack of evidence of carcinogenicity in humans
Group C	Possible Human Carcinogen	Limited evidence of carcinogenicity in animals, inadequate or lack of evidence of carcinogenicity in humans

Group D	Not classified as to human carcinogenicity	Inadequate evidence of carcinogenicity in animals, inadequate or lack of evidence or carcinogenicity in humans
Group E	No evidence of carcinogenicity	No evidence for carcinogenicity in at least two adequate animal tests or in both epidemiological and animal studies

In addition, more detailed toxicological profiles of the COPCs are presented in Appendix H. The hierarchy (USEPA, 1989b) for choosing these values was:

- Integrated Risk Information System (IRIS) (USEPA, 1998)
- Health Effects Assessment Summary Table (HEAST) (USEPA, 1997b)
- National Center for Environmental Assessment (NCEA)

The IRIS data base is updated monthly and contains both verified RfDs, RfCs and CSFs. The USEPA has formed an RfD work group to review existing data used to derive RfDs and RfCs. Once this task has been completed the verified RfD appears in IRIS. Like the RfD Work Group, the USEPA has also formed the Carcinogen Risk Assessment Verification Endeavor (CRAVE) Work group to review and validate toxicity values used in developing CSFs. Once the slope factors have been verified via extensive peer review, they also appear in the IRIS data base.

HEAST, on the other hand, provides both interim (unverified) and verified RfDs, RfCs and CSFs. This document is published quarterly and incorporates any applicable changes to its data base.

3.3.3 Dermal Absorption Efficiency

Many of the RfDs and CSFs are derived from oral toxicological studies based on administered dose and do not account for the amount of a substance that can penetrate exchange boundaries after contact (e.g., absorbed dose). As a result, there is very little information available regarding dermal toxicity criteria. Therefore, in order to account for a difference in toxicity between an administered dose and an absorbed dose, the RfDs and CSFs (that were based on an administered dose) were adjusted, as described by the USEPA (USEPA, 1989b), using experimentally-derived oral absorption efficiencies. The adjustment for the oral RfD that would correspond to a dermally absorbed dose is represented by multiplying the RfD by an oral absorption efficiency. The adjustment for the oral CSF that would correspond to the

dermally absorbed dose is represented by dividing the CSF by an oral absorption efficiency. The oral absorption efficiencies were obtained from sources such as the NCEA, IRIS, ATSDR toxicological profiles, toxicology publications, toxicology references, and USEPA Regional Offices. In some instances, published information was not available to determine the absorption efficiency. On these occasions, adjustments to the toxicity value were conducted using the following USEPA Region IV default values (USEPA, 1995a):

- VOCs - 80%
- SVOCs - 50%
- Inorganics - 20%

Chemical-specific absorption efficiencies used in this baseline RA for OUs 1, 6, and 7 are also presented in Table 3-20.

3.4 Evaluation of Dioxins and Furans

Dioxins are a class of compounds that contain the dibenzo-p-dioxin nucleus; furans are a class of compounds that contain the dibenzofuran nucleus. The chlorinated dioxins and furans, which are of toxicological concern, are those compounds where the nuclei are substituted with chloride ions at different positions in the benzene and furan rings, respectively. As many as eight positions are available for chlorine substitution on each of the dibenzo-p-dioxin and dibenzofuran nuclei. The chlorinated compounds are called polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs). Approximately 75 congeners of the PCDDs and 135 congeners of the PCDFs are known to exist. Of these, seven of the PCDDs and ten of the PCDFs are considered to be carcinogens of the greatest toxicological concern, with the lesser chlorinated compounds being the most carcinogenically potent. The compound 2,3,7,8-tetrachlorinated dibenzo-p-dioxin (2378-TCDD) is the most studied and is considered the most carcinogenically potent of all the PCDDs and PCDFs (USEPA, 1994c).

Exposure to 2378-TCDD, which is classified as a class B2 carcinogen by the U.S. EPA, results in adverse effects to the liver and adipose tissue, with the liver being the most sensitive target organ (USEPA, 1994b). 2378-TCDD also impacts the immune system, causes reproductive effects, and is teratogenic (USEPA, 1994b). Currently, the oral and inhalation cancer slope factor (CSF) established by the U.S. EPA for 2378 TCDD is 1.50×10^5 $(mg/kg/day)^{-1}$ (USEPA, 1997b). This slope factor was

derived based upon the development of respiratory system and liver tumors in laboratory rats (USEPA, 1997b).

Since CSFs have not been derived by the U.S. EPA for the remaining six PCDDs and ten PCDFs that are also of toxicological significance, a procedure has been developed which incorporates the cancer potencies of these compounds relative to that of 2378-TCDD to obtain 2378-TCDD toxic equivalent concentrations (TEC). This is done by multiplying the measured concentration of each congener by its established relative potency factor, or toxic equivalency factor (TEF).

Although analyses of individual congeners were not performed for samples collected from the sites included in this study, concentrations of total PCDDs/PCDFs were detected in sediment samples collected from OUs 1, 6 and 7. The total PCDDs/PCDFs (and respective TEFs) detected at these SWMUs included total pentachlorinated dibenzo-p-dioxins (total PeCDD; TEF = 0.5), total hexachlorinated dibenzo-p-dioxins (total HxCDD; TEF = 0.1) total tetrachlorinated dibenzofurans (total TCDF; TEF = 0.1), total pentachlorinated dibenzofurans (total PeCDF; TEF = 0.5), and total hexachlorinated dibenzofurans (total HxCDF; TEF = 0.1) (USEPA, 1994c).

3.5 Risk Characterization

The risk characterization combines COPCs, potential exposure, and toxicity, to produce a quantitative estimate of current and future potential human health risks associated with OUs 1, 6, and 7. Excess ILCRs and hazard indices (HIs) discussed in this section include those estimated for the following: potential current on-site commercial/maintenance worker at OUs 1, 6, and 7 who could be exposed to COPCs via accidental ingestion and dermal contact of surface soil, as well as inhalation of fugitive dusts; future adult construction worker who could be exposed to OUs 1, 6, and 7 subsurface soil COPCs via accidental ingestion, dermal contact, and inhalation of fugitive dusts; current adult and adolescent recreational users who could be exposed to sediment COPCs via accidental ingestion and dermal contact; and the future adult and child residents who could be exposed to surface soil and groundwater COPCs via accidental ingestion, dermal contact, and inhalation.

3.5.1 Carcinogenic Compounds

Quantitative risk calculations for potentially carcinogenic compounds estimate inferentially (versus probabilistically) the potential ILCR for an individual in a specified population. This unit of risk refers

to a potential cancer risk that is above the background cancer risk in unexposed individuals. For example, an ILCR of 1 x 10^{-6} indicates that an exposed individual has an increased probability of one in one million of developing cancer subsequent to exposure over the course of their lifetime.
The potential lifetime ILCR for an individual was estimated from the following relationship:

$$ILCR = \sum_{i=1}^{n} (CDI_i \text{ or } DAD_i) \times CSF_i$$

where the CSF_i is expressed as $(mg/kg/day)^{-1}$ for compound i, and the CDI_i and dermally absorbed dose (DAD_i) is expressed as mg/kg/day for compound i. Since the units of CSF are $(\text{mg chemical/kg body weight-day})^{-1}$ and the units of intake or dose are [mg chemical/kg body weight-day], the ILCR value is dimensionless. The aforementioned equation was derived assuming that cancer is a nonthreshold process and that the potential excess risk level is proportional to the cumulative intake over a lifetime.

For quantitative estimation of risk, it is assumed that cancer risks from various exposure routes are additive. Estimated ILCR values will be compared to 1 x 10^{-6} to 1 x 10^{-4} which represents the target risk range of ILCR values considered by the USEPA to represent an acceptable (i.e., de minimis) risk (USEPA, 1990).

3.5.2 Noncarcinogenic Compounds

Noncarcinogenic compounds assume that a threshold toxicological effect exists. Therefore, the potential for noncarcinogenic effects is calculated by comparing (i.e., dividing) CDI_i or DAD_i levels with RfDs for each COPC.

Noncarcinogenic effects are estimated by calculating the HQ for individual chemicals and the HI for overall chemicals and pathways by the following equation:

$$HI = \sum_{i=1}^{n} HQ_i$$

$$where:\ HQ_i = (CDI_i \text{ or } DAD_i)/RfD_i \text{ or } RfC_i$$

A HQ is the ratio of the daily intake or absorbed dose to the reference dose (or reference concentration for inhalation exposure). CDI_i is the chronic daily intake (mg/kg/day) of contaminant i; DAD_i is the dermally absorbed dose (mg/kg/day) of contaminant i; and RfD_i is the reference dose (mg/kg/day) of contaminant i over a prolonged period of exposure. RfC is the reference concentration used when determining exposure due to inhalation. Since the units of RfD are mg/kg-day and the units of CDI or DAD are mg/kg-day, the HQ and HI are dimensionless. To account for the additivity of noncarcinogenic risk following exposure to numerous chemicals, the HI, which is the sum of all the HQs, will be calculated. A ratio of 1.0 is used for examination of the HQ and HI. Ratios less than 1.0 indicate that adverse noncarcinogenic health effects are unlikely. Ratios greater than or equal to 1.0 indicate the potential for adverse noncarcinogenic health effects to occur at that exposure level and caution should be exercised. However, this does not mean that adverse effects will definitely be observed since the RfD incorporates safety and modifying factors to ensure that it is well below that dose for which adverse effects have been observed. This procedure assumes that the risks from exposure to multiple chemicals are additive, an assumption that is probably valid for compounds that have the same target organ or cause the same toxic effect.

3.5.3 Potential Human Health Effects

Potential carcinogenic and noncarcinogenic human health risks were estimated for human receptors under RME scenarios previously identified in Section 3.2.3. For each receptor, total site carcinogenic and total site noncarcinogenic risks were estimated by and are presented in Table 3-21 (Note: the total site risks presented for future residents represent the lifetime sum of the adult and child risks at one residence location for a period of 30 years.). Those scenarios that resulted in unacceptable risks, i.e., those scenarios for which carcinogenic and/or noncarcinogenic risks were estimated to exceed USEPA acceptable risk criteria (the target risk range of 1×10^{-6} to 1×10^{-4} and the target HI value of 1.0, respectively) are shaded in the table. Additional risk summary tables (Tables 3-22 through 3-36) are presented for each of the receptors and scenarios. These additional tables, which are presented by receptor, summarize the medium and pathway risks. Again, as in Table 3-21, those subtotal and total risks in Tables 3-21 through 3-36 that exceed USEPA acceptable risk criteria are shaded. The risk calculation spreadsheets showing the calculation of all CDIs, DADs, ILCRs, and HIs, by receptor, SWMU / AOC and pathway, are presented in Appendix G.

The following risks are discussed by receptor. It should be noted that potentially unacceptable risks were estimated for current on-site workers, current adult and adolescent recreational users, and future on-site residents. No unacceptable risks were estimated for future construction workers.

3.5.3.1 Current On-Site Workers

The following subsections describe the resultant risk values derived for exposures of current on-site workers. Potentially unacceptable risks were estimated for sediment exposures at SWMU 13, and surface soil exposures at SWMU 31 and SWMU 46 to current on-site workers. Acceptable risks were estimated for surface soil exposures at SWMU 26 and AOC C to current on-site workers. These risks are summarized in Tables 3-22 through 3-26.

SWMU 13 (On-Site Worker Exposures to Sediment)

Table 3-22 shows that the total ILCR (1.3×10^{-4}) estimated for on-site worker exposures to sediment in SWMU 13 exceeded the USEPA's generally acceptable target risk range of 1×10^{-6} to 1×10^{-4}. This exceedence is due primarily to dermal exposures to dieldrin (65.1% risk contribution) in the sediment. The total HI value (0.56) estimated for on-site worker exposures to noncarcinogenic COPCs in SWMU 13 sediment is less than 1.0, indicating that the potential for the occurrence of adverse systemic effects is insignificant.

SWMU 26 (On-Site Worker Exposures to Surface Soil)

Table 3-23 shows that the total ILCR (9.2×10^{-5}) estimated for on-site worker exposures to surface soil in SWMU 26 did not exceed the USEPA's generally acceptable target risk range of 1×10^{-6} to 1×10^{-4}. The total HI value (0.08) estimated for on-site worker exposures to noncarcinogenic COPCs in SWMU 26 surface soil is less than 1.0, indicating that the potential for the occurrence of adverse systemic effects is insignificant.

SWMU 31 (On-Site Worker Exposures to Surface Soil)

Table 3-24 shows that the total ILCR (2.3×10^{-4}) estimated for on-site worker exposures to surface soil in SWMU 31 exceeded USEPA's generally acceptable target risk range of 1×10^{-6} to 1×10^{-4}. This

exceedence is due predominantly to dermal exposures to total HxCDF, total PeCDF, and total HxCDD (54.1%, 24.5%, and 15.8% risk contribution, respectively) in the surface soil. No noncarcinogenic risks were estimated since only carcinogenic dioxins and furans were evaluated.

SWMU 46 (On-Site Worker Exposures to Surface Soil)

Table 3-25 shows that the total ILCR (1.4×10^{-4}) estimated for on-site worker exposures to surface soil in SWMU 46 exceeded USEPA's generally acceptable target risk range of 1×10^{-6} to 1×10^{-4}. This exceedence is due predominantly to dermal exposures to beryllium, benzo(a)pyrene, and Aroclor-1260 (65.4%, 11.0%, and 10.3% risk contribution, respectively) in the surface soil. The total HI value (0.11) estimated for on-site worker exposures to noncarcinogenic COPCs in SWMU 46 surface soil is less than 1.0, indicating that the potential for the occurrence of adverse systemic effects is insignificant.

AOC C (On-Site Worker Exposures to Surface Soil)

Table 3-26 shows that the total ILCR (7.2×10^{-5}) estimated for on-site worker exposures to surface soil in AOC C was within the USEPA's generally acceptable target risk range of 1×10^{-6} to 1×10^{-4}. The total HI value (0.15) estimated for on-site worker exposures to noncarcinogenic COPCs in AOC C surface soil is less than 1.0, indicating that the potential for the occurrence of adverse systemic effects is insignificant.

3.5.3.2 Future Construction Workers

The following subsections describe the resultant risk values derived for exposures of future construction workers. Acceptable risks were estimated for subsurface soil exposures to this receptor at SWMU 26, SWMU 46, and AOC C. These risks are summarized in Tables 3-27 through 3-29.

SWMU 26 (Future Construction Worker Exposures to Subsurface Soil)

Table 3-27 shows that the total ILCR (7.3×10^{-6}) estimated for the future construction worker exposures to subsurface soil in SWMU 26 did not exceed USEPA's generally acceptable target risk range of 1×10^{-6} to 1×10^{-4}. The total HI value (0.05) estimated for future construction worker

exposures to noncarcinogenic COPCs in SWMU 26 subsurface soil is less than 1.0, indicating that the potential for the occurrence of adverse systemic effects is insignificant.

SWMU 46 (Future Construction Worker Exposures to Subsurface Soil)

Table 3-28 shows that the total ILCR (4.1×10^{-6}) estimated for the future construction worker exposures to subsurface soil in SWMU 46 did not exceed USEPA's generally acceptable target risk range of 1×10^{-6} to 1×10^{-4}. The total HI value (0.29) estimated for future construction worker exposures to noncarcinogenic COPCs in SWMU 46 subsurface soil is less than 1.0, indicating that the potential for the occurrence of adverse systemic effects is insignificant.

AOC C (Future Construction Worker Exposures to Subsurface Soil)

Table 3-29 shows that the total ILCR (1.2×10^{-6}) estimated for the future construction worker exposures to subsurface soil in AOC C did not exceed USEPA's generally acceptable target risk range of 1×10^{-6} to 1×10^{-4}. The total HI value (0.29) estimated for future construction worker exposures to noncarcinogenic COPCs in AOC C subsurface soil is less than 1.0, indicating that the potential for the occurrence of adverse systemic effects is insignificant.

3.5.3.3 Current Adult and Adolescent Recreational Users

The following subsections describe the resultant risk values derived for exposures of current adult and adolescent recreational users. Potentially unacceptable risks were estimated for sediment exposures to this receptor at SWMU 13. These risks are summarized in Table 3-30.

SWMU 13 (Adult and Adolescent Recreational User Exposures to Sediment)

Table 3-30 shows that the total ILCR (2.2×10^{-4}) estimated for adult recreational user exposures to sediment in SWMU 13 exceeded the USEPA's generally acceptable target risk range of 1×10^{-6} to 1×10^{-4}. This exceedence is due predominately to dermal exposures to dieldrin (65.1% risk contributions) in the sediment. The total ILCR (1.0×10^{-4}) estimated for adolescent recreational user exposures to sediment did not exceed the USEPA's generally acceptable target risk range. The total HI value (0.84) for adult recreational users did not exceed the USEPA's generally acceptable target HI of 1.0. The total

HI value (1.4) for adolescents, however, did exceed the USEPA's generally acceptable target risk of 1.0. This exceedence is due predominantly to dermal exposures to dieldrin, 4,4'-DDT, and alpha-chlordane (51.0%, 29.0%, and 10.2% risk contributions, respectively) in the sediment. Exposures to all these COPCs affect the liver (see Table 6-20). Although the individual dermal HQs did not exceed 1.0, the sum of the dermal HQs for these COPCs is 1.2. Therefore, because the total HI is greater than 1.0, there could be potential adverse systemic risks to the liver when the adolescent recreational user is dermally exposed to sediment.

3.5.3.4 Future On-site Residents

The following subsections describe the resultant risk values derived for exposures of future adult and young child (ages 1 - 6 years old) residents. Potentially unacceptable risks were estimated for surface soil exposures at SWMU 26, SWMU 31, SWMU 46, and AOC C, and sediment exposures at SWMU 13. Acceptable risks were estimated for groundwater exposures at SWMU 06/AOC B. These risks are summarized in Tables 3-31 through 3-36.

SWMU 13 (Adult and Young Child Resident Exposures to Sediment)

Table 3-31 shows that the total ILCRs estimated for adult residential exposures (1.9×10^{-4}) to sediment in SWMU 13 exceeded the USEPA's generally acceptable target risk range of 1×10^{-6} to 1×10^{-4}. This exceedence is due predominately to dermal exposures to dieldrin (65.1% risk contribution) in sediment. The total ILCRs estimated for young child residential exposures (1.9×10^{-4}), however, did not exceed the USEPA's generally acceptable target risk range. The total HI values estimated for adult residential exposures (0.86) to noncarcinogenic COPCs in SWMU 13 sediment did not exceed the USEPA's generally acceptable target risk of 1.0. The total HI values estimated for young child residential exposures (1.8), however, did exceed the USEPA's generally acceptable target risk of 1.0. This exceedence is due predominately to dermal exposures to dieldrin, 4,4'-DDT, and alpha-chlordane (51.0%, 29.0%, and 10.2% risk contributions, respectively) in sediment. Exposures to all these COPCs affect the liver (see Table 6-20). Although the individual dermal HQs did not exceed 1.0, the sum of the dermal HQs for these COPCs is 1.2. Therefore, because the total HI is greater than 1.0, there could be potential adverse systemic risks to the liver when the adolescent recreational user is dermally exposed to sediment.

SWMU 26 (Adult and Young Child Resident Exposures to Surface Soil)

Table 3-32 shows that the total ILCRs estimated for adult and young child residential exposures (1.2 x 10^{-4} and 6.1 x 10^{-5}, respectively) to surface soil in SWMU 26 exceeded USEPA's generally acceptable target risk range of 1 x 10^{-6} to 1 x 10^{-4}. This exceedence is predominately due to dermal exposures to beryllium (98.8% risk contribution) in the surface soil. The total HI values estimated for adult and young child residential exposures (0.12 and 0.24, respectively) to noncarcinogenic COPCs in SWMU 26 surface soil is less than 1.0, indicating that the potential for the occurrence of adverse systemic effects is insignificant.

SWMU 31 (Adult and Young Child Resident Exposures to Surface Soil)

Table 3-33 shows that the total ILCRs estimated for adult and young child residential exposures (3.8 x 10^{-4} and 4.3 x 10^{-4}, respectively) to surface soil in SWMU 31 exceeded USEPA's generally acceptable target risk range of 1 x 10^{-6} to 1 x 10^{-4}. This exceedence is predominately due to ingestion and dermal exposures to total HxCDF, total PeCDF, and total HxCDD (54.1%, 24.5%, and 15.8% risk contribution, respectively) in the surface soil.

SWMU 46 (Adult and Young Child Resident Exposures to Surface Soil)

Table 3-34 shows that the total ILCRs estimated for adult and young child residential exposures (1.9 x 10^{-4} and 1.1 x 10^{-4}, respectively) to surface soil in SWMU 46 exceeded USEPA's generally acceptable target risk range of 1 x 10^{-6} to 1 x 10^{-4}. This exceedence is predominately due to dermal exposures to beryllium, benzo(a)pyrene, and Aroclor-1260 (65.4%, 11.0%, and 10.3% risk contribution, respectively) in the surface soil. The total HI values estimated for adult and young child residential exposures (0.17 and 0.64, respectively) to noncarcinogenic COPCs in SWMU 46 surface soil is less than 1.0, indicating that the potential for the occurrence of adverse systemic effects is insignificant.

SWMU 06/AOC B (Adult and Young Child Resident Exposures to Groundwater)

Table 3-35 shows that the total ILCRs estimated for adult and young child residential exposures (2.9 x 10^{-4} and 1.6 x 10^{-4}, respectively) to groundwater in SWMU 06/AOC B exceeded USEPA's generally acceptable target risk range of 1 x 10^{-6} to 1 x 10^{-4}. This exceedence is due to ingestion exposures to

beryllium (100% risk contribution) in the groundwater. It should be noted, however, that due to naturally poor groundwater quality and low yield capacity of the aquifer being investigated, it is highly improbable that the aquifer will ever be used as a potable source. The total HI values estimated for adult and young child residential exposures (0.18 and 0.42, respectively) to noncarcinogenic COPCs in SWMU 06/AOC B groundwater is less than 1.0, indicating that the potential for the occurrence of adverse systemic effects is insignificant.

AOC C (Adult and Young Child Resident Exposures to Surface Soil)

Table 3-36 shows that the total ILCRs estimated for adult and young child residential exposures (1.1×10^{-4} and 7.8×10^{-5}, respectively) to surface soil in AOC C exceeded USEPA's generally acceptable target risk range of 1×10^{-6} to 1×10^{-4}. This exceedence is predominately due to dermal exposures to Aroclor-1260, benzo(a)pyrene, beryllium, and arsenic (25.8%, 25.6%, 18.8% and 12.8% risk contribution, respectively) in the surface soil. The total HI values estimated for adult and young child residential exposures (0.25 and 0.99, respectively) to noncarcinogenic COPCs in AOC C surface soil is less than 1.0, indicating that the potential for the occurrence of adverse systemic effects is insignificant.

3.6 Sources of Uncertainty

Uncertainties are encountered throughout the process of performing a risk assessment. This section discusses the sources of uncertainty inherent in the following elements of the baseline human health risk assessment prepared for OUs 1, 6, and 7, NSRR:

- Sampling and analysis
- Selection of COPCs
- Exposure assessment
- Toxicity assessment
- Risk characterization

Uncertainties associated with this baseline RA are discussed in the following paragraphs. Table 3-37 summarizes the potential effects of certain uncertainties on the estimation of human health risks.

3.6.1 Sampling and Analysis

The development of a risk assessment depends on the reliability of, and uncertainties associated with, the analytical data available to the risk assessor. These, in turn, are dependent on the operating procedures and techniques applied to the collection of environmental samples in the field and their subsequent analyses in the laboratory. To minimize the uncertainties associated with sampling and analysis at OUs 1, 6, and 7, USEPA approved sampling and analytical methods were employed. Data were generated following RCRA methods of analysis for organics and inorganics, and were validated in accordance with USEPA Region II procedures. Samples were taken from locations specified in the approved Work Plan along with the necessary QA/QC samples. However, there are inherent uncertainties in incorporating several data sets from different investigations. The dates of sample collection differ by several years. The older data may not represent current conditions at the site. In addition, data sets from previous investigations were generated from different analytical methods. The quality and usability of these data are uncertain since no data validation was performed.

The reporting of elevated detection sample quantitation limits (SQLs) for individual VOC and SVOC constituents in surface and subsurface soil samples, in conjunction with the observed elevated detections of TPH, indicate the possible masking of actual constituent concentrations by interferences due to the presence of free product and matrix effects. One reason for the elevated SQLs is the dilution of samples. Analysis of a diluted sample could potentially impact a risk assessment since SQLs are reported at elevated values proportional to the magnitude of the dilution factor, and elevated SQLs could be masking detectable concentrations of lesser values. Values of one-half the elevated SQLs are then used for sample sets greater than ten samples to calculate exposure concentrations in the risk assessment, in accordance with Federal USEPA risk assessment guidance (USEPA, 1989b), equal to the upper limit of the 95 percent confidence interval of the arithmetic mean concentration.

Also, elevated SQLs due to the conversion of wet weight laboratory results to dry weight results for soil samples using the reported percent moisture content of the samples. This procedure is necessary in order to obtain “true” soil concentrations of the solid phase, rather than wet weight results which are representative of both the solid and aqueous phase of the sample.

Analytical data are limited by the precision and accuracy of the methods of analysis which are reflected by the Relative Percent Difference (RPD) of duplicate analyses and the percent recovery of spikes,

respectively. In addition, the statistical methods used to compile and analyze the data (mean concentrations, detection frequencies) are subject to the overall uncertainty in data measurement. Furthermore, chemical concentrations in environmental media fluctuate over time and with respect to sampling location. Analytical data must be sufficient to consider the temporal and spatial characteristics of contamination at the site with respect to exposure.

3.6.2 Selection of COPCs

The selection of COPCs is performed in a risk assessment following the evaluation of data. Analytical data also must be comprehensive in order to address the COPCs associated with the site. Types of organic COPCs encountered at OUs 1, 6, and 7 include SVOCs (in the surface soil and sediment), dioxins/furans (in the surface soils and sediment), pesticides (in the sediment), and PCBs (in the surface soil, subsurface soil, and sediment). Inorganic constituents were detected in every medium investigated. A summary of the COPC selection criteria for chemicals detected in soil and groundwater is presented below.

- Soil COPCs were selected based on comparisons of the detected concentration with Region III risk-based industrial and residential soil COC screening values.

- Groundwater COPCs were selected based on comparisons of the detected concentrations with Region III risk-based tap water COC screening values and Federal MCLs.

- Sediment COPCs were selected based on comparisons of the detected concentrations with Region III risk-based industrial and residential soil COC screening values.

Region III risk-based COC screening values are based on exposure assumptions and equations that are intended to introduce conservatism in the risk assessment process by changing the COPC screening method from a relative toxicity screen as presented in RAGS, to an absolute comparison of risk. However, the use of the Region III COC values which incorporate a set of non-site-specific assumptions in the selection of COPCs at OUs 1, 6, and 7, adds conservatism to the baseline RA.

Currently, no Station closures are planned for NSRR and future residential development of the land is not expected. The application of the residential COC values to soil and groundwater COPC selections would, therefore, tend to result in a list of COPCs that could be considered conservative for a military base. The use of conservative COPC selections in the baseline RA ensures the protection of public health in that the results of the baseline RA are incorporated into the determination of remedial alternatives and remedial action objectives in the CMS.

3.6.3 Exposure Assessment

In performing exposure assessments, uncertainties arise from two main sources. First, uncertainties arise in estimating the fate of a compound in the environment, including estimating release and transport in a particular environmental medium. Second, uncertainties arise in the estimation of chemical intakes resulting from contact by a receptor with a particular medium. An example of uncertainty introduced by the latter source is the estimation of potential intakes to future construction workers as a result of direct contact exposures to subsurface soil during excavation/construction activities. Here, the uncertainty lies in the assumption that the only medium of concern for this receptor is subsurface soil. Construction worker exposures to surface soil could also occur; however, it is assumed in this baseline RA that at surface soil exposures are insignificant at an excavated construction site relative to subsurface soil exposures. It should also be noted that subsurface soil exposure was evaluated for depths from one foot bgs to the water table. In some instances the water table was encountered at around twenty-four feet bgs. It is unlikely that subsurface soil exposure would occur at such depths. However, if few detects are observed in deep subsurface soils, combining with shallower depths may lower overall RME concentration for shallow depths. This may underestimate risk calculations for shallower depths. Intakes due to direct contact exposures to surface soil were estimated for the much more conservative residential scenario. The resulting residential risks are expected to be greater than those that would be estimated for the construction worker scenario, and would most likely drive the surface soil remedial efforts.

To estimate an intake, certain assumptions must be made about exposure events, exposure durations, and the corresponding assimilation of constituents by the receptor. Exposure factors have been generated by the scientific community and have undergone review by the USEPA. The USEPA has published an Exposure Factors Handbook (USEPA, 1989a) which contains the best and latest values. Regardless of the validity of these exposure factors, they have been derived from a range of values

generated by studies of limited numbers of individuals. In all instances, values used in this risk assessment, scientific judgments, and conservative assumptions agree with those of the USEPA.

The USEPA recommended use of the 95%UCL (normal or lognormal) as the RME concentration (in addition to RME assumptions) is designed to overestimate actual risks expected to result from "real-world" exposures. The W-Test (Gilbert, 1987) was performed on all data sets of the draft report in order to determine the underlying distribution (normal or lognormal)of each data set, and consequently, to determine whether the normal or lognormal 95%UCL would be more appropriate to use as an exposure concentration. The results of the W-Test, which are presented in Appendix F, indicate that some data sets consist of normally distributed data; some are lognormally distributed data; some data sets could be described by both distributions; while others could be described by neither distribution. As can be seen in Appendix F, the lognormal 95%UCLs are generally greater in value than the normal 95%UCLs. As discussed in the previous paragraph, the 95%UCL for the arithmetic mean versus the maximum detected concentration was used for risk calculations (i.e., assuming all data sets are normally distributed) to reduce the potential for the overestimation of risks. Likewise, the normal 95%UCL was used as the exposure concentration, instead of the lognormal 95%UCL in order to reduce the potential for the overestimation of risks. Therefore, in this risk assessment, the use of the normal 95%UCL reduces the uncertainty resulting from overestimation of actual exposures assumed to occur randomly across OUs 1, 6, and 7.

3.6.4 Toxicological Assessment

In making quantitative estimates of the toxicity for varying dosages of compounds to human receptors, uncertainties arise from two sources. First, data on human exposure and the subsequent effects are usually insufficient, if they are at all available. Human exposure data usually lack adequate concentration estimations and suffer from inherent temporal variability. Therefore, animal studies are often used, and new uncertainties arise from the process of extrapolating animal results to humans. Second, to obtain observable effects with a manageable number of experimental subjects, high doses of a compound are often used. In this situation, a high dose means that high exposures are used in the experiment with respect to most environmental exposures. Therefore, when applying the results of the animal experiment to the human condition, the effects at the high doses must be extrapolated to approximate effects at lower doses. In extrapolating effects from high doses in animals to low doses

in humans, scientific judgment and conservative assumptions are employed. In selecting animal studies for use in dose-response calculations, the following factors are considered:

- Studies are preferred where the animal closely mimics human toxicokinetics.

- Studies are preferred where dose intake most closely mimics the intake route and duration for humans.

- Studies are preferred which demonstrate the most sensitive response to the compound in question.

For compounds believed to cause threshold effects (i.e., noncarcinogens) safety factors are employed in the extrapolation of effects from animals to humans and from high doses to low doses. In deriving carcinogenic potency factors, the 95% UCL value is promulgated by the USEPA to prevent underestimation of potential risk.

Further conservatism in the baseline RA is also introduced through the use of experimentally-derived oral absorption efficiencies to account for a difference in the degree of toxicity between an administered dose and an absorbed dose. Equating the absorption efficiency of the dermal bi-phasic barrier to the absorption efficiency of the gastrointestinal lining is a very conservative approach that tends to overestimate the potential risk to human health. This is especially true for carcinogenic PAHs. The dermal absorption factor applied to carcinogenic PAHs provides an extremely conservative estimation of risk. Additionally, studies have shown that effects due to absorption of PAHs may not be significant since adverse effects are typically observed at the point of application. Thus, the approach for estimating dermal exposure for PAHs is very conservative.

In summary, the use of conservative assumptions results in quantitative indices of toxicity that are not expected to underestimate potential toxic effects, but may overestimate these effects by an order of magnitude or more.

3.6.5 Risk Characterization

The risk characterization bridges the gap between potential exposure and the possibility of systemic or carcinogenic human health effects, ultimately providing impetus for the remediation of the site or providing a basis for no remedial action.

Uncertainties associated with risk characterization include the assumption of chemical additivity and the inability to predict synergistic or antagonistic interactions between COPCs. These uncertainties are inherent in any inferential risk assessment. To account for this, USEPA- promulgated inputs to the quantitative risk assessment and toxicological indices are calculated to be protective of the human receptor and to err conservatively, so as to not underestimate the potential human health risks.

This section summarizes the results of the baseline RA, and identifies SWMU / AOCs that are associated with COPCs in environmental media that may pose potential human health and ecological risks. The OUs 1, 6, and 7 RFI was conducted at OUs 1, 6, and 7 at NSRR, Puerto Rico. Descriptions and historical background for the SWMU / AOC were provided in the previous sections of this RFI report. The purpose of the baseline RA is to evaluate the potential human health risks posed by the presence of COPCs detected in the environmental media investigated at each designated SWMU / AOC. Further action is recommended for a SWMU / AOC if the results of this baseline RA demonstrate that potentially unacceptable risks may be associated with an environmental medium within the boundary of that SWMU / AOC.

3.7 Summary of Results of the Baseline RA

COPCs were identified based on exceedences of health-based standards/criteria, as discussed in Section 3. 1.2, and as summarized in Tables 3-1 through 3-11. The following items summarize COPCs that were identified from surface soil, subsurface soil and groundwater samples collected throughout OUs 1, 6, and 7.

Surface Soil: Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene, Total TCDF, Total PeCDF, Total PeCDD, Total HxCDF, Total HxCDD, Aroclor-1260, Antimony, Arsenic, Beryllium, Chromium, and Vanadium

Subsurface Soil: Aroclor-1260, Arsenic, Beryllium, Chromium, and Vanadium

Unfiltered Groundwater: Arsenic, Barium, Beryllium, Cadmium, Chromium, Copper, Lead, Mercury, Vanadium, Zinc

Filtered Groundwater: Barium, Beryllium, Lead

Sediment: Benzo(a)pyrene, Total HxCDD, Total HxCDF, Total PeCDF, Total TCDF, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, alpha-Chlordane, gamma-Chlordane, Dieldrin, Aroclor-1260, Antimony, Arsenic, Beryllium, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Vanadium, and Zinc

Constituents identified as COPCs in OUs 1, 6, and 7 were retained for quantitative evaluation in the baseline RA. The baseline RA estimated potential carcinogenic and noncarcinogenic risks to potential current and future human receptors that would result from exposures to COPCs in the investigated environmental media. Current receptor groups evaluated included only the on-site adult workers and adult and adolescent recreational users; future receptor groups evaluated included on-site construction workers and adult and child (ages 1-6 years old) residents. The human exposure pathways evaluated for each receptor are summarized below.

Current on-site adult workers:

- Accidental ingestion of surface soil
- Dermal contact with surface soil
- Inhalation of fugitive dusts emanating from surface soil
- Accidental ingestion of sediment
- Dermal contact with sediment

Future on-site adult construction workers:

- Accidental ingestion of subsurface soil
- Dermal contact with subsurface soil
- Inhalation of fugitive dust emanating from excavated subsurface soil

Current adult and adolescent recreational users:

- Accidental ingestion of sediment

Dermal contact with sediment

Future on-site adult and child (1-6 years old) residents:

Accidental ingestion of surface soil

Dermal contact with surface soil

Inhalation of fugitive dusts emanating from surface soil

Ingestion of groundwater used as drinking water

Dermal contact with groundwater while bathing

Accidental ingestion of sediment

Dermal contact with sediment

However, it should be noted that currently, there are no facilities for personnel housing within OUs 1, 6, and 7, nor are there any likely to be developed. It is highly improbable that OUs 1, 6, and 7 will be developed for residential/ military personnel housing in the future since the mission of NSRR is that of a key naval station providing full support for Atlantic Fleet Weapons training and development activities, and the area surrounding Ensenada Honda (the harbor) is needed to support the mission. Although future residential development of OUs 1, 6, and 7 is highly unlikely, future residential exposures were evaluated as the most conservative (worst-case) scenario.

A quantitative risk evaluation of OUs 1, 6, and 7 was performed for the COPCs, receptors and exposure pathways previously outlined. Only analytical data acquired by Baker during investigations between 1995 and 1997 were used in the human health risk assessment conducted for the draft document. Future construction workers are not estimated to be at risk at OUs 1, 6, and 7. Current on-site workers, current adult and adolescent recreational users and future adult and young child residents, however, may potentially be at risk because of the outlined exposures to the COPCs.

The results of this baseline RA demonstrate that potentially unacceptable human heath risks were estimated with COPCs identified in the environmental media for all of the SWMUs/AOCs. The following briefly summarizes those SWMUs/AOCs and COPCs that may pose unacceptable human health risks to the evaluated receptors.

SWMU 06/AOC B - Former Building 25 Site

Potentially unacceptable carcinogenic risks were estimated for future adult and young child residents that would result predominately from ingestion exposures to beryllium in groundwater.

SWMU 26 - Building 544 Area

Potentially unacceptable carcinogenic risks were estimated for future adult and young child residents that would result predominantly from dermal exposures to beryllium in surface soil.

SWMU 31 - Public Works Yard

Potentially unacceptable carcinogenic risks were estimated for current on-site workers and future adult and young child residents that would result predominantly from dermal and ingestion exposures to total HxCDF, total PeCDF, and total HxCDD in soil.

SWMU 46 - Pole Storage Yard Covered Pad

Potentially unacceptable carcinogenic risks were estimated for current on-site workers and future adult and young child residents that would result predominantly from dermal and ingestion exposures to beryllium, benzo(a)pyrene, and Aroclor-1260 in surface soil.

AOC C - Transformer Storage Pads

Potentially unacceptable carcinogenic risks were estimated for future adult and young child residents that would result predominantly from dermal exposures to Aroclor-1260, benzo(a)pyrene, beryllium, and arsenic in surface soil.

SWMU 13 - Pest Control Shop

Potentially unacceptable carcinogenic risks were estimated for current on-site workers, current and adolescent recreational users, and future adult and young child residents that would result predominantly from dermal exposures to dieldrin, 4,4'-DDT, and alpha-chlordane in sediment.

AOC D - Ensenada Honda Sediments

Risks that could be estimated for the Phase II data were qualitatively derived from a comparison between the Phase I and Phase II data. In the Phase I HEA, potentially unacceptable risks were estimated for recreational users and future residents who may be dermally exposed to sediments in AOC D. In addition, the ecological risk assessment conducted in the HEA indicated that a slight potential for risk to the aquatic environment exists in the SWMUs that were evaluated in AOC D.

TABLES

TABLE 3-1

GROUNDWATER DATA AND COPC SELECTION SUMMARY
SWMU 06/AOC B (FORMER BUILDING 25 SITE)
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Contaminant[1]	Groundwater Criteria[2]		Frequency/Range[3]		Comparison to Criteria		Station Background Values[4]	Selected as a COPC?
	USEPA Region III Tapwater COC Value (µg/L)	Primary Federal MCL (µg/L)	No. of Positive Detects/ No. of Samples	Concentration Range (µg/L)	No. of Detects Above COC Value	No. of Detects Above Primary MCL		
Semivolatiles (µg/L):								
Benzoic acid	15,000	--	1/3	2J	0	--	ND	No
Inorganics (Total, µg/L):								
Arsenic	0.045	50	2/3	3.6-5.8J	2	0	3.55	Yes
Barium	260	2,000	3/3	342-2210	3	1	706	Yes
Beryllium	0.016	4	2/3	1.1J-5.9	2	1	2.7	Yes
Chromium	18	100	3/3	25.9-165	3	1	117	Yes
Cobalt	220	--	3/3	60.9-162	0	--	143	No
Copper	150	1,300	3/3	414J-2480	3	1	299	Yes
Lead	--	15[5]	3/3	5.6-19.1J	--	1	7.1	Yes
Mercury	1.1	2	2/3	0.19-0.23	0	0	ND	No
Nickel	73	100	3/3	25.4-199	1	1	89.8	Yes
Tin	2,200	--	1/3	6.5J	0	--	ND	No
Vanadium	26	--	3/3	269-790	3	--	418.9	Yes
Zinc	1,100	--	3/3	239-2,020	1	--	360.85	Yes

TABLE 3-1 (Continued)

GROUNDWATER DATA AND COPC SELECTION SUMMARY
SWMU 06/AOC B (FORMER BUILDING 25 SITE)
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Contaminant[1]	Groundwater Criteria[2]		Frequency/Range[3]		Comparison to Criteria		Station Background Values[4]	Selected as a COPC?
	USEPA Region III Tapwater COC Value (µg/L)	Primary Federal MCL (µg/L)	No. of Positive Detects/ No. of Samples	Concentration Range (µg/L)	No. of Detects Above COC Value	No. of Detects Above Primary MCL		
Inorganics (Dissolved, µg/L):								
Barium	260	2,000	1/3	454	1	0	239	Yes
Beryllium	0.016	4	1/3	1.9	1	0	2.7	Yes
Chromium	18	100	1/3	1.9J	0	0	3.8	No
Cobalt	220	--	1/3	3.6J	0	--	58.6	No
Copper	150	1,300	2/3	3.6-10.6	0	0	299	No
Lead	--	15	1/3	17.5	--	1	7.1	Yes
Tin	2,200	--	1/3	4J	0	--	ND	No
Vanadium	26	--	1/3	2.4J	0	--	6	No
Zinc	1,100	--	1/3	4.5J	0	--	75.7	No

TABLE 3-1 (Continued)

GROUNDWATER DATA AND COPC SELECTION SUMMARY
SWMU 06/AOC B (FORMER BUILDING 25 SITE)
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Notes:

(1) All concentrations reported in µg/L.
(2) Federal MCLs - Federal Safe Drinking Water Act Maximum Contaminant Level (USEPA, 1996c; Drinking Water Regulations and Health Advisories) were used for COPC selection only in the absence of COC screening values.
COC values - USEPA Region III COC screening value derived from RBC Tables (USEPA, 1997a).
(3) J = Analyte was positively identified, value is estimated
(4) Background values represent two times the arithmetic mean concentrations. Background values not used in the selection of COPCs.
(5) Action level.

-- = No criteria published
ND = No background concentrations detected for constituent.

TABLE 3-2

SURFACE SOIL DATA AND COPC SELECTION SUMMARY
SWMU 26 (BUILDING 544 AREA)
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Contaminant[1]	Risk-Based COC Screening Criteria[2]		Detection Frequency and Range[3]		Comparison to Criteria		SWMU 26 Background Values[4]	Selected as a COPC? (Yes/No)
	Industrial Scenario	Residential Scenario	No. of Positive Detects/ No. of Samples	Range of Positive Detections	Positive Detects Above Industrial COC Value	Positive Detects Above Residential COC Value		
Volatiles (µg/kg):								
2-Hexanone	8,200,000	310,000	1/12	11	0	0	ND	No
Semivolatiles (µg/kg):								
Benzo(a)anthracene	7,800	880	3/12	40J-89J	0	0	ND	No
Benzo(b)fluoranthene	7,800	880	5/12	68J-140J	0	0	ND	No
Benzo(k)fluoranthene	78,000	8,800	4/12	46J-68J	0	0	ND	No
Benzo(a)pyrene	780	88	5/12	40J-80J	0	0	ND	No
Benzo(g,h,i)perylene	6,100,000[5]	230,000[5]	2/12	41J-56J	0	0	ND	No
Bis(2-ethylhexyl)phthalate	410,000	46,000	9/12	41J-150J	0	0	336	No
Chrysene	780,000	88,000	5/12	44J-150J	0	0	ND	No
Di-n-octylphthalate	4,100,000	160,000	3/10	39J-64J	0	0	ND	No
Fluoranthene	8,200,000	310,000	3/12	98J-460	0	0	313	No
Indeno(1,2,3-cd)pyrene	7,800	880	2/12	44J-46J	0	0	ND	No
Pentachlorophenol	48,000	5,300	1/12	170J	0	0	ND	No
Phenanthrene	8,200,000[6]	310,000[6]	2/12	89J-290J	0	0	ND	No
Pyrene	6,100,000	230,000	3/10	74J-330J	0	0	ND	No

TABLE 3-2 (CONTINUED)

SURFACE SOIL DATA AND COPC SELECTION SUMMARY
SWMU 26 (BUILDING 544 AREA)
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Contaminant[1]	Risk-Based COC Screening Criteria[2]		Detection Frequency and Range[3]		Comparison to Criteria		SWMU 26 Background Values[4]	Selected as a COPC? (Yes/No)
	Industrial Scenario	Residential Scenario	No. of Positive Detects/ No. of Samples	Range of Positive Detections	Positive Detects Above Industrial COC Value	Positive Detects Above Residential COC Value		
Pesticides (µg/kg):								
4,4'-DDT	17,000	1,900	1/5	21	0	0	ND	No
Inorganics (mg/kg)								
Arsenic	3.8	0.43	12/12	0.29J-1.5J	0	11	2,867	Yes
Antimony	82	3.1	1/5	1.90	0	0	ND	No
Barium	14,000	550	5/5	178-233	0	0	ND	No
Beryllium	1.3	0.15	11/12	0.11-1.7	3	9	1,940	Yes
Cadmium	100	3.9	1/5	0.35	0	0	ND	No
Chromium	1,000[7]	39[7]	5/5	9.2-24.8	0	0	ND	No
Cobalt	12,000	470	5/5	13-21.7	0	0	ND	No
Copper	8,200	310	5/5	81.1-113	0	0	ND	No
Lead	--	400[8]	5/5	8.4-28.5	--	0	ND	No
Nickel	4,100	160	5/5	5.3-11.6	0	0	ND	No
Selenium	1,000	39	3/5	0.44J-0.86	0	0	ND	No
Tin	100,000	4,700	3/5	2.5-3.1	0	0	ND	No
Vanadium	1,400	55	5/5	79.6-129	0	5	ND	Yes

TABLE 3-2 (CONTINUED)

SURFACE SOIL DATA AND COPC SELECTION SUMMARY
SWMU 26 (BUILDING 544 AREA)
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Contaminant[1]	Risk-Based COC Screening Criteria[2]		Detection Frequency and Range[3]		Comparison to Criteria		SWMU 26 Background Values[4]	Selected as a COPC? (Yes/No)
	Industrial Scenario	Residential Scenario	No. of Positive Detects/ No. of Samples	Range of Positive Detections	Positive Detects Above Industrial COC Value	Positive Detects Above Residential COC Value		
Zinc	61,000	2,300	5/5	34.9-80.6	0	0	ND	No

Notes:

(1) Organic concentrations are reported in µg/kg; inorganic concentrations are reported in mg/kg.
(2) COC = Chemical of concern risk-based screening values derived from USEPA Region III RBC Tables (USEPA, 1997a).
(3) J = Analyte was positively identified. Reported value may not be accurate or precise.
(4) Background represents two times the arithmetic mean concentrations. Background values not used in the selection of COPCs.
(5) Pyrene used as a surrogate for benzo(g,h,i)perylene
(6) Naphthalene used as a surrogate for phenanthrene
(7) Chromium (VI) COC value used for chromium.
(8) Action level for residential soils (USEPA, 1994b).

-- = No criteria published
ND = No background concentrations detected for constituent.

TABLE 3-3

SUBSURFACE SOIL DATA AND COPC SELECTION SUMMARY
SWMU 26 (BUILDING 544 AREA)
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Contaminant[1]	Risk-Based COC Screening Criteria[2]		Detection Frequency and Range[3]		Comparison to Criteria		Station Background Values[4]	Selected as a COPC? (Yes/No)
	Industrial Scenario	Residential Scenario	No. of Positive Detects/ No. of Samples	Range of Positive Detections	Positive Detects Above Industrial COC Value	Positive Detects Above Residential COC Value		
Volatiles (µg/kg):								
2-Hexanone	8,200,000	310,000	1/7	17J	0	0	ND	No
Semivolatiles (µg/kg):								
Diethylphthalate	100,000,000	6,300,000	2/7	55J-160J	0	0	ND	No
Inorganics (mg/kg)								
Arsenic	3.8	0.43	3/7	0.6J-1.8J	0	3	2,287	Yes
Beryllium	1.3	0.15	7/7	0.85-2.9	4	7	1,673	Yes

Notes:

(1) Organic concentrations are reported in µg/kg; inorganic concentrations are reported in mg/kg.
(2) COC = Chemical of concern risk-based screening values derived from USEPA Region III RBC Tables (USEPA, 1997a).
(3) J = Analyte was positively identified. Reported value may not be accurate or precise.
(4) Background values represent two times the arithmetic mean concentrations. Background values not used in the selection of COPCs.

ND = No background concentrations detected for constituent.

TABLE 3-4

SURFACE SOIL DATA AND COPC SELECTION SUMMARY
SWMU 31 (PUBLIC WORKS YARD)
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Contaminant[1]	Risk-Based COC Screening Criteria[2]		Detection Frequency and Range[3]		Comparison to Criteria		Station Background Values[4]	Selected as a COPC? (Yes/No)
	Industrial Scenario	Residential Scenario	No. of Positive Detects/ No. of Samples	Range of Positive Detections	Positive Detects Above Industrial COC Value	Positive Detects Above Residential COC Value		
Dioxins/Furans (µg/kg) [5]:								
Total TCDF	0.38	0.043	3/12	0.04J-0.17J	3	3	ND	Yes
Total PeCDF	0.076	0.0086	6/12	0.07J-3.1	6	6	ND	Yes
Total HxCDD	0.38	0.043	5/12	0.16J-12	5	5	ND	Yes
Total PeCDD	0.076	0.0086	1/12	0.74J	1	1	ND	Yes
Total HxCDF	0.38	0.043	7/12	0.06J-43	5	7	ND	Yes

Notes:

(1) All concentrations are reported in µg/kg.
(2) COC = Chemical of concern risk-based screening values derived from USEPA Region III RBC Tables (USEPA, 1997a).
(3) J = Analyte was positively identified. Reported value may not be accurate or precise.
(4) Background values represent two times the arithmetic mean concentration. Background values not used in the selection of COPCs.
(5) Dioxin/furan COC screening values represent 2,3,7,8-TCDD toxic equivalence concentrations

ND = No background concentrations detected for constituent.

TABLE 3-5

SURFACE SOIL DATA AND COPC SELECTION SUMMARY
SWMU 46 (POLE STORAGE YARD COVERED PAD)
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Contaminant[1]	Risk-Based COC Screening Criteria[2]		Detection Frequency and Range[3]		Comparison to Criteria		Station Background Values[4]	Selected as a COPC? (Yes/No)
	Industrial Scenario	Residential Scenario	No. of Positive Detects/ No. of Samples	Range of Positive Detections	Positive Detects Above Industrial COC Value	Positive Detects Above Residential COC Value		
Volatiles (µg/kg):								
Carbon Disulfide	20,000,000	780,000	1/9	2J	0	0	ND	No
Xyene (total)	100,000,000	16,000,000	2/9	2J-3J	0	0	ND	No
Semivolatiles (µg/kg):								
2,4-Dimethylphenol	4,100,000	160,000	2/24	93J-540	0	0	ND	No
Acenaphthylene	12,000,000[5]	470,000[5]	1/24	89J	0	0	ND	No
Anthracene	61,000,000	2,300,000	4/24	45J-320J	0	0	ND	No
Benzo(a)anthracene	7,800	880	21/24	54J-880J	0	1	ND	Yes
Benzo(b)fluoranthene	7,800	880	21/24	80J-5,400	0	5	ND	Yes
Benzo(k)fluoranthene	78,000	8,800	20/24	48J-1,900	0	0	ND	No
Benzo(a)pyrene	780	88	21/24	54J-2,400	2	17	ND	Yes
Benzo(g,h,i)perylene	6,100,000[6]	230,000[6]	18/24	44J-2,900	0	0	ND	No
Bis(2-ethylhexyl)phthalate	410,000	46,000	1/24	84J	0	0	336	No
Butylbenzylphthalate	41,000,000	1,600,000	2/24	98J-150J	0	0	321	No
Carbazole	290,000	32,000	4/17	63J-86J	0	0	ND	No

TABLE 3-5 (Continued)

SURFACE SOIL DATA AND COPC SELECTION SUMMARY
SWMU 46 (POLE STORAGE YARD COVERED PAD)
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Contaminant[1]	Risk-Based COC Screening Criteria[2]		Detection Frequency and Range[3]		Comparison to Criteria		Station Background Values[4]	Selected as a COPC? (Yes/No)
	Industrial Scenario	Residential Scenario	No. of Positive Detects/ No. of Samples	Range of Positive Detections	Positive Detects Above Industrial COC Value	Positive Detects Above Residential COC Value		
Chrysene	780,000	88,000	21/24	76J-1,600	0	0	ND	No
Dibenzo(a,h)anthracene	780	88	6/24	62J-820	1	4	ND	Yes
Diethylphthalate	100,000,000	6,300,000	1/24	65J	0	0	ND	No
Fluoranthene	8,200,000	310,000	21/24	70J-1,600	0	0	313	No
Indeno(1,2,3-cd)pyrene	7,800	880	19/24	49J-2,700	0	1	ND	Yes
Phenanthrene	8,200,000[7]	310,000[7]	9/24	49J-210J	0	0	ND	No
Pyrene	6,100,000	230,000	21/24	68J-1,100	0	0	ND	No
PCBs (µg/kg):								
Aroclor-1260	2,900	320	23/24	59-35,000	6	17	ND	Yes
Inorganics (mg/kg)								
Arsenic	3.8	0.43	22/24	0.23J-4.3J	2	20	2.43	Yes
Barium	14,000	550	9/9	41.6-173	0	0	105.2	No
Beryllium	1.3	0.15	16/17	0.18-1.8	3	16	0.45	Yes
Cadmium	100	3.9	2/9	0.36-0.45	0	0	0	No
Chromium	1,000[8]	39[8]	9/9	2.4-24.3	0	0	59.3	No

TABLE 3-5 (Continued)

SURFACE SOIL DATA AND COPC SELECTION SUMMARY
SWMU 46 (POLE STORAGE YARD COVERED PAD)
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Contaminant[1]	Risk-Based COC Screening Criteria[2]		Detection Frequency and Range[3]		Comparison to Criteria		Station Background Values[4]	Selected as a COPC? (Yes/No)
	Industrial Scenario	Residential Scenario	No. of Positive Detects/ No. of Samples	Range of Positive Detections	Positive Detects Above Industrial COC Value	Positive Detects Above Residential COC Value		
Cobalt	12,000	470	2/2	6.4-30	0	0	44	No
Copper	8,200	310	2/2	20.2-106	0	0	234	No
Lead	--	400[9]	9/9	3J-36.3	0	0	15.3	No
Nickel	4,100	160	2/2	2.4-14.8	0	0	16.6	No
Tin	100,000	4,700	1/2	1.9J	0	0	2.4	No
Vanadium	1,400	55	2/2	45.5J-179J	0	1	354.5	Yes
Zinc	61,000	2,300	2/2	36.2J-241J	0	0	125.2	No

Notes:

(1) Organic concentrations are reported in µg/kg; inorganic concentrations are reported in mg/kg.
(2) COC = Chemical of concern risk-based screening values derived from USEPA Region III RBC Tables (USEPA, 1997a).
(3) J = Analyte was positively identified. Reported value may not be accurate or precise.
(4) Background values represent two times the arithmetic mean concentrations. Background values not used in the selection of COPCs.
(5) Acenaphthene used as a surrogate for acenaphthylene.
(6) Pyrene used as a surrogate for benzo(g,h,i)perylene.
(7) Naphthalene used as a surrogate for phenanthrene.
(8) Chromium (VI) COC value used for chromium.
(9) Action level for residential soils (USEPA, 1994b).

-- = No criteria published
ND = No background concentrations detected for constituent.

TABLE 3-6

SUBSURFACE SOIL DATA AND COPC SELECTION SUMMARY
SWMU 46 (POLE STORAGE YARD COVERED PAD)
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Contaminant[1]	Risk-Based COC Screening Criteria[2]		Detection Frequency and Range[3]		Comparison to Criteria		Station Background Values[4]	Selected as a COPC? (Yes/No)
	Industrial Scenario	Residential Scenario	No. of Positive Detects/ No. of Samples	Range of Positive Detections	Positive Detects Above Industrial COC Value	Positive Detects Above Residential COC Value		
Semivolatiles (µg/kg):								
Bis(2-ethylhexyl)phthalate	410,000	46,000	2/17	150J-3,600	0	0	ND	No
Diethylphthalate	100,000,000	6,300,000	3/17	67J-240J	0	0	ND	No
Phenol	100,000,000	4,700,000	1/17	280J	0	0	ND	No
Pyrene	6,100,000	230,000	1/17	160J	0	0	ND	No
PCBs (µg/kg):								
Aroclor-1260	2,900	320	1/17	14J	0	0	ND	No
Inorganics (mg/kg)								
Arsenic	3.8	0.43	11/17	0.32J-1.1J	0	10	2.05	Yes
Barium	14,000	550	4/4	49.8-220	0	0	222	No
Beryllium	1.3	0.15	13/15	0.32J-2.2	4	13	0.74	Yes
Chromium	1,000[5]	39[5]	4/4	9.2-30.7	0	0	135.9	No
Cobalt	12,000	470	2/2	7.4-34	0	0	30	No
Copper	8,200	310	2/2	66.8-69	0	0	201.6	No
Lead	--	400[6]	4/4	0.86-3.3	0	0	8.7	No
Nickel	4,100	160	2/2	9.8-23.4	0	0	31.9	No

TABLE 3-6 (Continued)

SUBSURFACE SOIL DATA AND COPC SELECTION SUMMARY
SWMU 46 (POLE STORAGE YARD COVERED PAD)
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Contaminant[1]	Risk-Based COC Screening Criteria[2]		Detection Frequency and Range[3]		Comparison to Criteria		Station Background Values[4]	Selected as a COPC? (Yes/No)
	Industrial Scenario	Residential Scenario	No. of Positive Detects/ No. of Samples	Range of Positive Detections	Positive Detects Above Industrial COC Value	Positive Detects Above Residential COC Value		
Selenium	1,000	39	1/4	0.88	0	0	0.57	No
Silver	1,000	39	1/4	2	0	0	0	
Vanadium	1,400	55	2/2	118-243	0	2	462	Yes
Zinc	61,000	2,300	2/2	57.4-86.8	0	0	88.6	No

Notes:

(1) Organic concentrations are reported in µg/kg; inorganic concentrations are reported in mg/kg.
(2) COC = Chemical of concern risk-based screening values derived from USEPA Region III RBC Tables (USEPA, 1997a).
(3) J = Analyte was positively identified. Reported value may not be accurate or precise.
(4) Background values represent two times the arithmetic mean concentrations. Background values not used in the selection of COPCs.
(5) Chromium (VI) COC value used for chromium.
(6) Action level for residential soils (USEPA, 1994b).

-- = No criteria published
ND = No background concentrations detected for constituent.

TABLE 3-7

SURFACE SOIL DATA AND COPC SELECTION SUMMARY
AOC C (TRANSFORMER STORAGE PADS)
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Contaminant[1]	Risk-Based COC Screening Criteria[2]		Detection Frequency and Range[3]		Comparison to Criteria		Station Background Values[4]	Selected as a COPC? (Yes/No)
	Industrial Scenario	Residential Scenario	No. of Positive Detects/ No. of Samples	Range of Positive Detections	Positive Detects Above Industrial COC Value	Positive Detects Above Residential COC Value		
Volatiles (µg/kg):								
2-Hexanone	8,200,000	310,000	1/29	15J	0	0	ND	No
Semivolatiles (µg/kg):								
2,4-Dinitrotoluene	410,000	16,000	1/29	1700	0	0	ND	No
2,6-Dinitrotoluene	200,000	7,800	1/29	170J	0	0	ND	No
Acenaphthene	12,000,000	470,000	2/29	110J-220J	0	0	ND	No
Acenaphthylene	12,000,000[5]	470,000[5]	3/29	44J-290J	0	0	ND	No
Anthracene	61,000,000	2,300,000	6/29	37J-480	0	0	ND	No
Benzo(a)anthracene	7,800	880	22/29	51J-2,100	0	4	ND	Yes
Benzo(b)fluoranthene	7,800	880	26/29	40J-5,500	0	8	ND	Yes
Benzo(k)fluoranthene	78,000	8,800	23/29	42J-1,900	0	0	ND	No
Benzo(a)pyrene	780	88	24/29	37J-2,600	6	18	ND	Yes
Benzo(g,h,i)perylene	6,100,000[6]	230,000[6]	22/29	53J-1,500	0	0	ND	No
Bis(2-ethylhexyl)phthalate	410,000	46,000	11/29	37J-1,200	0	0	336	No
Carbazole	290,000	32,000	13/29	44J-500	0	0	ND	No

TABLE 3-7 (Continued)

SURFACE SOIL DATA AND COPC SELECTION SUMMARY
AOC C (TRANSFORMER STORAGE PADS)
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Contaminant[1]	Risk-Based COC Screening Criteria[2]		Detection Frequency and Range[3]		Comparison to Criteria		Station Background Values[4]	Selected as a COPC? (Yes/No)
	Industrial Scenario	Residential Scenario	No. of Positive Detects/ No. of Samples	Range of Positive Detections	Positive Detects Above Industrial COC Value	Positive Detects Above Residential COC Value		
Chrysene	780,000	88,000	24/29	57J-3,200	0	0	ND	No
Dibenzo(a,h)anthracene	780	88	10/29	62J-440	0	8	ND	Yes
Dibenzofuran	820,000	31,000	1/29	110J	0	0	ND	No
Dimethylphthalate	100,000,000	78,000,000	1/29	37J	0	0	ND	No
Di-n-butylphthalate	20,000,000	780,000	4/29	38J-110J	0	0	ND	No
Fluoranthene	8,200,000	310,000	25/29	62J-3,000	0	0	313	No
Fluorene	8,200,000	310,000	2/29	100J-200J	0	0	ND	No
Indeno(1,2,3-cd)pyrene	7,800	880	24/29	43J-1,900	0	2	ND	Yes
Naphthalene	8,200,000	310,000	1/29	140J	0	0	ND	No
N-Nitrosodiphenylamine(1)	1,200,000	130,000	1/29	82J	0	0	ND	No
Phenanthrene	8,200,000[7]	310,000[7]	10/29	43J-2,100	0	0	ND	No
Pyrene	6,100,000	230,000	27/29	49J-4,200	0	0	ND	No
PCBs (µg/kg):							ND	No
Aroclor-1260	2,900	320	29/29	62-30,000	8	21	ND	Yes
Inorganics (mg/kg)								

TABLE 3-7 (Continued)

SURFACE SOIL DATA AND COPC SELECTION SUMMARY
AOC C (TRANSFORMER STORAGE PADS)
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Contaminant[1]	Risk-Based COC Screening Criteria[2]		Detection Frequency and Range[3]		Comparison to Criteria		Station Background Values[4]	Selected as a COPC? (Yes/No)
	Industrial Scenario	Residential Scenario	No. of Positive Detects/ No. of Samples	Range of Positive Detections	Positive Detects Above Industrial COC Value	Positive Detects Above Residential COC Value		
Antimony	82	3.1	21/29	0.24J-5.8J	0	1	0	Yes
Arsenic	3.8	0.43	26/29	1J-40.5J	13	26	2.43	Yes
Barium	14,000	550	29/29	18.6-211	0	0	105.2	No
Beryllium	1.3	0.15	29/29	0.04J-0.27J	0	12	0.45	Yes
Cadmium	100	3.9	17/29	0.28J-3.8	0	0	0	No
Chromium	1,000[8]	39[8]	29/29	4-74.4J	0	6	59.3	Yes
Cobalt	12,000	470	29/29	7.1-38.8	0	0	44	No
Copper	8,200	310	24/24	15.4J-228J	0	0	234	No
Lead	--	400[9]	29/29	3.6J-276	0	0	15.3	No
Mercury	61	2.3	8/29	0.03J-0.25	0	0	0.11	No
Nickel	4,100	160	29/29	2.6J-18.2	0	0	16.6	No
Selenium	1,000	39	3/19	0.6J-1J	0	0	1.5	No
Silver	1,000	39	29/29	0.07J-0.42J	0	0	0	No
Thallium	16	0.3	4/29	0.09J-0.11J	0	0	0.12	No
Tin	100,000	4,700	28/29	1.9J-5J	0	0	2.4	No

TABLE 3-7 (Continued)

SURFACE SOIL DATA AND COPC SELECTION SUMMARY
AOC C (TRANSFORMER STORAGE PADS)
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Contaminant[1]	Risk-Based COC Screening Criteria[2]		Detection Frequency and Range[3]		Comparison to Criteria		Station Background Values[4]	Selected as a COPC? (Yes/No)
	Industrial Scenario	Residential Scenario	No. of Positive Detects/ No. of Samples	Range of Positive Detections	Positive Detects Above Industrial COC Value	Positive Detects Above Residential COC Value		
Vanadium	1,400	55	29/29	29.5-211	0	28	354.5	Yes
Zinc	61,000	2,300	29/29	43.6-409	0	0	125.2	No

Notes:

(1) Organic concentrations are reported in µg/kg; inorganic concentrations are reported in mg/kg.
(2) COC = Chemical of concern risk-based screening values derived from USEPA Region III RBC Tables (USEPA, 1997a).
(3) J = Analyte was positively identified. Reported value may not be accurate or precise.
(4) Background values represent two times the arithmetic mean concentrations. Background values not used in the selection of COPCs.
(5) Acenaphthene used as a surrogate for acenaphthylene.
(6) Pyrene used as a surrogate for benzo(g,h,i)perylene.
(7) Naphthalene used as a surrogate for phenanthrene.
(8) Chromium (VI) COC value used for chromium.
(9) Action level for residential soils (USEPA, 1994b).

-- = No criteria published
ND = No background concentrations detected for constituent.

TABLE 3-8

SUBSURFACE SOIL DATA AND COPC SELECTION SUMMARY
AOC C (TRANSFORMER STORAGE PADS)
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Contaminant[1]	Risk-Based COC Screening Criteria[2]		Detection Frequency and Range[3]		Comparison to Criteria		Station Background Values[4]	Selected as a COPC? (Yes/No)
	Industrial Scenario	Residential Scenario	No. of Positive Detects/ No. of Samples	Range of Positive Detections	Positive Detects Above Industrial COC Value	Positive Detects Above Residential COC Value		
Semivolatiles (µg/kg):								
2-Butanone	100,000,000	4,700,000	1/14	18J	0	0	ND	No
Benzo(b)fluoranthene	7,800	880	2/14	40J-94J	0	0	ND	No
Bis(2-ethylhexyl)phthalate	410,000	46,000	2/14	44J-46J	0	0	ND	No
Chrysene	780,000	88,000	1/14	67J	0	0	ND	No
Diethylphthalate	100,000,000	6,300,000	1/14	58J	0	0	ND	No
Phenanthrene	8,200,000[5]	310,000[5]	1/14	240J	0	0	ND	No
PCB (µg/kg):								
Aroclor-1260	2,900	320	8/14	20J-170	0	0	ND	No
Inorganics (mg/kg)								
Antimony	82	3.1	9/14	0.22J-0.49J	0	0	0	No
Arsenic	3.8	0.43	5/14	1J-5.6J	1	5	2.05	Yes
Barium	14,000	550	14/14	31.9-253	0	0	222	No
Beryllium	1.3	0.15	14/14	0.1J-0.48J	0	10	0.74	Yes
Cadmium	100	3.9	5/14	0.13J-1.1	0	0	0.74	No
Chromium	1,000[6]	39[6]	14/14	7.9J-50.1J	0	1	135.9	Yes

TABLE 3-8 (CONTINUED)

SUBSURFACE SOIL DATA AND COPC SELECTION SUMMARY
AOC C (TRANSFORMER STORAGE PADS)
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Contaminant[1]	Risk-Based COC Screening Criteria[2]		Detection Frequency and Range[3]		Comparison to Criteria		Station Background Values[4]	Selected as a COPC? (Yes/No)
	Industrial Scenario	Residential Scenario	No. of Positive Detects/ No. of Samples	Range of Positive Detections	Positive Detects Above Industrial COC Value	Positive Detects Above Residential COC Value		
Cobalt	12,000	470	14/14	7.3-63.6	0	0	30	No
Copper	8,200	310	2/2	85.6-105	0	0	201.6	No
Lead	--	400[7]	14/14	1.4-9.2	0	0	8.7	No
Mercury	61	2.3	4/14	0.03J-0.09	0	0	0.09	No
Nickel	4,100	160	14/14	6-24.8	0	0	31.9	No
Selenium	1,000	39	6/14	1J-2.7J	0	0	0.57	No
Silver	1,000	39	12/14	0.08J-0.29J	0	0	0	No
Thallium	16[8]	0.63[8]	1/14	0.12J	0	0	0	No
Tin	100,000	4,700	14/14	1.8J-3.2J	0	0	2.96	No
Vanadium	1,400	55	14/14	95.3-274	0	14	462	Yes
Zinc	61,000	2,300	14/14	48.7-171	0	0	88.6	No

TABLE 3-8 (CONTINUED)

SUBSURFACE SOIL DATA AND COPC SELECTION SUMMARY
AOC C (TRANSFORMER STORAGE PADS)
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Notes:

(1) Organic concentrations are reported in µg/kg; inorganic concentrations are reported in mg/kg.
(2) COC = Chemical of concern risk-based screening values derived from USEPA Region III RBC Tables (USEPA, 1997a).
(3) J = Analyte was positively identified. Reported value may not be accurate or precise.
(4) Background values represent two times the arithmetic mean concentrations. Background values not used in the selection of COPCs.
(5) Naphthalene used as a surrogate for phenanthrene.
(6) Chromium (VI) COC value used for chromium.
(7) Action level for residential soils (USEPA, 1994b).
(8) COC screening values for thallium carbonate, chloride, and sulfate (USEPA, 1997a).

-- = No criteria published
ND = No background concentrations detected for constituent.

TABLE 3-9

GROUNDWATER DATA AND COPC SELECTION SUMMARY
SWMU 13 (PEST CONTROL SHOP)
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Contaminant[1]	Groundwater Criteria[2]		Frequency/Range[3]		Comparison to Criteria		Station Background Values[4]	COPC Selection
	Federal MCL (µg/L)	USEPA Region III Tapwater COC Value (µg/L)	No. of Positive Detects/No. of Samples	Concentration Range (µg/L)	No. of Detects Above MCL	No. of Detects Above COC Value		Retained as a COPC?
Pesticides (µg/L):								
4,4'-DDD	--	0.28	1/7	0.054J	--	0	ND	No

Notes:

(1) All concentrations reported in µg/L.
(2) Federal MCL - Federal Safe Drinking Water Act Maximum Contaminant Level (USEPA, 1996c; Drinking Water Regulations and Health Advisories). COC values - USEPA Region III COC screening value derived from RBC Tables (USEPA, 1997a).
(3) J = Analyte was positively identified, value is estimated
(4) Background values represent two times the arithmetic mean concentrations. Background values not used in the selection of COPCs.

-- = No criteria published
ND = No background concentrations detected for constituent.

TABLE 3-10

SEDIMENT DATA AND COPC SELECTION SUMMARY
SWMU 13 (PEST CONTROL SHOP)
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Contaminant[1]	Sediment Criteria[2]		Detection Frequency and Range[3]		Comparison to Criteria		Station Background Values[4]	Selected as a COPC? (Yes/No)
	Risk-Based COC Screening Criteria Industrial Scenario (µg/kg)	Risk-Based COC Screening Criteria Residential Scenario (µg/kg)	No. of Positive Detects/ No. of Samples	Range of Positive Detections	Positive Detects Above Industrial COC	Positive Detects Above Residential COC		
Volatiles (µg/kg)								
2-Chloro-1,3-butadiene	4,100,000	160,000	1/11	180J	0	0	ND	No
Semivolatiles (µg/kg):								
Benzo(a)anthracene	7,800	880	2/11	87J-140J	0	0	ND	No
Benzo(b)fluoranthene	7,800	880	4/11	56J-760	0	0	ND	No
Benzo(k)fluoranthene	78,000	8,800	1/11	140J	0	0	ND	No
Benzo(a)pyrene	780	88	2/11	120J-290J	0	2	ND	Yes
Benzo(g,h,i)perylene	6,100,000 [5]	230,000 [5]	2/11	120J-220J	0	0	ND	No
Bis(2-ethylhexyl)phthalate	410,000	46,000	2/11	140J-140J	0	0	ND	No
Chrysene	780,000	88,000	3/11	47J-560J	0	0	ND	No
Fluoranthene	8,200,000	310,000	3/11	42J-220J	0	0	ND	No
Indeno(1,2,3-cd)pyrene	7,800	880	2/11	150J-210J	0	0	ND	No
Phenanthrene	6,100,000 [6]	230,000 [6]	1/11	46J	0	0	ND	No
Pyrene	6,100,000	230,000	3/11	62J-270J	0	0	ND	No

TABLE 3-10 (Continued)

SEDIMENT DATA AND COPC SELECTION SUMMARY
SWMU 13 (PEST CONTROL SHOP)
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Contaminant[1]	Sediment Criteria[2]		Detection Frequency and Range[3]		Comparison to Criteria		Station Background Values[4]	Selected as a COPC? (Yes/No)
	Risk-Based COC Screening Criteria Industrial Scenario (µg/kg)	Risk-Based COC Screening Criteria Residential Scenario (µg/kg)	No. of Positive Detects/ No. of Samples	Range of Positive Detections	Positive Detects Above Industrial COC	Positive Detects Above Residential COC		
Pesticides (µg/kg):								
4,4'-DDD	24,000	2,700	10/11	2.9-50,000	2	7	ND	Yes
4,4'-DDE	17,000	1,900	10/11	14J-21,000	2	7	ND	Yes
4,4'-DDT	17,000	1,900	9/11	20-34,000	2	6	ND	Yes
alpha-Chlordane	16,000 [7]	1,800 [7]	5/11	52J-5,000J	0	2	ND	Yes
Dieldrin	360	40	5/11	220J-1,800	3	5	ND	Yes
gamma-Chlordane	16,000 [7]	1,800 [7]	5/11	48J-5,000J	0	2	ND	Yes

Notes:

(1) All concentrations are reported in µg/kg.
(2) Risk-Based COC Screening Criteria Residential Scenario
SSV = Sediment Screening Value (Long, et al., 1995).
(3) J = Analyte was positively identified. Reported value may not be accurate or precise.
(4) Background values represent two times the arithmetic mean concentrations. Background values not used in the selection of COPCs.
(5) Pyrene used as a surrogate for benzo(g,h,i)perylene.
(6) Pyrene used as a surrogate for phenanthrene.
(7) Value for chlordane used for alpha-chlordane and gamma-chlordane.

-- = No criteria published
ND = No background concentrations detected for constituent.

TABLE 3-11

DATA COMPARISONS FOR AOC D (STATION LANDFILL) SEDIMENT
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

	Range of Positive Detections - Phase I Data [1]	Range of Positive Detections - Phase II Data [2]
Volatiles (µg/kg):		
Acetone	26-93	ND
Xyene (total)	2J	ND
Semivolatiles (µg/kg):		
Benzo(a)anthracene	120J	ND
Benzo(a)pyrene	64J-160J	ND
Benzo(b)fluoranthene	63J-310J	ND
Benzo(g,h,i)perylene	140J	ND
Benzo(k)fluoranthene	72J-130J	ND
Benzoic Acid	570J-3,600	ND
Bis(2-ethylhexyl)phthalate	59J-200J	ND
Chrysene	140J-180J	ND
Fluoranthene	120J-130J	ND
Indeno(1,2,3-cd)pyrene	51J-140J	ND
Phenanthrene	86J	ND
Phenol	100J-800	ND
Pyrene	62J-180J	ND
Pesticides/PCBs (µg/kg):		
4,4'-DDD	42-97	ND

TABLE 3-11 (Continued))

SEDIMENT DATA AND COPC SELECTION SUMMARY
AOC D (STATION LANDFILL)
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

	Range of Positive Detections - Phase I Data [1]	Range of Positive Detections - Phase II Data [2]
4,4'-DDE	370-930	ND
4,4'-DDT	63-130	ND
Aroclor-1260	440	ND
Herbicides (µg/kg):		
2,4,5-TP (Silvex)	40J	ND
Dioxins/Furans (µg/kg):		
Total HxCDD	0.64J-2.4J	NA
Total HxCDF	0.31J-2.2J	NA
Total PeCDF	0.34J	NA
Total TCDF	0.13J	NA
Inorganics (mg/kg)		
Antimony	0.31J-23.6J	0.31J-0.40J
Arsenic	0.19J-9.8	2J-2.4J
Barium	6.3-486J	7.1J-7.8J
Beryllium	0.07-0.56	ND
Cadmium	0.11J-4.7	0.11J
Chromium	3.3-49.2	3.3-5.8
Cobalt	0.93-34.7	1.6
Copper	0.71J-1,020	0.71-7.8

TABLE 3-11 (Continued))

SEDIMENT DATA AND COPC SELECTION SUMMARY
AOC D (STATION LANDFILL)
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

	Range of Positive Detections - Phase I Data [1]	Range of Positive Detections - Phase II Data [2]
Lead	0.36J-966J	0.73-1
Mercury	0.04-0.85	ND
Nickel	1.2J-63.3	1.2
Selenium	0.23J-1.8J	ND
Silver	0.38J-0.63	ND
Tin	1J-181	1J-1.9J
Vanadium	3.6J-154J	3.6J-19.3
Zinc	1.7J-1,780	1.7J-6

Notes:

[1] Data from 1995-1996 investigation.
[2] Data from 1997 investigation.

ND = Not detected.
NA = Not analyzed.

J = Analyte was positively identified. Reported value may not be accurate or precise.

TABLE 3-12

SUMMARY OF SURFACE SOIL AND SUBSURFACE SOIL COPCs [(1)]
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

	Surface Soil				Subsurface Soil		
COPCs	**SWMU 26**	**SWMU 31**	**SWMU 46**	**AOC C**	**SWMU 26**	**SWMU 46**	**AOC C**
Semivolatiles:							
Benzo(a)anthracene			X	X			
Benzo(a)pyrene			X	X			
Benzo(b)fluoranthene			X	X			
Dibenzo(a,h)anthracene			X	X			
Indeno(1,2,3-cd)pyrene			X	X			
Dioxins/Furans:							
Total TCDF		X					
Total PeCDF		X					
Total HxCDD		X					
Total PeCDD		X					
Total HxCDF		X					
PCBs:							
Aroclor-1260			X	X			
Inorganics:							
Antimony				X			
Arsenic	X		X	X	X	**X**	X
Beryllium	X		X	**X**	X	X	**X**
Chromium				X			**X**
Vanadium	X		**X**	**X**		**X**	**X**

Notes:

(1) Only the SWMUs and AOCs for which COPC were identified are presented in the table.

X Chemical identified as a COPC for SWMU/AOC.

Bold Xs indicate that the COPCs were less than the corresponding background values

TABLE 3-13

SUMMARY OF GROUNDWATER AND SEDIMENT COPCs (1)
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

	Groundwater COPCs	**Sediment COPCs**
	SWMU 06 / AOC B	**SWMU 13**
Semivolatiles:		
Benzo(a)pyrene		X
Pesticides:		
4,4'-DDD		X
4,4'-DDE		X
4,4'-DDT		X
alpha-Chlordane		X
gamma-Chlordane		X
Dieldrin		X
Inorganics:		
Total Arsenic	X	
Total Barium	X	
Total Beryllium	X	
Total Chromium	X	
Total Copper	X	
Total Lead	X	
Total Nickel	X	
Total Vanadium	X	
Total Zinc	X	
Dissolved Barium	X	
Dissolved Beryllium	X	
Dissolved Lead	X	

Notes:
(1) Only the SWMUs and AOCs for which COPC were identified are presented in the table.
X Chemical identified as a COPC for SWMU/AOC.

TABLE 3-14

PHYSICAL AND CHEMICAL PROPERTIES FOR ORGANIC CHEMICALS OF POTENTIAL CONCERN
OUs 1,6, AND 7
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Constituents	Vapor Pressure (mm Hg)	Water Solubility (mg/L)	Log K_{oc}	Log K_{ow}	Specific Gravity (g/cm^3)	Henry's Law Constant ($atm\text{-}m^3/mole$)	Mobility Index
Semivolatiles:							
Benzo(a)anthracene	2.20E-08	5.70E-03	6.14	5.60	1.32	1.16E-06	-16
Benzo(a)pyrene	5.60E-09	1.20E-03	6.74	6.06	--	1.55E-06	-18
Benzo(b)fluoranthene	5.00E-07	1.40E-02	5.74	6.06	--	1.19E-05	-14
Dibenzo(a,h)anthracene	1.00E-10	5.00E-04	6.52	6.80	--	7.33E-08	-20
Indeno(1,2,3-cd)pyrene	1.00E-10	5.30E-04	6.20	6.50	--	6.86E-08	-19
Dioxins/Furans:							
Total TCDF (1)	1.70E-06	2.00E-04	6.52	6.72	--	3.60E-03	-16
Total PeCDF (1)	1.70E-06	2.00E-04	6.52	6.72	--	3.60E-03	-16
Total PeCDD (1)	1.70E-06	2.00E-04	6.52	6.72	--	3.60E-03	-16
Total HxCDF (1)	1.70E-06	2.00E-04	6.52	6.72	--	3.60E-03	-16
Total HxCDD(1)	1.70E-06	2.00E-04	6.52	6.72	--	3.60E-03	-16
Pesticides/PCBs:							
4,4'-DDD	1.89E-06	1.00E-01	5.89	6.20	--	7.96E-06	-13
4,4'-DDE	6.50E-06	4.00E-02	6.64	7.00	--	6.80E-06	-13
4,4'-DDT	5.50E-06	5.00E-03	5.39	6.19	--	5.13E-04	-13
alpha-Chlordane(2)	1.00E-05	5.60E-01	5.15	3.32	--	9.63E-06	-10
gamma-Chlordane(2)	1.00E-05	5.60E-01	5.15	3.32	--	9.63E-06	-10
Dieldrin	1.78E-07	1.95E-01	3.23	3.50	1.75	4.58E-07	-11
Aroclor-1260(3)	7.70E-05	3.10E-02	5.72	6.04	0.66	1.07E-03	-11

TABLE 3-14 (Continued)

PHYSICAL AND CHEMICAL PROPERTIES FOR ORGANIC CHEMICALS OF POTENTIAL CONCERN
OUs 1,6, and 7
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Notes:

(1) Physical constants for 2,3,7,8-TCDD
(2) Physical constants for Chlordane
(3) Physical constants for PCBs

-- = Value not available.

TABLE 3-15

SUMMARY OF ANALYSIS OF INDIVIDUAL SWMUs/AOCs
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

SWMU/AOC	Media	Current On-Site Workers	Future Construction Workers	Current Recreational Users	Future Residents
06 / AOC B	Groundwater				X
26	Surface Soil	X			X
	Subsurface Soil		X		
31	Surface Soil	X			X
46	Surface Soil	X			X
	Subsurface Soil		X		
AOC C	Surface Soil	X			X
	Subsurface Soil		X		
13	Groundwater				X
	Sediment	X		X	X

TABLE 3-16

EXPOSURE INPUT PARAMETERS FOR CURRENT ON-SITE WORKERS
SURFACE SOIL AND SEDIMENT
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Input Parameter	Media	Units	Input Values	Comments&References
ED, Exposure Duration	Soil/Sediment	years	25	USEPA, 1991a
IR, Ingestion Rate	Soil/Sediment	mg/day	100	USEPA, 1991a
EF, Exposure Frequency	Soil/Sediment	days&yr	250	Professional Judgment
AF, Adherence Factor	Soil/Sediment	mg/cm^2	1.0	USEPA, 1991/1992a
ABS, Dermal Absorption Factor for Organics/Inorganics	Soil/Sediment	unitless	Chemical-specific (1)	USEPA, 1995a
ET, Exposure Time	Soil	hrs&day	8	USEPA, 1991a
SA, Surface Area	Soil/Sediment	cm^2/day	5,300(2)	USEPA, 1992a
FI, Fraction Ingested	Soil/Sediment	unitless	0.5	USEPA, 1989b
AT_{nc}, Averaging Time - Noncarcinogens	Soil/Sediment	days	9,125	USEPA, 1989b
AT_c, Averaging Time - Carcinogens	Soil/Sediment	days	25,550	USEPA, 1989b
BW, Body Weight	Soil/Sediment	kg	70	USEPA, 1989b
RR, Respiration Rate	Air (3)	m^3/hr	1.25	USEPA, 1991a

Notes:

(1) The The following USEPA Region III default absorbance factors will be applied to estimate dermal intake of COPCs in soil and sediment (USEPA, 1995a):

SVOCs/Pesticides - 10%
Dioxins/Furans - 3% (USEPA, 1992a)
PCBs - 6%
Arsenic - 3.2%
Inorganics - 1%

(2) Skin surface area available for contact assuming an adult wears a short-sleeved shirt, short pants, and shoes.

(3) Inhalation of fugative dusts emanating from surface soil.

TABLE 3-16 (Continued)

EXPOSURE INPUT PARAMETERS FOR CURRENT ON-SITE WORKERS
SURFACE SOIL AND SEDIMENT
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

References:

USEPA, 1995a. Assessing Dermal Exposure from Soil.

USEPA, 1992a. Dermal Exposure Assessment: Principles and Applications ! Interim Report.

USEPA, 1991a. Risk Assessment Guidance for Superfund, Volume I ! Human Health Evaluation Manual Supplemental Guidance. "Standard Default Exposure Factors." Interim Final.

USEPA, 1989a. Exposure Factors Handbook.

USEPA, 1989b. Risk Assessment Guidance for Superfund, Volume I ! Human Health Evaluation Manual (Part A) Interim Final.

TABLE 3-17

EXPOSURE INPUT PARAMETERS FOR FUTURE CONSTRUCTION WORKERS
SUBSURFACE SOIL
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Input Parameter	Units	Input Values	Comments&References
ED, Exposure Duration	years	1	USEPA, 1991a
EF, Exposure Frequency	days&year	250	USEPA, 1991a
ET, Exposure Time	hrs&day	8	USEPA, 1991a
IR, Ingestion Rate	mg&day	480	USEPA, 1991a
SA, Exposed Surface Area	cm^2&day	5,300[(1)]	USEPA, 1992a
RR, Respiration Rate	m^3&hr	1.25	USEPA, 1989a
FI, Fraction Ingested	unitless	1.0	Professional Judgment
ABS, Dermal Absorption Factor	unitless	Chemical-specific[(2)]	USEPA, 1995a
AF, Adherence Factor	mg&cm^2	1	USEPA, 1991a/1992a
BW, Body Weight	kg	70	USEPA, 1989b
AT_{nc}, Averaging Time - Noncarcinogens	days	365	USEPA, 1989b
AT_c, Averaging Time - Carcinogens	days	25,550	USEPA, 1989b

Notes:

(1) Skin surface area available for contact for an individual wearing a sleeveless shirt, long pants, and shoes.

(2) The following USEPA Region III default absorbance factors will be applied to estimate dermal intake of COPCs in subsurface soil (USEPA, 1995a):
Arsenic - 3.2%
Inorganics - 1%

References:

USEPA, 1995a. Assessing Dermal Exposure from Soil.

USEPA, 1992a. Dermal Exposure Assessment: Principles and Applications ! Interim Report.

USEPA, 1991a. Risk Assessment Guidance for Superfund, Volume I ! Human Health Evaluation Manual Supplemental Guidance. "Standard Default Exposure Factors." Interim Final.

USEPA, 1989a. Exposure Factors Handbook.

USEPA, 1989b. Risk Assessment Guidance for Superfund, Volume I ! Human Health Evaluation Manual (Part A) Interim Final.

TABLE 3-18

EXPOSURE INPUT PARAMETERS FOR
CURRENT ADULT AND ADOLESCENT RECREATIONAL USERS
SEDIMENT
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Input Parameter	Units	Input Values		Comments&References
		Adolescent (7-15 years)	Adult	
ED, Exposure Duration	year	9	30	Professional Judgment
EF, Exposure Frequency	days/year	104[1]	104[1]	Professional Judgment
IR, Ingestion Rate	mg/day	100	100	USEPA, 1989b
SA, Surface Area	cm^2	15,700[2]	20,000[2]	USEPA, 1989a/1992a
FI, Fraction Ingested	unitless	0.5	0.5	Professional Judgment
ABS, Absorption Factor	unitless	Chemical Specific[3]	Chemical Specific[3]	USEPA, 1995a
AF, Adherence Factor	mg&cm^2	1	1	USEPA, 1992a
BW, Body Weight	kg	37	70	USEPA, 1989b
AT_{nc}, Averaging Time - Noncarcinogens	day	3,285	10,950	USEPA, 1989b
AT_c, Averaging Time - Carcinogens	day	25,550	25,550	USEPA, 1989b

Notes:

(1) Frequency conservatively assumes 2 days per weekend, every weekend for 12 months.

(2) Total body surface area is conservatively assumed to be available for exposure.

(3) The following USEPA Region III default absorbance factors will be applied to estimate dermal intake of COPCs in soil and sediment (USEPA, 1995a):

SVOCs/Pesticides - 10%
Dioxins/Furans - 3% (USEPA, 1992a)
PCBs - 6%
Arsenic - 3.2%
Inorganics - 1%

References:

USEPA, 1995a. Assessing Dermal Exposure from Soil.

USEPA, 1992a. Dermal Exposure Assessment: Principles and Applications ! Interim Report.

USEPA, 1989a. Exposure Factors Handbook.

USEPA, 1989b. Risk Assessment Guidance for Superfund, Volume I ! Human Health Evaluation Manual (Part A) Interim Final.

TABLE 3-19

EXPOSURE INPUT PARAMETERS FOR FUTURE RESIDENT CHILDREN AND ADULTS
SURFACE SOIL, GROUNDWATER AND SEDIMENT
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Input Parameter	Media	Units	Input Values		Comments&References
			Child (1 to 6 years)	Adult	
ED, Exposure Duration	All Media	years	6	24	USEPA, 1991a
EF, Exposure Frequency	Soil/Groundwater	days&year	350	350	USEPA, 1991a
	Sediment	days/year	104(1)	104(1)	Professional Judgment
ET, Exposure Time	Groundwater	hrs&day	0.2	0.2	USEPA, 1989a
	Surface Soil	hrs&day	24	24	Professional Judgement
IR, Ingestion Rate	Groundwater	L&day	1	2	USEPA, 1991a
	Soil/Sediment	mg&day	200	100	USEPA, 1989b
SA, Surface Area	Groundwater/ Sediment	cm^2	8,023 (2)	20,000(2)	USEPA, 1992a
	Soil	cm^2	2,006(3)	5,300(3)	USEPA, 1989a and 1992a
RR, Respiration Rate	Air (Fugitive Dusts)	m^3&hr	0.83	0.83	USEPA, 1991a
FI, Fraction Ingested	Soil/Sediment	unitless	1.0	1.0	USEPA, 1989b/ Professional Judgement
ABS, Absorbance Factor	Soil/Sediment	unitless	Chemical Specific(4)	Chemical Specific(4)	USEPA, 1995a
AF, Adherence Factor	Soil/Sediment	mg&cm^2	1	1	USEPA, 1992b
BW, Body Weight	All Media	kg	15	70	USEPA, 1989b
PC, Permeability Constant	Groundwater	cm&hr	Chemical-Specific	Chemical-Specific	USEPA, 1992a
AT_{nc}, Averaging Time - Noncarcinogens	All Media	day	2,190	8,760	USEPA, 1989b
AT_c, Averaging Time - Carcinogens	All Media	day	25,550	25,550	USEPA, 1989b

Notes:

(1) Frequency conservatively assumes 2 days per weekend, every weekend for 12 months.

(2) Represents total body surface area.

(3) Represents approximately 25% of the total body surface area.

TABLE 3-19 (Continued)

EXPOSURE INPUT PARAMETERS FOR FUTURE RESIDENT CHILDREN AND ADULTS
SURFACE SOIL, GROUNDWATER AND SEDIMENT
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

(4) The following USEPA Region III default absorbance factors will be applied to estimate dermal intake of COPCs in soil and sediment (USEPA, 1995a):

SVOCs/Pesticides - 10%
Dioxins/Furans - 3% (USEPA, 1992a)
PCBs - 6%
Arsenic - 3.2%
Inorganics - 1%

References:

USEPA, 1995a. Assessing Dermal Exposure from Soil.

USEPA, 1992a. Dermal Exposure Assessment: Principles and Applications ! Interim Report.

USEPA, 1991a. Risk Assessment Guidance for Superfund, Volume I ! Human Health Evaluation Manual Supplemental Guidance. "Standard Default Exposure Factors." Interim Final.

USEPA, 1989a. Exposure Factors Handbook.

USEPA, 1989b. Risk Assessment Guidance for Superfund, Volume I ! Human Health Evaluation Manual (Part A) Interim Final.

TABLE 3-20

HUMAN HEALTH RISK ASSESSMENT TOXICITY FACTORS
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Constituents	Oral CSF $(mg/kg/day)^{-1}$	Inhalation CSF $(mg/kg/day)^{-1}$	Oral RfD (mg/kg/day)	Inhalation RfD (mg/kg/day)	Oral Absorption Factors	WOE	Target Organ (Systemic Toxicants)	Critical Effect (Systemic Toxicants)
Semivolatiles:								
Benzo(a)anthracene	7.3E-01 (e)	3.1E-01 (e)	--	--	50%	B2	--	--
Benzo(a)pyrene	7.3 (i)	3.1 (e)	--	--	50%	B2	--	--
Benzo(b)fluoranthene	7.3E-01 (e)	3.1E-01 (e)	--	--	50%	B2	--	--
Dibenzo(a,h)anthracene	7.3 (e)	3.1 (e)	--	--	50%	B2	--	--
Indeno(1,2,3-cd)pyrene	7.3E-01 (e)	3.1E-01 (e)	--	--	50%	B2	--	--
Dioxins/Furans:								
Total TCDF (1)	1.50E+05 (h)	1.50E+05 (h)	--	--	90%	B2	--	--
Total PeCDD(1)	1.50E+05 (h)	1.50E+05 (h)	--	--	90%	B2	--	--
Total PeCDF (1)	1.50E+05 (h)	1.50E+05 (h)	--	--	90%	B2	--	--
Total HxCDD(1)	1.50E+05 (h)	1.50E+05 (h)	--	--	90%	B2	--	--
Total HxCDF (1)	1.50E+05 (h)	1.50E+05 (h)	--	--	90%	B2	--	--

TABLE 3-20 (Continued)

HUMAN HEALTH RISK ASSESSMENT TOXICITY FACTORS
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Constituents	Oral CSF $(mg/kg/day)^{-1}$	Inhalation CSF $(mg/kg/day)^{-1}$	Oral RfD (mg/kg/day)	Inhalation RfD (mg/kg/day)	Oral Absorption Factors	WOE	Target Organ (Systemic Toxicants)	Critical Effect (Systemic Toxicants)
Pesticides								
4,4'-DDD	2.40E-01 (i)	--	--	--	90%	B2	--	--
4,4'-DDE	3.4E-01 (a)	--	--	--	90%	B2	--	--
4,4'-DDT	3.4E-01 (i)	3.4E-01 (i)	5.00E-04 (i)	--	90%	B2	Liver	Lesions
alpha-Chlordane [(2)]	3.5E-01 (i)	3.5E-01 (i)	5.00E-04 (i)	--	50%	B2	Liver	Lesions
gamma-Chlordane [(2)]	3.5E-01 (i)	3.5E-01 (i)	5.00E-04 (i)	--	50%	B2	Liver	Lesions
Dieldrin	1.60E+01 (i)	1.61E+01 (i)	5.00E-05 (i)	--	50%	B2	Liver	Lesions
PCBs:								
Aroclor-1260[(3)]	2.0 (i)	4.00E-01 (i)	--	--	89%	B2	--	--
Inorganics:								
Antimony	--	--	4.00E-04 (i)	--	20%	D	Whole BodyBlood	Increased Mortality/ Altered Chemistry
Arsenic	1.5 (i)	15.1 (i)	3.00E-04 (i)	--	95%	A	Skin	Keratosis/ Hyperpigmentation
Barium	--	--	7.00E-02 (i)	1.43E-04 (i)	100%	D	--	Increased Blood Pressure

TABLE 3-20 (Continued)

HUMAN HEALTH RISK ASSESSMENT TOXICITY FACTORS
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Constituents	Oral CSF $(mg/kg/day)^{-1}$	Inhalation CSF $(mg/kg/day)^{-1}$	Oral RfD (mg/kg/day)	Inhalation RfD (mg/kg/day)	Oral Absorption Factors	WOE	Target Organ (Systemic Toxicants)	Critical Effect (Systemic Toxicants)
Beryllium	4.30 (i)	8.40 (i)	5.00E-03 (i)	--	1%	B2	--	None Observed
Chromium (VI)	--	4.20E+01 (i)	5.00E-03 (i)	--	20%	A	--	None Reported
Copper	--	--	4.00E-02 (e)	--	60%	D	Gastrointestinal System	Irritation
Lead	--	--	--	--	--	B2	--	--
Nickel	--	--	2.00E-02 (i)	--	4.3	D	Major Whole Body Organs	Decreased Weight
Vanadium	--	--	7.00E-03 (i)	--	20%	D	Eyes / skin	--
Zinc	--	--	3.00E-01 (i)	--	25%	D	Blood	Decreased Blood Enzyme

Notes:

(1) Toxicitiy criteria for 2,3,7,8-TCDD used in the absence of congener-specific toxicity criteria. In addition, 2,3,7,8-TCDD toxicity equivalent factors (TECs) of 0.5, 0.10, and 0.10 were applied to detected total PeCDD, total HxCDD and total HxCDF concentrations in calculations of risk.
(2) Toxicity criteria for chlordane used in the absence of chemical-specific toxicity criteria.
(3) Cancer slope factor for polychlorinated biphenyls used for Aroclor-1260.

i = Integrated Risk Information System (IRIS), 1998.
e = EPA-NCEA (as cited from USEPA, Region III RBC Tables, October 1997).
h = Health Effects Assessment Summary Tables (HEAST), 1997.
a = HEAST Alternative Method, 1997.
w = Withdrawn from IRIS or HEAST.
-- = Information not published

TABLE 3-21

TOTAL SITE INCREMENTAL LIFETIME CANCER RISKs (ILCRs) AND HAZARD INDICES (HIs) FOR CURRENT AND FUTURE POTENTIAL HUMAN RECEPTORS NAVAL STATION ROOSEVELT ROADS PUERTO RICO

		Current On-site Commercial/ Maintenance Workers (1)	Future Construction Workers (2)	Current Adult Recreational Users (3)	Current Adolescent Recreational Users (3)	Future Adult On-Site Residents (4)	Future Young Child On-Site Residents (4)
SWMU 06/AOC B	Total ILCR	NE	NE	NE	NE	2.9×10^{-4}	1.6×10^{-4}
	Total HI	NE	NE	NE	NE	0.18	0.42
SWMU 26	Total ILCR	9.2×10^{-5}	7.3×10^{-6}	NE	NE	1.2×10^{-4}	6.1×10^{-5}
	Total HI	0.08	0.05	NE	NE	0.12	0.24
SWMU 31	Total ILCR	2.3×10^{-4}	NE	NE	NE	3.8×10^{-4}	4.3×10^{-4}
	Total HI	--	NE	NE	NE	--	--
SWMU 46	Total ILCR	1.4×10^{-4}	4.1×10^{-6}	NE	NE	2.0×10^{-4}	1.1×10^{-4}
	Total HI	0.11	0.29	NE	NE	0.17	0.64
AOC C	Total ILCR	7.2×10^{-5}	1.2×10^{-6}	NE	NE	1.1×10^{-4}	7.8×10^{-5}
	Total HI	0.15	0.29	NE	NE	0.25	0.99
SWMU 13	Total ILCR	1.3×10^{-4}	NE	2.2×10^{-4}	1.0×10^{-4}	1.9×10^{-4}	9.5×10^{-5}
	Total HI	0.56	NE	0.84	1.4	0.86	1.8

TABLE 3-21 (Continued)

TOTAL SITE INCREMENTAL LIFETIME CANCER RISKs (ILCRs) AND
HAZARD INDICES (HIs) FOR CURRENT AND FUTURE POTENTIAL HUMAN RECEPTORS
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

NE - Receptor not evaluated at this SWMU/AOC
-- Not applicable because no toxicological criteria was available

Shading indicates exceedence of USEPA acceptable target risk criteria by total risk value.

Notes:
(1) Current on-site workers were evaluated for exposures to surface soil and sediment COPCs.
(2) Future construction workers were evaluated for exposures to subsurface soil COPCs.
(4) Current adult and adolescent recreational users were evaluated for exposures to sediment COPCs.
(4) Future adult and young child on-site residents were evaluated for exposures to surface soil, groundwater, and sediment COPCs.

TABLE 3-22

INCREMENTAL LIFETIME CANCER RISKS (ILCRs) AND HAZARD INDICES (HIs)
FOR CURRENT ON-SITE WORKERS
SWMU 13
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Medium/Pathway	Current On-site Worker	
	ILCR	HI
Sediment		
Ingestion	6.6×10^{-6}	0.03
Dermal Contact	1.2×10^{-4}	0.53
TOTAL	1.3×10^{-4} [(1)]	0.56

Notes:

[(1)] Total ILCR exceeded USEPA's target risk range due to dermal exposures to dieldrin (65.1% risk contribution) in sediment. It should be noted, however, that the individual ILCR for dieldrin did not exceed the USEPA's acceptable target risk range.

Shading indicates exceedence of USEPA acceptable target risk criteria by total risk value.

TABLE 3-23

INCREMENTAL LIFETIME CANCER RISKS (ILCRs) AND HAZARD INDICES (HIs)
FOR CURRENT ON-SITE WORKERS
SWMU 26
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Medium/Pathway	Current On-site Worker	
	ILCR	HI
Surface Soil		
Ingestion	1.2×10^{-6}	0.01
Dermal Contact	9.1×10^{-5}	0.07
Inhalation[(1)]	7.2×10^{-10}	--
TOTAL	9.2×10^{-5}	0.08

Notes:

[(1)] Inhalation of fugitive dusts.

-- Not applicable because no toxicological criteria was available

Shading indicates exceedence of USEPA acceptable target risk criteria by total risk value.

TABLE 3-24

INCREMENTAL LIFETIME CANCER RISKS (ILCRs) AND HAZARD INDICES (HIs)
FOR CURRENT ON-SITE WORKERS
SWMU 31
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Medium/Pathway	Current On-site Worker	
	ILCR	HI
Surface Soil		
Ingestion	5.1×10^{-5}	--
Dermal Contact	1.8×10^{-4}	--
Inhalation[1]	7.8×10^{-9}	--
TOTAL	2.3×10^{-4} [2]	--

Notes:

[1] Inhalation of fugitive dusts.

[2] Total ILCR exceeded USEPA's target risk range due to dermal exposures to total HxCDF, total PeCDF, and total HxCDD (54.1%, 24.5% and 15.8% risk contributions, respectively) in surface soil. It should be noted, however, that the individual ILCRs for these compounds did not exceed the USEPA's acceptable target risk range of 1×10^{-6} to 1×10^{-4} for the dermal contact route.

-- Not applicable because no noncarcinogenic COPCs were identified for SWMU 31 surface soil

Shading indicates exceedence of USEPA acceptable target risk criteria by total risk value.

TABLE 3-25

INCREMENTAL LIFETIME CANCER RISKS (ILCRs) AND HAZARD INDICES (HIs)
FOR CURRENT ON-SITE WORKERS
SWMU 46
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Medium/Pathway	Current On-site Worker	
	ILCR	HI
Surface Soil		
Ingestion	4.7×10^{-6}	0.02
Dermal Contact	1.4×10^{-4}	0.09
Inhalation[1]	1.1×10^{-9}	--
TOTAL	1.4×10^{-4} [2]	0.11

Notes:

[1] Inhalation of fugitive dusts

[2] Total ILCR exceeded USEPA's target risk range due to dermal exposures to beryllium, benzo(a)pyrene, and aroclor-1260 (65.4%, 11.0%, and 10.3 % risk contributions, respectively) in surface soil. None of the individual ILCRs for these COPCs exceeded the USEPA's acceptable target risk range.

-- Not applicable because no toxicological criteria was available

Shading indicates exceedence of USEPA acceptable target risk criteria by total risk value.

TABLE 3-26

INCREMENTAL LIFETIME CANCER RISKS (ILCRs) AND HAZARD INDICES (HIs)
FOR CURRENT ON-SITE WORKERS
AOC C
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Medium/Pathway	Current On-site Worker	
	ILCR	HI
Surface Soil		
Ingestion	6.2×10^{-6}	0.03
Dermal Contact	6.6×10^{-5}	0.12
Inhalation[(1)]	3.8×10^{-8}	--
TOTAL	7.2×10^{-5}	0.15

Notes:

[(1)] Inhalation of fugitive dusts

-- Not applicable because no toxicological criteria was available

Shading indicates exceedence of USEPA acceptable target risk criteria by total risk value.

TABLE 3-27

INCREMENTAL LIFETIME CANCER RISKS (ILCRs) AND HAZARD INDICES (HIs)
FOR FUTURE CONSTRUCTION WORKERS
SWMU 26
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Medium/Pathway	Current On-site Worker	
	ILCR	HI
Subsurface Soil		
Ingestion	7.1×10^{-7}	0.02
Dermal Contact	6.6×10^{-6}	0.03
Inhalation[(1)]	3.6×10^{-11}	--
TOTAL	7.3×10^{-6}	0.05

Notes:

[(1)] Inhalation of fugitive dusts.

-- Not applicable because no toxicological criteria was available

Shading indicates exceedence of USEPA acceptable target risk criteria by total risk value.

TABLE 3-28

INCREMENTAL LIFETIME CANCER RISKS (ILCRs) AND HAZARD INDICES (HIs)
FOR FUTURE CONSTRUCTION WORKERS
SWMU 46
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Medium/Pathway	Current On-site Worker	
	ILCR	HI
Subsurface Soil		
Ingestion	4.1×10^{-7}	0.18
Dermal Contact	3.7×10^{-6}	0.11
Inhalation[(1)]	2.2×10^{-11}	--
TOTAL	4.1×10^{-6}	0.29

Notes:

[(1)] Inhalation of fugitive dusts.

-- Not applicable because no toxicological criteria was available

Shading indicates exceedence of USEPA acceptable target risk criteria by total risk value.

TABLE 3-29

INCREMENTAL LIFETIME CANCER RISKS (ILCRs) AND HAZARD INDICES (HIs)
FOR FUTURE CONSTRUCTION WORKERS
AOC C
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Medium/Pathway	Current On-site Worker	
	ILCR	HI
Subsurface Soil		
Ingestion	2.6×10^{-7}	0.19
Dermal Contact	9.0×10^{-7}	0.10
Inhalation[(1)]	1.4×10^{-9}	--
TOTAL	1.2×10^{-6}	0.29

Notes:

[(1)] Inhalation of fugitive dusts.

-- Not applicable because no toxicological criteria was available

Shading indicates exceedence of USEPA acceptable target risk criteria by total risk value.

TABLE 3-30

INCREMENTAL LIFETIME CANCER RISKS (ILCRs) AND HAZARD INDICES (HIs)
FOR CURRENT ADULT AND ADOLESCENT RECREATIONAL USERS
SWMU 13
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Pathway	Recreational Users			
	Adult		Adolescent	
	ICR	HI	ICR	HI
Sediment				
Ingestion	3.3×10^{-6}	0.01	1.9×10^{-6}	0.02
Dermal Contact	2.2×10^{-4}	0.83	9.9×10^{-5}	1.2
TOTAL	2.2×10^{-4} (1)	0.84	1.0×10^{-4}	1.4 (2)

Notes:

(1) Total ILCR exceeded USEPA's target risk range due to dermal exposures to dieldrin (65.1% risk contributions) in sediment. It should be noted that the individual ILCR for adult exposures to dieldrin also exceeded the USEPA's acceptable target risk range of 1×10^{-6} to 1×10^{-4}.

(2) Total HI exceeded USEPA's target risk due to dermal exposures to dieldrin, 4,4'-DDT, and alpha-chlordane (51.0%, 29.0%, and 10.2% risk contributions, respectively) in sediment. It should be noted that the individual HQs for adolescent exposures to these COPCs did not exceed the USEPA's acceptable target risk of 1.0. However, when the HQs are summed to determine the potential effects to the liver, the sum exceeds 1.0.

Shading indicates exceedence of USEPA acceptable target risk criteria by total risk value.

TABLE 3-31

INCREMENTAL LIFETIME CANCER RISKS (ILCRs) AND HAZARD INDICES (HIs)
FOR FUTURE ADULT AND YOUNG CHILD RESIDENTS
SWMU 13
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Pathway	Residents			
	Adult		Young Child	
	ICR	HI	ICR	HI
Sediment				
Ingestion	5.3×10^{-6}	0.03	1.2×10^{-5}	0.24
Dermal Contact	1.8×10^{-4}	0.83	8.3×10^{-5}	1.6
TOTAL	1.9×10^{-4} (1)	0.86	9.5×10^{-5}	1.8 (2)

Notes:

(1) Total ILCR exceeded USEPA's target risk range due to dermal exposures to dieldrin (65.1% risk contribution) in sediment. It should be noted that the individual ILCR for dieldrin also exceeded the USEPA's acceptable target risk range of 1×10^{-6} to 1×10^{-4} for the dermal contact route.

(2) Total HI exceeded USEPA's target risk due to dermal exposures to dieldrin, 4,4'-DDT, and alpha-chlordane (51.0%, 29.0%, and 10.2% risk contributions, respectively) in sediment. It should be noted that the individual HQs for adolescent exposures to these COPCs did not exceed the USEPA's acceptable target risk of 1.0. However, when the HQs are summed to determine the potential effects to the liver, the sum exceeds 1.0.

Shading indicates exceedence of USEPA acceptable target risk criteria by total risk value.

TABLE 3-32

INCREMENTAL LIFETIME CANCER RISKS (ILCRs) AND HAZARD INDICES (HIs)
FOR FUTURE ADULT AND YOUNG CHILD RESIDENTS
SWMU 26
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Pathway	Residents			
	Adult		Young Child	
	ICR	HI	ICR	HI
Surface Soil				
Ingestion	3.1×10^{-6}	0.03	7.2×10^{-6}	0.28
Dermal Contact	1.2×10^{-4}	0.09	5.4×10^{-5}	0.16
Inhalation [(1)]	1.9×10^{-9}	--	2.2×10^{-9}	--
TOTAL	1.2×10^{-4} [(2)]	0.12	6.1×10^{-5}	0.24

Notes:

[(1)] Inhalation of fugitive dusts.

[(2)] Total ILCR exceeded USEPA's target risk range due to dermal exposures to beryllium (98.8% risk contribution) in surface soil. The individual ILCR for beryllium exceeded USEPA's acceptable target risk range.

-- Not applicable because no toxicological criteria was available

Shading indicates exceedence of USEPA acceptable target risk criteria by total risk value.

TABLE 3-33

INCREMENTAL LIFETIME CANCER RISKS (ILCRs) AND HAZARD INDICES (HIs)
FOR FUTURE ADULT AND YOUNG CHILD RESIDENTS
SWMU 31
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Pathway	Residents			
	Adult		Young Child	
	ICR	HI	ICR	HI
Surface Soil				
Ingestion	1.4×10^{-4}	--	3.2×10^{-4}	--
Dermal Contact	2.4×10^{-4}	--	1.1×10^{-4}	--
Inhalation [(1)]	2.1×10^{-18}	--	2.4×10^{-18}	--
TOTAL	3.8×10^{-4} [(2)]	--	4.3×10^{-4} [(2)]	--

Notes:

[(1)] Inhalation of fugitive dusts.

[(2)] Total ILCR for adult and young child scenarios exceeded USEPA's target risk range due to ingestion and dermal exposures to total HxCDF, total PeCDF, and total HxCDD (54.1%, 24.5%, and 15.8% risk contributions, respectively) in surface soil. It should be noted, however, that none of the individual ILCRs for these COPCs exceeded USEPA's acceptable target risk range.

-- Not applicable because no noncarcinogenic COPCs were identified for SWMU 31 surface soil.

Shading indicates exceedence of USEPA acceptable target risk criteria by total risk value.

TABLE 3-34

INCREMENTAL LIFETIME CANCER RISKS (ILCRs) AND HAZARD INDICES (HIs)
FOR FUTURE ADULT AND YOUNG CHILD RESIDENTS
SWMU 46
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Pathway	Residents			
	Adult		Young Child	
	ICR	HI	ICR	HI
Surface Soil				
Ingestion	1.3×10^{-5}	0.04	3.0×10^{-5}	0.42
Dermal Contact	1.9×10^{-4}	0.13	8.3×10^{-5}	0.22
Inhalation [(1)]	3.1×10^{-9}	--	3.6×10^{-9}	--
TOTAL	2.0×10^{-4} [(2)]	0.17	1.1×10^{-4} [(2)]	0.64

Notes:

[(1)] Inhalation of fugitive dusts.

[(2)] Total ILCR for adult and young child scenarios exceeded USEPA's target risk range due to dermal exposures to beryllium, benzo(a)pyrene, and aroclor-1260 (65.4%, 11.0%, and 10.3% risk contributions, respectively) in surface soil. None of the individual ILCRs for these COPCs exceeded USEPA's acceptable target risk range.

-- Not applicable because no toxicological criteria was available

Shading indicates exceedence of USEPA acceptable target risk criteria by total risk value.

TABLE 3-35

INCREMENTAL LIFETIME CANCER RISKS (ILCRs) AND HAZARD INDICES (HIs)
FOR FUTURE ADULT AND YOUNG CHILD RESIDENTS
SWMU 06/AOC B
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Pathway	Residents			
	Adult		Young Child	
	ICR	HI	ICR	HI
Groundwater				
Ingestion	2.4×10^{-4}	0.18	1.4×10^{-4}	0.42
Dermal Contact	4.8×10^{-5}	< 0.01	2.2×10^{-5}	< 0.01
TOTAL	2.9×10^{-4} (1)	0.18	1.6×10^{-4} (1)	0.42

Notes:

Shading indicates exceedence of USEPA acceptable target risk criteria by total risk value.

(1) Total ILCR exceeded USEPA's target risk range due to ingestion exposures to beryllium (100% risk contribution) in sediment.

TABLE 3-36

INCREMENTAL LIFETIME CANCER RISKS (ILCRs) AND HAZARD INDICES (HIs)
FOR FUTURE ADULT AND YOUNG CHILD RESIDENTS
AOC C
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

Pathway	Residents			
	Adult		Young Child	
	ICR	HI	ICR	HI
Surface Soil				
Ingestion	1.7×10^{-5}	0.08	3.9×10^{-5}	0.70
Dermal Contact	8.8×10^{-5}	0.17	3.9×10^{-5}	0.29
Inhalation [(1)]	1.0×10^{-7}	--	1.2×10^{-7}	--
TOTAL	1.1×10^{-4} [(2)]	0.25	7.8×10^{-5}	0.99

Notes:

[(1)] Inhalation of fugitive dusts.

[(2)] Total ILCR for adult and young child scenarios exceeded USEPA's target risk range due to dermal exposures to aroclor-1260, benzo(a)pyrene, beryllium, and arsenic (25.8%, 25.6%, 18.8%, and 12.8% risk contributions, respectively) in surface soil. None of the individual ILCR for these COPCs exceeded USEPA's acceptable target risk range.

-- Not applicable because no toxicological criteria was available

Shading indicates exceedence of USEPA acceptable target risk criteria by total risk value.

TABLE 3-37

SUMMARY OF UNCERTAINTIES IN THE RESULTS OF THE HUMAN HEALTH RISK ASSESSMENT OUs 1,6,7 NAVAL STATION ROOSEVELT ROADS PUERTO RICO

	Potential Magnitude for Over! Estimation of Risks	Potential Magnitude for Under! Estimation of Risks	Potential Magnitude for Over or Under! Estimation of Risks
Environmental Sampling and Analysis Sufficient samples may not have been taken to characterize the media being evaluated.			Moderate
Systematic or random errors in the chemical analysis may yield erroneous data.			Low
Use of unvalidated data from previous investigation.			Moderate
Elevated SQLs reported for VOCs and SVOCs in soil.			Moderate
Selection of COPCs The use of USEPA Region III COC screening values in selecting COPCs in soil and groundwater.			Low
Exposure Assessment The standard assumptions regarding body weight, exposure period, life expectancy, population characteristics, and lifestyle may not be representative of the actual exposure situations.			Moderate
The use of the 95% UCL of the arithmetic mean in the estimation of the soil, groundwater, surface water and sediment exposure point concentrations.	Low		
Using one-half of the CRQL as a surrogate concentration in the derivation of the 95% UCL.			Moderate
Assessing future residential property use when the likelihood of residential development is low.	High		
The amount of media intake is assumed to be constant and representative of any actual exposure.			Low
Toxicological Assessment Toxicological indices derived from high dose animal studies, extrapolated to low dose human exposure.	Moderate		
Lack of promulgated toxicological indices for the inhalation pathway.		Low	
Adjusting toxicity values for a difference in toxicity between an aministered dose and an absorbed dose.	Moderate		
Dermal exposure assessment of PAHs.	Moderate		

TABLE 3-37 (Continued)

SUMMARY OF UNCERTAINTIES IN THE RESULTS OF THE HUMAN HEALTH RISK ASSESSMENT OUs 1,6,7 NAVAL STATION ROOSEVELT ROADS PUERTO RICO

	Potential Magnitude for Over! Estimation of Risks	Potential Magnitude for Under! Estimation of Risks	Potential Magnitude for Over or Under! Estimation of Risks
Risk Characterization Assumption of additivity in the quantitation of cancer risks without consideration of synergism, antagonism, promotion and initiation.			Moderate
Assumption of additivity in the estimation of systemic health effects without consideration of synergism, antagonism, etc.			Moderate
Additivity of risks by individual exposure pathways (dermal, ingestion and inhalation)			Low

Notes:

Low ! Assumptions categorized as ?low" may effect risk estimates by less than one order of magnitude.

Moderate ! Assumptions categorized as ?moderate" may effect estimates of risk by between one and two orders of magnitude.

High ! Assumptions categorized as ?high" may effect estimates of risk by more than two orders of magnitude.

Source: Risk Assessment Guidance for Superfund, Volume 1, Part A: Human Health Evaluation Manual. USEPA, 1989b.

4.0 CONCLUSIONS AND RECOMMENDATIONS

This section provides conclusions and recommendations for each of the SWMUs/AOCs investigated. The results of the recent investigations have been utilized in reaching the conclusions and formatting the recommendations.

4.1 SWMU 6/AOC B

Conclusions

One new monitoring well was installed at the site to replace an old IR program well for which no construction data was known. Soil samples from the well installation and a groundwater sample were submitted for laboratory analysis.

A risk assessment was performed for the groundwater during this phase of investigation. [Note: a risk assessment for soils was done previously which showed potentially unacceptable risk posed to future residents]. The results showed a potentially unacceptable risk to future residents using the groundwater as a potable source largely due to beryllium concentrations.

The area is presently used as a storage area for large equipment and large materials. It is surrounded by warehouses, surplus metal accumulation areas and National Guard facilities. The base has a water system which provides potable water from an off-site source. Based on these conditions, it is extremely unlikely that the area would ever be used for residential purposes or that the groundwater would ever be developed as a potable source.

Recommendations

The previous OU 1, 6 and 7 report recommended that there be no remedial measures undertaken at the site. A land use restriction was to be placed on SWMU 6/AOC B limiting its use to industrial purposes only. Based on the results of the Phase II investigation the recommended action of land use restriction only has not changed.

4.2 SWMU 10

Conclusions

This area was subjected to a soil removal action for PCBs. In order to ascertain whether the former presence of PCBs in soil had affected the groundwater, three samples were obtained from temporary wells installed for that purpose.

No VOCs, SVOCs or PCBs were detected in any of the samples.

Recommendations

No contaminants were detected in the groundwater; therefore, no further actions are recommended for SWMU 10.

4.3 SWMU 13

Conclusions

Previous investigations showed that there were pesticides present in the ditch sediments and surface soils. The initial risk assessment calculated a potentially unacceptable human health risk for the sediments. Based on these findings, a further characterization of the sediments and a groundwater investigation were performed. Findings from the Phase II work indicated that the sediments still were affected but that the pesticides had not entered the groundwater. There was a single very low concentration (0.054 µg/L) of 4,4"-DDD in a single sample an order of magnitude below the tap water RBC.

Recommendations

It is recommended that no further actions be undertaken for surface soils, subsurface soils or groundwater based on the findings of the two phases of investigation.

A Correctives Measures Study (CMS) is recommended for the ditch sediment. This is envisioned as a streamlined CMS process which will likely result in the proposal of a presumptive remedy of sediment removal.

4.4 SWMU 26

Conclusions

The surface soils at SWMU 26 were additionally characterized during Phase II investigations. Also, subsurface soil was characterized as a result of the findings of Phase I investigations. During Phase II the site specific background for arsenic and beryllium was established in accordance with the approved additional investigations workplan.

There were found to be no significant releases to subsurface soil. A risk assessment was performed for the surface soils which showed that there was a potentially unacceptable risk posed future residents by surface soil predominately as the result of beryllium concentrations. All arsenic and beryllium concentrations were found to be below two times the average background levels. This would indicate that the inorganic risk drivers are naturally occurring and do not result from current or past site usage.

Recommendations

No further action of any kind is recommended for SWMU 26 based on the results of the Phase I and II investigatory findings. The risk calculated for future residents results from naturally occurring constituents of the soil and not from site activities.

4.5 SWMU 31 and 32

Conclusions

The initial risk assessment at these SWMUs found no unacceptable risk to human health related to on-site workers. During the review of document, dioxin values for risk assessment changed and a

recalculation indicated a slight risk was posed to current on-site workers as a result of the dioxins present.

A land use restriction was proposed which would keep the site for industrial use only. This continues to be proposed which negates the risks calculated for future residents.

A total of eight additional samples were taken in Phase II. In seven of the samples, dioxins exceeded the industrial RBCs. A risk assessment performed indicated potentially unacceptable human health risks were present for future residents and current on-site workers.

Recommendations

The Navy proposes to place the SWMUs under a land use restriction as proposed in the January 1997 Draft RCRA Facility Investigation report - Addendum, Operable Units 1, 6 and 7. This will negate the risks posed to future residents.

No further action is proposed at the site. The risk to current on-site workers is mitigated by the fact that significant portions of the site are paved and, where unpaved, the material is hard packed and does not generally produce dust when windblown or transited. For this reason, a complete pathway for exposure to the dioxins is difficult to establish.

4.6 SWMU 46

Conclusions

Additional investigations were performed at SWMU 46 to confirm the findings of Phase I and to assess the extent of contaminants in soil. Based on the initial work, surface and subsurface soil was sampled. The results of a human health risk assessment performed for the area indicated that a potentially unacceptable risk existed for current on-site workers and future residents largely as a result of exposure to beryllium, benzo(a)pyrene and aroclor 1260 in surface soil.

The beryllium is attributed to natural soil conditions as seen throughout the base. The benzo(a)pyrene and PCB appear site related.

Recommendations

Figure 2-13 graphically depicts the occurrence of PCB at SWMU 46 and AOC C. As the two areas now appear to be a single unit in terms of contamination, they will be addressed together.

The navy proposes performing a CMS for the combined SWMU 46/AOC C area. Soil removal is the likely remedial approach; however, other available alternatives will be reviewed.

It appears from Figure 2-13 that there are areas beyond the present investigation limits. It is proposed that any additional investigations needed to establish the extent of contamination be provided for in the CMS workplan and will be performed as either a part of the CMS process, during the design stage or as a part of actual remediation once clean-up goals are established.

4.7 AOC C

Conclusions

The soils in this area needed to be recharacterized as a result of an inadvertent soil removal during a general clean up for hurricane season. The recharacterization included both surface and subsurface soils. SVOCs and PCBs were found at significant levels in the surface soil. No significant levels of SVOCs or PCBs were found in the subsurface. The inorganics of concern, primarily arsenic and beryllium, are attributed to natural soil conditions as seen throughout the Station. Similar risks to those seen for SWMU 46 were noted.

Recommendations

It is recommended that SWMU 46 and AOC C be combined for corrective measures purposes. The approach to this area will be as described in Section 4.6 for SWMU 46.

4.8 AOC D

Conclusions

Two samples of sediments were taken on the eastern side of the Base landfill. The results of the analyses performed indicated that there were no constituents of concern detected.

Recommendations

No Further actions are recommended for the sediments associated with the sediments comprising AOC D. [Note: sediments associated with SWMU 2 are addressed separately in the OU 3/5 RFI report].

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