FINAL

Phase I/II Environmental Condition of Property Report

Former U.S. Naval Station Roosevelt Roads
Ceiba, Puerto Rico

Prepared For:

Commander, Navy Region Southeast (CNRSE)
U.S. Navy

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LIST OF ACRONYMS

°C	Degrees Celsius
°F	Degrees Fahrenheit
ACM	Asbestos containing materials
AFWTF	Atlantic Fleet Weapons Training Facility
AOC	Area of Concern
ASL	Above sea level
AST	Aboveground storage tank
ASTM	American Society for Testing and Materials
BASH	Bird Aircraft Strike Hazard
BEQ	Bachelor-enlisted quarters
BTEX	Benzene, toluene, ethyl benzene, xylene
CA	Corrective Action
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CERCLIS	Comprehensive Environmental Response Compensation and Liability Information System
CERFA	Community Environmental Response Facilitation Act
CFR	Code of Federal Regulations
CMI	Corrective Measures Investigation
CMS	Corrective Measures Study
CNI	Commander, Navy Installations
CNRSE	Commander, Navy Region Southeast
CO	Carbon Monoxide
COC	Chemicals of Concern
COMLANTFLT	Commander, U.S. Atlantic Fleet
COPC	Chemicals of Potential Concern
CORRACTS	Corrective Action Report
CY	Calendar Year
DERP	Defense Environmental Restoration Program
DoD	Department of Defense
DOI	U.S. Department of the Interior
DRO	Diesel range organics
ECP	Environmental Condition of Property
EPA	U.S. Environmental Protection Agency
ERZ	Ecological Risk Assessment
ERM	Environmental Resources Management
ERNS	Emergency Response Notification System
EQB	Puerto Rico Environmental Quality Board
FAD	Friable, Accessible and Damaged
FINDS	Facility Index System/Facility Identification Initiative Program Summary Report
FOIA	Freedom of Information Act
FS	Feasibility study
GIS	Geographic information system
GPS	Global positioning system
GRO	Gasoline range organics
HAP	Hazardous Air Pollutants
HAZMAT	Hazardous Materials
HHRA	Human Health Risk Assessment
IAS	Initial Assessment Study
ICM	Interim Corrective Measure
IR	Installation Restoration
IRP	Installation Restoration Program
JP-5	Jet propulsion fuel 5
kg	Kilogram
L	Liter
LBP	Lead-based paint

LQG	Large quantity generator
LUST	Leaking underground storage tank
MCL	Maximum contaminant level
MEC	Munitions and explosives of concern
MOA	Memorandum of Agreement
MOGAS	Motor Gasoline
MOU	Memorandum of Understanding
mg	Milligrams
mm	Millimeters
MNA	Monitored Natural Attenuation
msl	Mean Sea Level
μg	Micrograms
NAAQS	National Ambient Air Quality Standards
NAVFAC	Naval Facilities Engineering Command
NFRAP	No Further Remedial Action Planned
NOV	Notice of Violation
NOx	Nitrogen Oxide
NPL	National Priorities List
NRC	Nuclear Regulatory Commission
NRDA	Natural Resources Damage Assessment
NRHP	National Register of Historic Places
NSRR	U.S. Naval Station Roosevelt Roads
O_3	Ozone
OB/OD	Open burning/open detonation
OIC	Officer-in-Charge
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PA	Preliminary Assessment
PAOC	Potential Area of Concern
PAH	Polyaromatic Hydrocarbons
Pb	Lead
PCB	Polychlorinated biphenyl
PCPMP	Pesticide Compliance and Pest Management Plan
PI	Photo identified
PID	Photoionization Detector
PM_{10}	Particulate Matter
POL	Petroleum, oils, and lubricants
PR	Puerto Rico
PRASA	Puerto Rico Aqueduct and Sewer Authority
PSD	Prevention of Significant Deterioration
PSI	[ECP] Physical Site Inspections
PSH	Phase Separated Hydrocarbons
PWD	Public Works Department
QA/QC	Quality assurance/quality control
RA	Risk Assessment
RAATS	RCRA Administrative Action Tracking System
RAC	Risk Assessment Code
RBC	Risk-based concentrations
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RI	Remedial Investigation
ROD	Record of Decision
SAR	Small arms range
SARA	Superfund Amendments and Reauthorization Act
SHWS	State Hazardous Waste Sites
SI	Site Investigation
SO_2	Sulfur Dioxide
SOPs	Standard Operating Procedures

SQG	Small quantity generator
SSI	Supplemental Site Investigation
SVOC	Semi-volatile organic compound
SWMU	Solid Waste Management Unit
TCE	Trichloroethylene
TPH	Total petroleum hydrocarbons
TRIS	Toxic Chemical Release Inventory System
TSD	Treatment, storage, and disposal
TWFF	Tow Way Fuel Farm
UIC	Underground injection control
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
USMC	United States Marine Corps
USPS	United States Post Office
UST	Underground storage tank
UXO	Unexploded ordnance
VSI	Visual Site Investigation
VOC	Volatile organic compound

EXECUTIVE SUMMARY

The U.S. Naval Facilities Engineering Command Atlantic (NAVFAC Atlantic) has conducted a Phase I and II Environmental Condition of Property (ECP) Report for the Commander, Navy Region Southeast (CNRSE) for the former U.S. Naval Station Roosevelt Roads (NSRR), located in Ceiba, Puerto Rico. NSRR is located on approximately 8,432 acres of land on the eastern coast of Puerto Rico, and includes the immediately adjacent islands of Piñeros and Cabeza de Perro (see Section 2.1). NSRR was commissioned in 1943 as a Naval Operations Base and redesignated a Naval Station in 1957.

This ECP Report has been performed to document the environmental condition of NSRR due to closure of the station and subsequent planned real estate disposal/transfer actions. NSRR was officially closed on March 31, 2004. The U.S. Navy then established Naval Activity Puerto Rico (NAPR) to serve as the caretaker of the real property associated with NSRR and to assist in the transfer of the property.

It is important to note that the ECP focuses on both historic and recent operations at NSRR. Prior to closure, NSRR was a very large and active Naval installation, with numerous industrial and commercial operations and activities. Since the establishment of NAPR, almost all industrial and commercial operations on the property have ceased. Therefore, in order to more accurately represent activities and operations conducted on the property and their potential for environmental contamination, the ECP concentrates on historic operations and operations immediately prior to closure. Current operations at NAPR are discussed in less detail because they do not represent overall use of the property and do not present a significant potential for environmental contamination.

There are over 1,300 buildings at NSRR with approximately 4.6 million square feet of space. Other significant features of the installation include an airfield with an 11,000 ft. long runway, industrial waterfront property that includes a 1,180 ft. long general-purpose pier, an 800 ft. long fuel mooring pier, three small craft bulkheads with a total length of over 2,100 ft., a 743 ft. long general purpose bulkhead, commercial/retail facilities, and both single-family and apartment style housing.

The ECP Report discloses available, factual, environmentally relevant information regarding the condition of NSRR. It is based on the results of NSRR investigations, interviews with persons familiar with historic operations at NSRR, and review of available information and data on NSRR historic operations related to storage, release, treatment or disposal of hazardous substances or petroleum products on the property to determine the presence or likely presence of a release or threatened release of any hazardous substance or petroleum product.

The ECP investigation confirmed that a mature and comprehensive environmental program, focused on areas of historic environmental concern, has been in existence at NSRR for decades.

- NSRR investigative activities under the Navy's Installation Restoration Program (IRP) have been ongoing since the early 1980s.

- The entire station is currently encompassed under a U.S. Environmental Protection Agency (EPA) Corrective Action component of the station's Resource Conservation and Recovery Act (RCRA) permit.

- Under the IRP, and currently pursuant to the EPA RCRA Corrective Action permit, 59 historic sites at NSRR [Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs)] have been investigated (for some, if only to conclude that no further investigation was warranted), are currently under investigation, or are pending further corrective action measures.

- Under the UST program, seven former UST sites and one current AST site are under a Monitored Natural Attenuation (MNA) study in accordance with the monitoring protocols developed by the Underground Storage Tank Management Division (USTMD) of the Puerto Rico Environmental Quality Board (EQB).

Installation Restoration Program

Until 1993, all environmental investigation and remediation activities, with the exception of USTs, were conducted under the Navy's IRP, which generally followed Comprehensive Environmental Response Compensation and Liability Act (CERCLA) guidelines. In total, 55 SWMUs and 4 AOCs were identified. In 1993, NSRR submitted a RCRA Part B Permit application for the storage of hazardous waste on the Station. On October 20, 1994, the EPA Region II issued a Final RCRA Part B permit. The corrective action provisions of the permit (addressing sites of known/suspected releases of hazardous waste) currently contain specific requirements for investigation, and potentially, RCRA Facility Investigation (RFI) activities and remediation at 28 SWMUs and 3 AOCs. The remainder of the SWMUs/AOCs identified were determined to require no further investigation, due to the fact that no release or disposal of hazardous waste or materials was identified.

Section 5.3 describes the current regulatory status and current physical and environmental condition of the SWMUs/AOCs in the IRP at NSRR. Table 5-4 provides a brief summary of each SWMU and AOC, including IRP designation

(IR Site No.), type of RFI required in the RCRA Part B Permit, operable unit number, current work status, as well as comments on the current status of each unit. The locations of the IRP sites are presented in Figure 5-4.

MNA Sites

A MNA study of seven former UST sites and one current AST site at NSRR is being performed by the Navy. The Year 4 summary report, dated December 2004, presents the findings of the study along with recommendations based on those findings. These are discussed in Section 5.5.1.1.

ECP Sites

ECP Sites are areas of potential environmental concern that were identified as a result of the records review, aerial photography analysis, physical site inspections, and interviews conducted as part of the ECP investigation. The ECP Sites had not been previously identified or investigated under existing environmental programs (e.g., IRP, USTs, etc.) at NSRR, although there are a few ECP Sites that border and/or encompass existing IRP sites. The Phase I portion of the ECP investigation identified 23 ECP Sites that required further evaluation. ECP Sites are addressed in Section 5.4. Table 5-5 presents a list of the ECP Sites, and Figure 5-54 presents the overall location of each of the ECP Sites.

The newly identified ECP Sites were then evaluated under the Phase II portion of the ECP investigation (see Appendix F). The Phase II investigation was conducted to determine if a release/disposal actually occurred at newly identified ECP sites and, if so, if any potential risk to human health is present at the sites. The Phase II investigation consisted of field observations, environmental media (e.g., soil, groundwater) sample collection, laboratory analysis, review of analytical data, and a qualitative risk assessment for each site (see Section 4.6). Based on the results of the ECP Phase II Investigation, it was determined that six sites have not been environmentally impacted by past and present operations at NSRR and therefore, require no further investigation:

- ECP Site 4
- ECP Site 9
- ECP Site 10
- ECP Site 11
- ECP Site 12
- ECP Site 18

The Phase II ECP investigation also determined that 14 of the ECP Sites have been impacted by past and recent operations at NSRR and therefore, are being incorporated into the NSRR RCRA Corrective Action Program:

- ECP Site 2
- ECP Site 3
- ECP Site 5
- ECP Site 6
- ECP Site 7
- ECP Site 8
- ECP Site 13
- ECP Site 14
- ECP Site 15
- ECP Site 16
- ECP Site 17
- ECP Site 19
- ECP Site 20
- ECP Site 21

No further ECP investigations will be performed at ECP Sites 1 and 22 because they are being transferred to other federal agencies. ECP Site 23 is being addressed separately under the Navy's Munitions Response Program (MRP).

ENVIRONMENTAL COMPLIANCE

In addition, reasonably ascertainable operational and regulatory compliance deficiencies of environmental program areas such as underground storage tanks (USTs), above ground storage tanks (ASTs), air emissions, asbestos, pesticides, polychlorinated biphenyls (PCBs), radon, medical waste, ordnance, lead-based paint (LBP), drinking water supply, and wastewater are also noted in the ECP Report.

The ECP investigation identified few areas of concern regarding current environmental compliance. These are discussed in Section 5.1. None is currently significant.

Asbestos Containing Material (ACM). The last large-scale survey to identify friable, accessible, or damaged (FAD) ACM on NSRR was performed approximately 20 years ago but no follow-up documentation was located. Since then, specific areas have been surveyed but no station-wide conclusions may be drawn other than the assumption that, given the age of construction of most buildings on NSRR, the presence of some form of ACM should be presumed.

A comprehensive station-wide ACM survey is underway and targeted for completion in late Summer 2005. When published, this report can be consulted for the most up-to-date ACM information.

Lead-Based Paint (LBP). Eight hundred and seventy-nine buildings at NSRR were constructed prior to 1978, the year in which LBP was banned for consumer use. These buildings, and any other structures built before 1978, therefore, are presumed to contain LBP. LBP surveys have been conducted in specific areas at NSRR but no station-wide survey has been conducted at NSRR.

A LBP inspection and risk assessment of family housing is underway and targeted for completion in late Summer 2005. When published, this report can be consulted for the most up-to-date LBP information.

PROPERTY CATEGORIZATION

Considering the active, comprehensive, and ongoing IRP and MNA sites, in conjunction with the newly identified ECP sites, it may reasonably be concluded that all areas of significant environmental concern on NSRR have been identified; and all have been, are undergoing, or will be evaluated/investigated.

In accordance with Community Environmental Response Facilitation Act (CERFA) [Public Law 102-426, October 19, 1992 - Title 42, United States Code, Section 9620 (h)(4)] procedures, this ECP Report divides all property at NSRR into "parcels", and classifies them into one of the three following categories (see Section 1.1 for a description and explanation as to the derivation of these categories):

- **Category 1** – Areas where no known or documented releases, or disposal of hazardous substances or petroleum products or their derivatives has occurred, including no migration of these substances from adjacent areas.

- **Category 2** – Areas where the release, disposal, or migration, or some combination thereof, of hazardous substances, or petroleum products or their derivatives has occurred, but at concentrations that do not require a removal or remedial action, or all remedial actions necessary to protect human health and the environment have been taken.

- **Category 3** – Areas where a confirmed or suspected release, disposal, or migration, or some combination thereof, of hazardous substances, or petroleum products or their derivatives has occurred, but required investigation and/or response actions have not yet been initiated or are ongoing.

Table 7-1 presents a listing of all Category 2 and 3 sites identified during the Phase I/II ECP investigation at NSRR, as well as a list of all IRP, MNA, and ECP sites investigated and determined to be Category 1 sites. Figure 7-1 is a map of the station with all station property divided into parcels and categorized into one of the above-referenced categories.

[Note: In addition to the designated IRP, MNA, and ECP sites, the end of Table 7-1 and Figure 7-1 depict four areas of known contamination that are not easily categorized into one of the existing environmental programs at NSRR. All four of these areas are considered Category 2 (see definition above). With the exception of the JP-4 fuel spill area, historical operations in these areas were industrial in nature, and included routine minor maintenance and storage activities that resulted in small (i.e., at concentrations that do not require a removal or remedial action) releases of POL and/or hazardous substances. Furthermore, specific areas of significant environmental contamination have been identified within these three areas through the IRP, MNA, and ECP investigations, and are being addressed under these programs. The JP-4 fuel spill area has been remediated and evaluated under the Natural Resources Damage Assement (NRDA) program (see Section 5.2.4).]

[Note: Figure 7-1 should be viewed as a general categorization of NSRR property. Given the available data, it is not possible to spatially identify the precise boundaries of all SWMUs, AOCs, MNA sites, and ECP sites.

Figure 7-1 must be interpreted in conjunction with this ECP Report, as well as all relevant IRP documents and other documents that provide currently available data on all sites of environmental concern. The imprecision with regard to parcel boundaries is attributable to the fact that:

- *ECP sites require further investigation under the IRP/RCRA Corrective Action program to determine their full extent of contamination.*
- *MNA sites are undergoing continuing characterization.*
- *For some historic spills, the available information provides only an estimation as to the extent of impact.*
- *Some areas are not amenable to spatial depiction (for example SWMU 38: "below ground sanitary/storm sewers").*
- *Some areas are defined not only by hard data, but also by a common knowledge of historic operations. The best example would be hangar aprons at the airfield. Specific apron areas have been previously identified for investigation but common knowledge suggests the entire apron was most likely a source of minor spills/releases/unconfined maintenance in the 1940s-50s.]*

All Category 3 sites will continue to be evaluated, investigated and, if warranted, remediated under the IRP/RCRA Corrective Action program or the MNA program.

1.0 INTRODUCTION

NAVFAC Atlantic has prepared a Phase I/II ECP Report for CNSRE for the former NSRR, located in Ceiba, Puerto Rico. NSRR is located on approximately 8,432 acres of land on the eastern coast of Puerto Rico, and includes the immediately adjacent islands of Piñeros and Cabeza de Perro (see Section 2.1 for figures).

The ECP Report has been performed to document the environmental condition of NSRR due to closure of the station on March 31, 2004, and subsequent planned real estate disposal/transfer actions. Section 8132 of Fiscal Year 2004 Defense Appropriations Act, signed into law on 30 September 2003, directed that NSRR be disestablished and that the real estate disposal/transfer be carried out in accordance with procedures contained in the BRAC 1990.

1.1 PURPOSE

The ECP Report discloses available, factual, environmentally relevant information regarding the condition of NSRR. It is based on the results of NSRR investigations, interviews with persons familiar with NSRR, and review of available information and data on NSRR operations related to storage, release, treatment or disposal of hazardous substances or petroleum products on the property to determine the presence or likely presence of a release or threatened release of any hazardous substance or petroleum product. The ECP also included a Phase II investigation (Appendix F) to include sampling and analysis to determine if a release/disposal actually occurred at newly identified ECP sites and, if so, if any potential risk to human health is present at the sites. In addition, reasonably ascertainable operational and regulatory compliance deficiencies of environmental program areas such as USTs, ASTs, air emissions, asbestos, pesticides, PCBs, radon, medical waste, ordnance, LBP, drinking water supply, and wastewater are also noted in the ECP Report.

It is important to note that the ECP focuses on both historic and recent operations at NSRR. Prior to closure, NSRR was a very large and active Naval installation, with numerous industrial and commercial operations and activities. Since the establishment of NAPR, almost all industrial and commercial operations on the property have ceased. Therefore, in order to more accurately represent activities and operations conducted on the property and their potential for environmental contamination, the ECP concentrates on historic operations and operations immediately prior to closure. Current operations at NAPR are discussed in less detail because they do not represent overall use of the property and do not present a significant potential for environmental contamination.

The entire station is currently encompassed under an EPA Corrective Action component of the station's RCRA permit. The Puerto Rico Environmental Quality Board (EQB) also has a review role in the process. This ECP Report does not re-investigate or otherwise review the adequacy of previously conducted or ongoing investigations associated with the IRP, but does incorporate the current conditions of all SWMUs and AOCs as identified under the IRP. The ECP Report focuses on areas not previously evaluated under previous investigations, and documents readily observable adverse changes in NSRR conditions.

In accordance with CERFA procedures, the ultimate objective of the ECP Report is to categorize all property at NSRR into one of the three following categories:

- **Category 1** – Areas where no known or documented releases, or disposal of hazardous substances or petroleum products or their derivatives has occurred, including no migration of these substances from adjacent areas.

- **Category 2** – Areas where the release, disposal, or migration, or some combination thereof, of hazardous substances, or petroleum products or their derivatives has occurred, but at concentrations that do not require a removal or remedial action, or all remedial actions necessary to protect human health and the environment have been taken.

- **Category 3** – Areas where a confirmed or suspected release, disposal, or migration, or some combination thereof, of hazardous substances, or petroleum products or their derivatives has occurred, but required investigation and/or response actions have not yet been initiated or are ongoing.

These categories are derived from both CERFA and the American Society for Testing and Materials (ASTM) Standard Practice for Conducting Environmental Baseline Surveys (ASTM Standard D 6008-96), which further incorporates ASTM D 5746-98 (2002) Standard Classification of Environmental Condition of Property Area Types for Defense Base Closure and Realignment Facilities. ASTM Standard D 5746-98 (2002) specifies the following seven standard property category codes:

- Type 1 – Areas where no release, or disposal of hazardous substances or petroleum products or their derivatives has occurred, including no migration of these substances from adjacent areas.

- Type 2 – Areas where only release or disposal of petroleum products has occurred.

- Type 3 – Areas where the release, disposal, or migration, or some combination thereof, of hazardous substances has occurred, but at concentrations that do not require a removal or remedial action.

- Type 4 – Areas where release, disposal, or migration, or some combination thereof, of hazardous substances has occurred, and all remedial actions necessary to protect human health and the environment have been taken.

- Type 5 – Areas where release, disposal, or migration, or some combination thereof, of hazardous substances has occurred and removal or remedial actions, or both, are under way, but all required remedial actions have not yet been taken.

- Type 6 – Areas where release, disposal, or migration, or some combination thereof, of hazardous substances has occurred, but required response actions have not yet been initiated.

- Type 7 – Areas that are unevaluated or that require additional evaluation.

Due to required identification of property in accordance with CERFA, the nature of this ECP investigation, and the ultimate disposition of NSRR, the three ECP categories intentionally differ from the seven standard categories specified in ASTM D 5746.

[Note: the ECP categories eliminate the distinction between hazardous substance and petroleum releases, since for many sites at NSRR, the distinction between hazardous substance and petroleum releases is difficult-to-impossible to make (particularly at historic sites). Furthermore, the distinction is not being made under the ongoing RCRA corrective action investigations.]

CERFA [Public Law 102-426, October 19, 1992 - Title 42, United States Code, Section 9620 (h)(4)] amended Section 120(h) of CERCLA and stipulates that the federal government identify "uncontaminated property" scheduled for transfer. Uncontaminated property is defined as "…real property on which no hazardous substances and no petroleum products or their derivatives were known to have been released, or disposed of" (§9620 (h)(4)(A)). ECP Category 1 is identical to ASTM Standard Type 1, and constitutes "uncontaminated property" as identified in CERFA.

Property that has been identified as contaminated, but at concentrations that do not require a removal or remedial action, or property at which all remedial actions necessary to protect human health and the environment have been taken, is categorized as ECP Category 2. ECP Category 2 encompasses ASTM Standard Types 3 and 4, and is the proper category for the "RCRA sites" [or other contaminated sites] that have been deemed "No Further Action Required".

Property that is either undergoing remedial action or requires further investigation is categorized as ECP Category 3. ECP Category 3 encompasses ASTM Standard Types 5, 6, and 7, and is the proper category for the "RCRA sites" [or other contaminated sites] that have not been deemed "No Further Action Required" as well as any newly discovered "ECP sites" (sites identified during the ECP investigation) which the ECP Report recommends for further evaluation.

1.2 APPROACH AND RATIONALE

An established set of investigative procedures was followed during the ECP investigation. These procedures facilitated and coordinated the activities of the project teams during the various phases of the project. Similarly, the preparation of this ECP Report followed an established set of procedures to ensure proper documentation of all activities.

In summary, this project involved the following tasks in order:

1. A review of records maintained at U.S. Navy offices in Norfolk, Virginia, NSRR, the U.S. National Archives and Records Administration in College Park, Maryland, and EPA and EQB records (see Sections 4.1 and 4.2);

2. An analysis of historic aerial photographs (see Section 4.3);

3. Physical site inspections (PSIs) (see Section 4.4);

4. Interviews with persons familiar with past and current NSRR operations and activities (see Section 4.5),

5. Conduction of a Phase II study that included site sampling and risk screening (see Appendix F), and

6. Completion of the ECP Report (this document).

The ECP Report was conducted in general accordance with the following guidance:

- ASTM Standard Practice for Conducting Environmental Baseline Surveys (ASTM Standard D 6008-96),

- ASTM Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process (ASTM Standard E 1527-00), and

- Naval Facilities Engineering Command, Environmental Baseline Survey Guidance, March 1995.

- Original Scope of Work and Modification No. 1, NAVFAC Atlantic Delivery Order No. 16, dated November 2003.

1.3 REPORT ORGANIZATION

Section 1.0 of the ECP Report provides an overall introduction to the project, and outlines the methodology used to conduct the ECP investigation. Section 2.0 describes the environmental setting of NSRR and surrounding areas. Section 3.0 describes property ownership, and current and historic operations at NSRR. Section 4.0 discusses the records reviews, aerial photography analysis, physical site inspections, and interviews. Section 5.0 presents the findings for NSRR, and Section 6.0 presents the findings for adjacent property. Section 7.0 presents the conclusions of the ECP Report. Section 8.0 presents a list of references used in preparation of the ECP Report.

ECP photographs are included in Appendix A. Real property records are included in Appendix B. The commercial regulatory database search is included in Appendix C. Aerial photography analysis is included in Appendix D. Copies of select historic NSRR maps are included in Appendix E. The details of the Phase II ECP investigation are presented in Appendix F.

1.4 LIMITATIONS AND EXCEPTIONS OF ASSESMENTS

The contents of this report are based, in part, on information made available during the course of the records reviews, NSRR inspections, and interviews with persons having direct knowledge of the activities conducted at NSRR and the land use history. Given that NSRR is a large, old, complex naval station, comprehensively documenting current environmental conditions was complicated by the following:

- Age of the station - NSRR has been in continuous operation since its construction in the early 1940s. Most records dating to operations in the 1940s-1970s are no longer readily available, if still in existence at all.

- Tenant activities - Throughout its history, NSRR has been a host installation for a myriad of varied tenant activities. Many of these tenant activities no longer exist. Records documenting, in whole or in part, the operational history of many of these activities are no longer readily available.

- Availability of former employees (“Old-Timers”) - Normally an indispensable source of information on historic operation, former employees at NSRR were often difficult to identify or locate, and often of marginal value in securing information. This was especially true of former employees of tenant activities.

2.0 ENVIRONMENTAL SETTING

2.1 LOCATION

NSRR is located at 18º15’ North latitude and 65º38’ East longitude on approximately 8,432 acres of land on the eastern coast of Puerto Rico. Puerto Rico is the easternmost island in the Greater Antilles chain separating the Caribbean Sea from the Atlantic Ocean; the island is approximately 110 miles long by 35 miles wide. NSRR is bordered by the municipalities of Ceiba to the west and north and Naguabo to the southwest. The nearest major town, Fajardo, with a population of nearly 42,000, is approximately eight miles north of NSRR. Figure 2-1 presents the general location of NSRR.

NSRR is bounded to the west and north by public and private lands, following a roughly straight line which runs in a south-southwest to north-northeast direction from the Ceiba State Forest to Bahía (Bay) Demajagua; and to the east and south by the coastline of eastern Puerto Rico along the Vieques Passage, formed by numerous large and small peninsulas, coves and bays. The coastal areas occupied by NSRR include Bahía Algodones, Ensenada Honda, Bahía Puerca, Pasaje Medio Mundo, Puerto Medio Mundo and the lower part of Bahía Demajagua.

NSRR also encompasses the nearby islands of Piñeros and Cabeza de Perro. Piñeros and Cabeza de Perro Islands are located approximately ½ mile east of NSRR in the Caribbean Sea at 18º15’N latitude and 65º35’E longitude. Piñeros Island is approximately 1 mile by ½ mile in size (310 acres) and Cabeza de Perro is a small island at approximately ¼ mile in diameter (30 acres) located ¼ mile east of Piñeros (EEI 1992). Figure 2-2 presents a map of NSRR, and identifies the “common names” for various sections of NSRR.

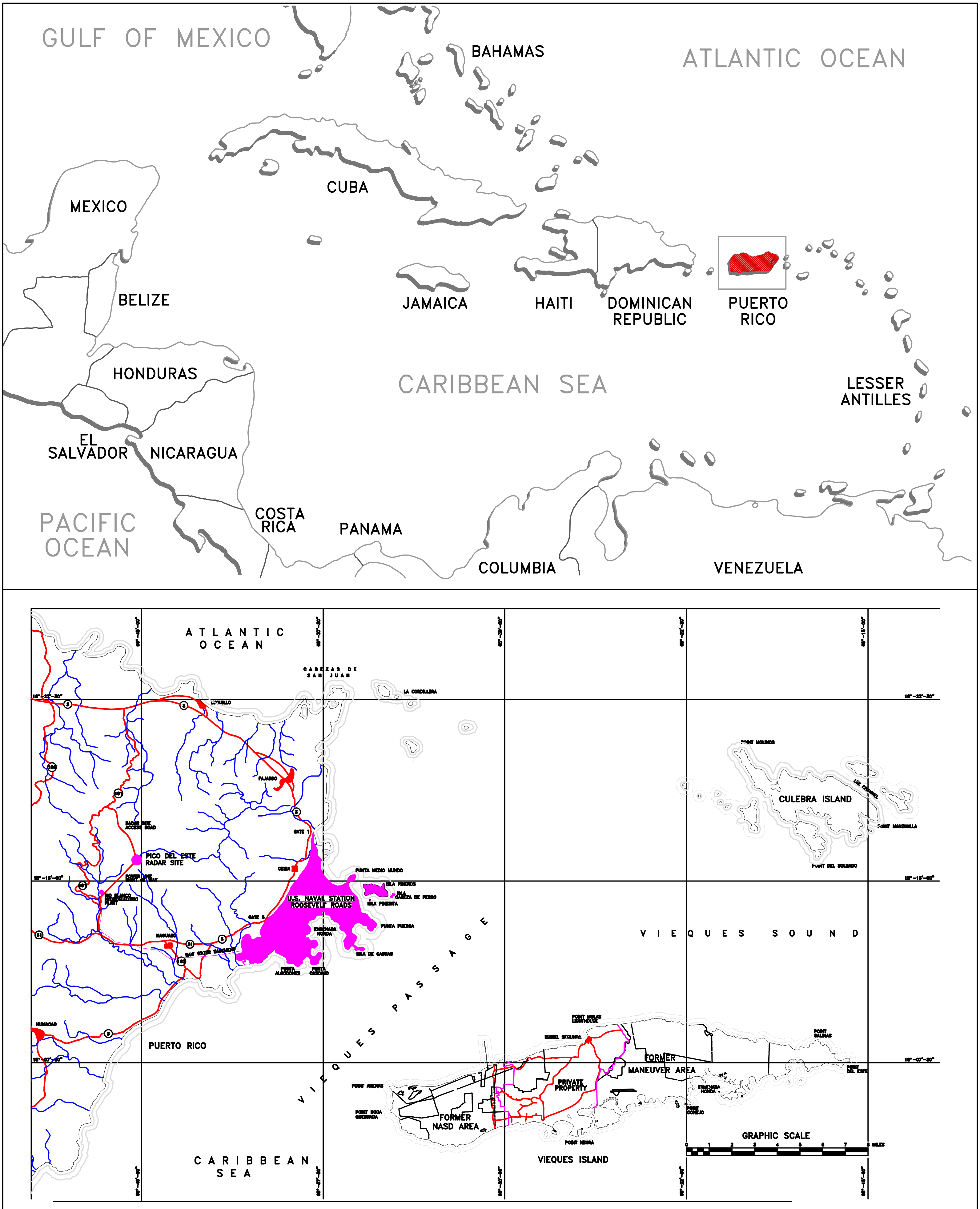


Figure 2-1. General NSRR Location

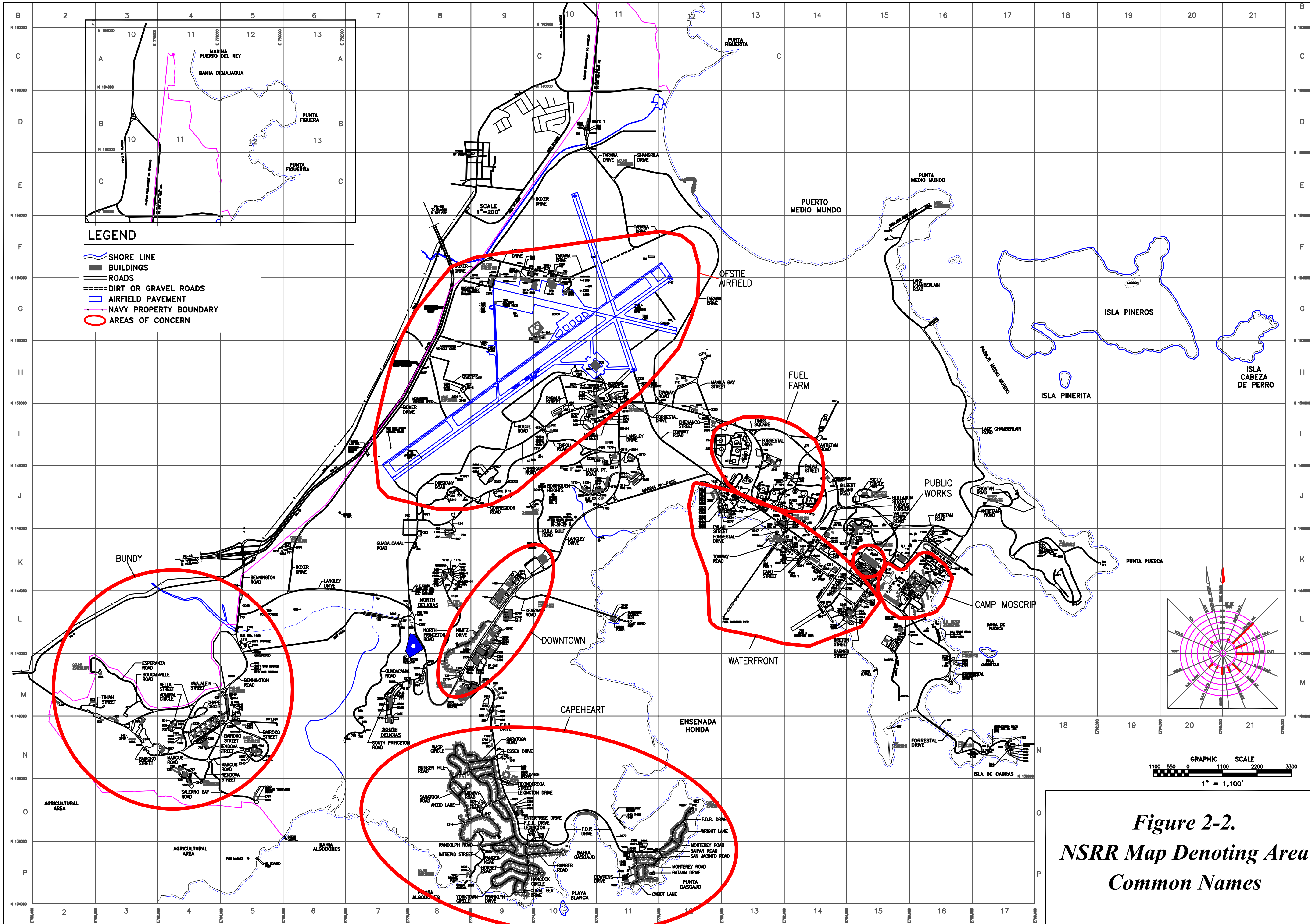


Figure 2-2.
NSRR Map Denoting Area Common Names

2.2 *EXISTING LAND USE*

NSRR encompasses approximately 8,432 acres of land, classified into three categories: improved, semi-improved, and unimproved. Improved land includes those areas that have been highly developed and maintained for aesthetics and/or mission and operational needs. Improved areas of NSRR include the housing and administrative areas (Capehart and Bundy), Ofstie Field, the Waterfront/ Forrestal area, and infrastructure improvements associated with these areas (i.e., roads utilities, etc.). These areas are generally intensively developed, maintained, and/or landscaped. NSRR has approximately 2,500 acres of improved lands, or approximately 30 percent of NSRR's total land mass (GMI 1998).

Semi-improved areas at NSRR comprise the agricultural out lease area, some operations areas (e.g., ammunition storage area, small arms range, and fuel storage areas), and infrastructure improvements associated with these areas (e.g., roads, utilities, etc.). Semi-improved lands are characterized as grounds that require regular maintenance (although not as intense as improved lands) due to operational considerations. The semi-improved lands on NSRR encompass approximately 1,400 acres, or 17 percent of NSRR's land (GMI 1998).

Included in the Semi-improved areas is a leased portion of NSRR, located north of Gate 1 outside the boundaries of the perimeter fence. These areas include 200 acres leased to an individual for cattle grazing and 11.8 acres leased to the municipality of Ceiba for recreational purposes (see photo A-1). The lessee performs management and maintenance of these areas. Under the terms of the lease, the lessee of the grazing land must install and maintain a boundary fence on the grazing land to prevent livestock from entering the adjacent mangroves. The lease for the recreational land requires that a fence be installed and maintained along the western and southern boundaries of the parcel and prohibits the construction of permanent structures on the land (GMI 1998).

Unimproved land at NSRR consists of marine habitat, coastline areas, mangrove areas, upland forest areas, special habitats (critical habitat, wetlands), and infrastructure improvements associated with these areas (primarily utility right-of-way). Unimproved lands encompass approximately 4,500 acres or over 53 percent of NSRR's land mass. Included in the unimproved lands are Isla Piñeros and Cabeza de Perro, two islands located just off the east coast of NSRR (GMI 1998) (see Section 2.1).

Figure 2-3 presents a depiction of the land category types at NSRR.

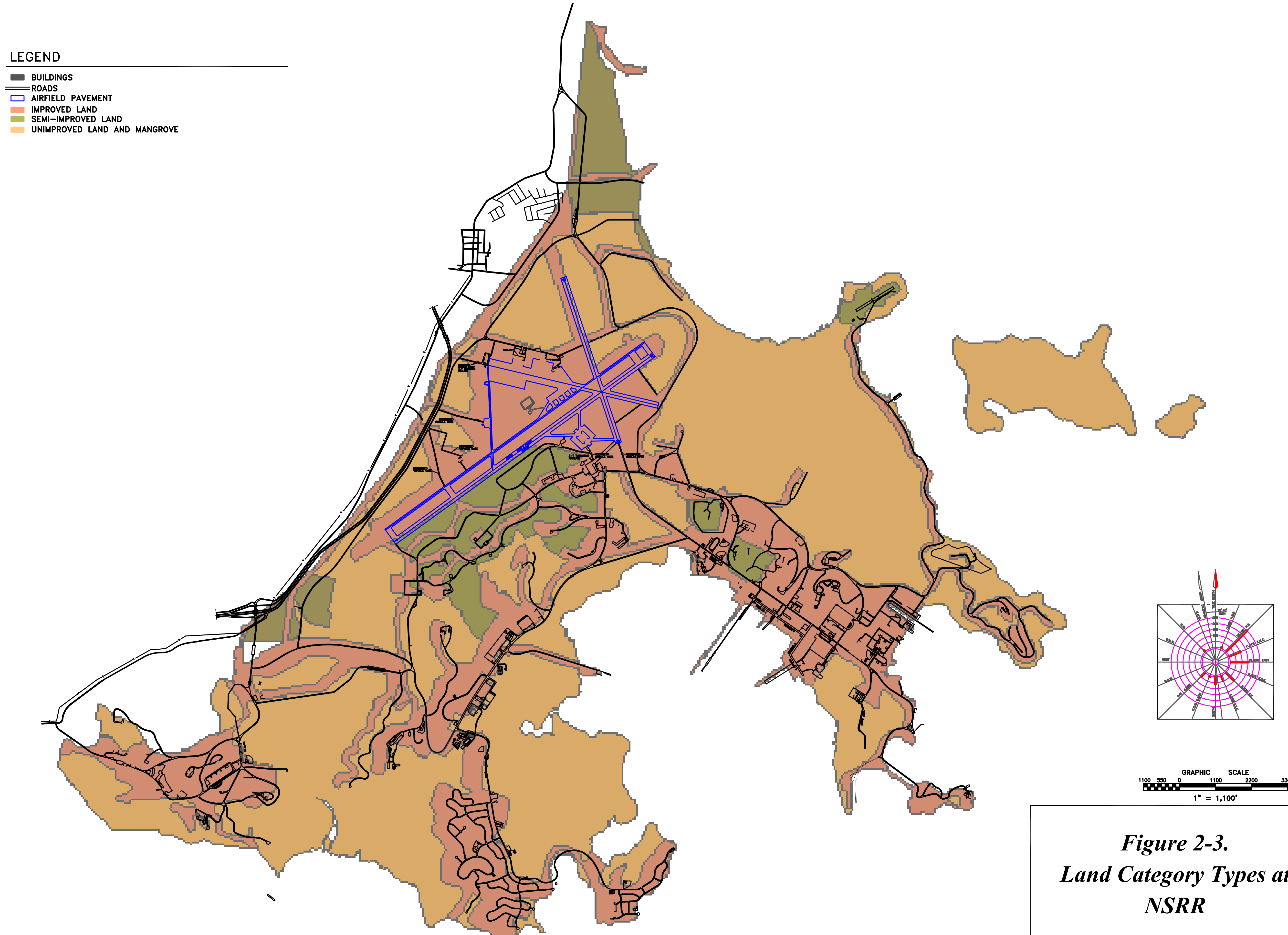


Figure 2-3. Land Category Types at NSRR

NSRR ECP - 7/15/05

2.3 CLIMATE

NSRR has a tropical-marine climate characterized by minimal temperature fluctuations, relatively moderate humidity, and frequent rain showers. The annual mean temperature is 79.9 degrees Fahrenheit (°F). July and August are the warmest months (82.4°F) and February is the coldest month (76.8°F). Easterly trade winds, which persist throughout the year, have a substantial moderating effect on the tropical heat. The relative humidity averages 65-78%.

Rainfall in Puerto Rico varies considerably from place to place, but generally consists of brief showers that occur frequently throughout the year. On NSRR, the average annual rainfall is approximately 58 inches. The rainy season is typically defined as May through November, when monthly rainfall averages between 4.08 and 7.64 inches. However, significant rainfall events have also been recorded during December (e.g., 16.05 inches in 1981, 10.11 inches in 1975). In addition, it should be noted that areas immediately west and north of NSRR routinely receive approximately 70 to 100 inches annually. These areas include portions of the Rio Daguao watershed, the lower part of which encompasses lands within NSRR (EEI 1987). The hurricane season is from June 1 through November 30; maximum winds exceed 95 knots during severe hurricanes. An average of two tropical storms per year occur in the general area of NSRR, one of which usually reaches hurricane intensity.

Rainfall on Piñeros and Cabeza de Perro islands generally consists of brief showers throughout the year. The average rainfall is approximately 50 inches; rain clouds approaching NSRR from the east tend to move in a path that takes them north of the islands (EEI 1992).

2.4 TOPOGRAPHY

The region encompassing NSRR consists of an interrupted, narrow coastal plain with small valleys extending from the Sierra de Luquillo range, which has been severely eroded by streams into valleys several hundreds of feet deep. Slopes of up to 60 percent are common.

The topography within the immediate area of NSRR is varied, with elevations ranging from sea level along the coast to approximately 297 feet above mean sea level (MSL) at North Delicias Hill and at a hill in the southwestern-most corner of NSRR (see Figure 2-4).

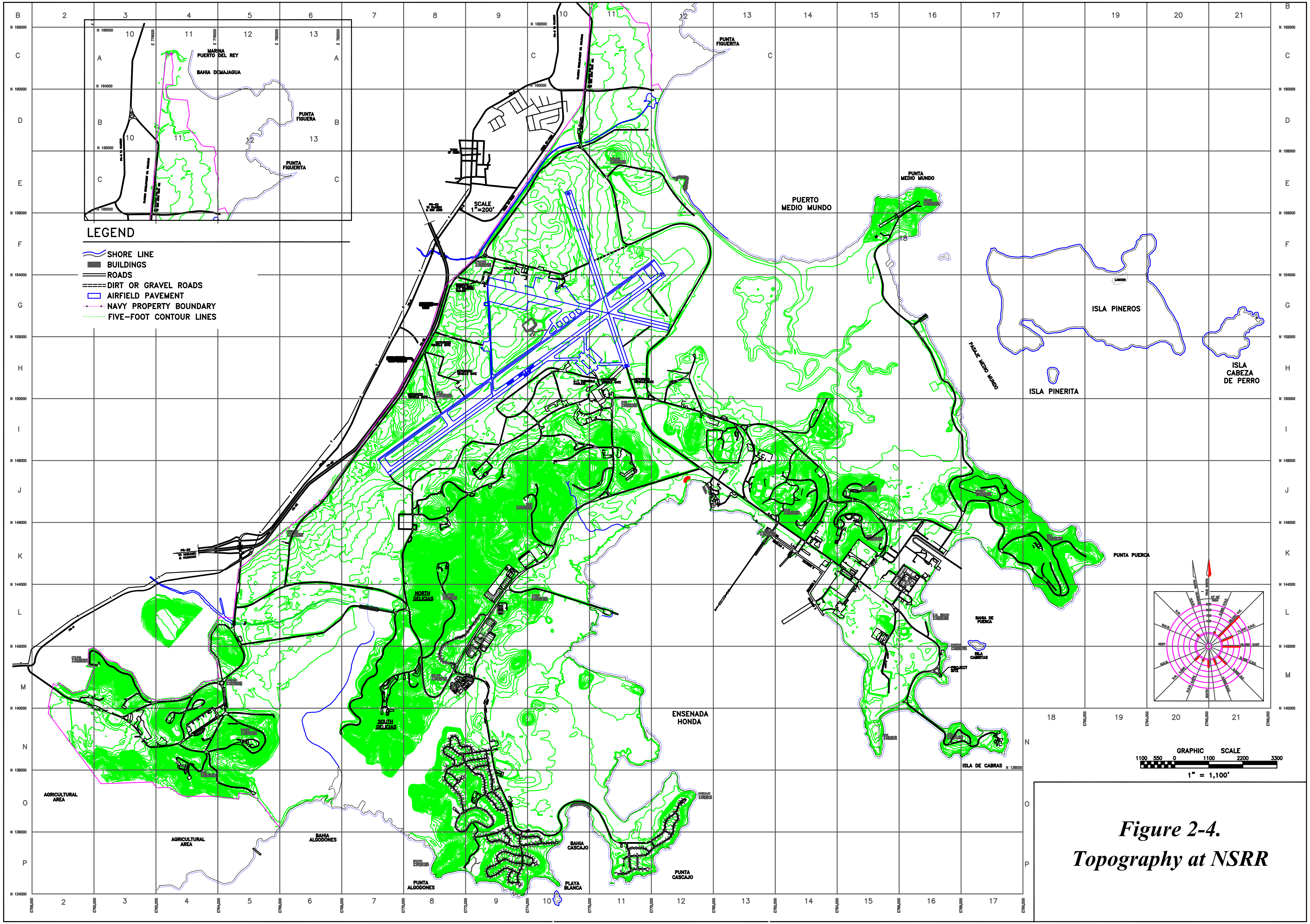


Figure 2-4.
Topography at NSRR

There is a series of three hilly areas on NSRR; these are interspersed with broad flat valleys and coastal plains within which most development is concentrated, as well as mangrove and marsh areas. Two of the three hilly areas separate the southern Ofstie Airfield area from the Waterfront, housing, and Personnel Support areas. The third set of hills is in the Bundy area. These ridgelines not only separate sections of NSRR; they dictate the degree of allowable development. The ridgeline south of the Ofstie Airfield provides an excellent sound barrier, lessening the aircraft-generated noise reaching the bachelor-enlisted quarters (BEQ) and housing areas to an acceptable level. Immediately to the north of the NSRR boundary, the hills rise abruptly to heights of 800-1,015 feet above MSL (NAVFAC Atlantic 1980).

The topography of Piñeros Island is characterized by a series of smooth, round hills and low-lying swampy areas. The hills range in elevation from less than 70 feet in the northwest to a hill of 250 feet above MSL in the south-central portion of the island. The hills run generally in a southeast to northwest direction. These hills are generally very steep, with slopes of greater than 25% found on 140.5 acres (45.3%) of the island and slopes of 15 to 25% on 42.2 acres (13.6%) of the island. Only approximately 39 acres (12.6%) of the surface area on Piñeros consists of upland with slopes less than 15%. The remaining 88.2 acres (28.5%) of Piñeros is composed of low-lying mangrove swamp or brackish lagoon. The most significant areas of swamp are located on the southwestern and northeastern portions of the island. Piñeros Island is surrounded by mostly narrow (less than ten-feet-wide) sandy beaches, except where steep rock cliffs abut the ocean. Coral reefs border the north and east coastlines (EEI 1992).

Cabeza de Perro Island is a smoothly rounded cay with a maximum elevation of 100 feet above MSL. The shoreline of Cabeza de Perro consists of rocky beaches and sea cliffs (EEI 1992).

2.5 SURFACE WATER

The surface waters that flow across the northeastern plain of Puerto Rico, where NSRR is situated, originate on the eastern slopes of the Sierra de Luquillo Mountains. The surface runoff is channeled into various rivers and streams that eventually flow into the Caribbean Sea. The Daguao River and Quebrada Seca Stream collect surface waters from the hills immediately north of NSRR, and in periods of heavy rain, on-site flooding occurs. The Daguao/Quebrada Seca watershed comprises an area of approximately 7.6 square miles (4,864 acres), nearly a third of which is comprised of NSRR land. The Daguao River falls approximately 700 feet from its source, through the western portion of NSRR, and finally to sea level at Bahia Algodones.

The increased development in the Town of Ceiba, especially in areas adjacent to NSRR's northern boundary, has significantly increased the surface water runoff reaching NSRR, causing ponding and erosion in the Boxer Drive area (see NSRR location map, Figure 2-1).

Under a 1942 agreement, NSRR gets raw water from the Rio Blanco watershed, located approximately 11 miles from NSRR, west of the Town of Naguabo. This water source is described in detail in Section 5.13.1.

Both Piñeros and Cabeza de Perro islands lack fresh surface water resources. Three brackish water lagoons are located on Piñeros Island, two of which are perennially flooded and one of which is intermittently flooded. The largest of these is located in the southwest lowland area and is approximately 4.5 acres in size. The next largest lagoon is located on the northeast portion of the island at the base of the major southeast-to-northwest-running hill system, is permanently flooded and approximately 1.9 acres in size. The third lagoon is located between two low hills on the extreme northeast area of Piñeros, dries up during the dry season, and is approximately 0.6 acre in size (EEI 1987).

Figure 2-5 depicts the floodplains/major surface water features at NSRR. Wetlands, mangroves, and other natural resources at NSRR are discussed in Section 2.9.

2.6 GEOLOGY AND SOILS

The underlying geology of NSRR is predominantly volcanic composed of lava and tuff, as well as sedimentary rocks derived from discontinuous beds of limestone. These rocks range in age from early Cretaceous to middle Eocene. The volcanic rocks and interbedded limestone have been complexly faulted, folded, metamorphosed, and intruded by dioritic rocks. This complex geological restructuring occurred sometime after the deposition of the limestone during the middle Tertiary age, when Puerto Rico was separated from the other major Antillean Islands by block faulting and was arched, uplifted, and tilted to the northeast. In addition to the predominant volcanic and sedimentary rock, the northwestern and western sectors of NSRR are underlain by unconsolidated alluvial and old alluvial deposits from the Quarternary period.

The primary geologic formations on and near NSRR are various beach deposits, alluvium, quartz diorite and granodiorite, quartz keratophyre, the Daguao formation, and Figuera lava. The Peña Pobre fault zone traverses NSRR (EEI 1984).

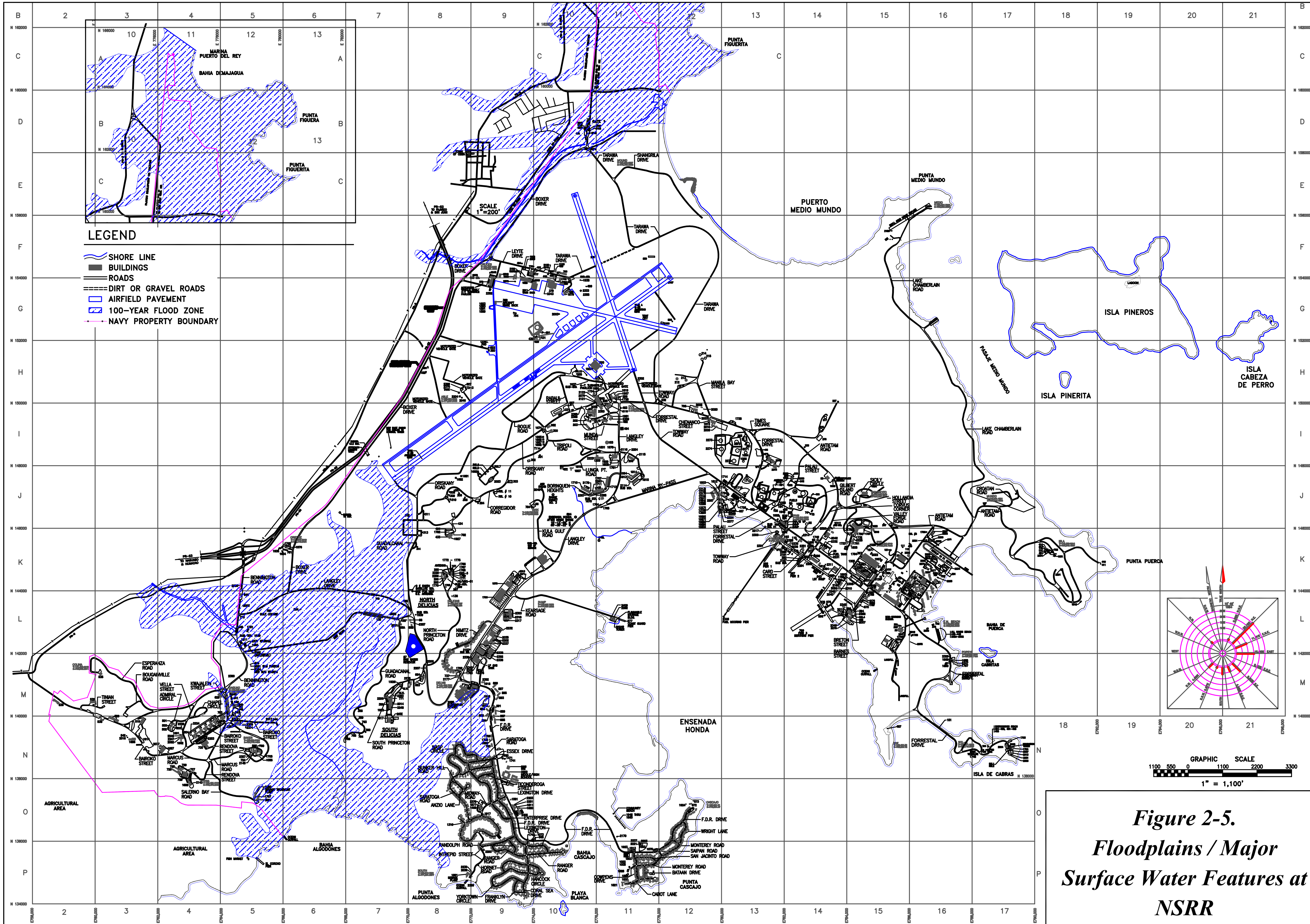


Figure 2-5. Floodplains / Major Surface Water Features at NSRR

The soils on NSRR can be grouped into six associations (see Figure 2-6). An association is comprised of one or more major soils (from which the name is derived), and usually several minor soils. In some areas, a detailed classification of soil is not practical (e.g., when the soils are too rocky, shallow, severely eroded, or variable). On NSRR, these land types include Rock Land, Wet Alluvial Land, and Made Land.

The first soil association is the Swamps-Marshes association, which consists of deep, very poorly drained soils found in level or nearly level strips of land along coastal areas. The soils in this association are sandy or clayey and contain organic materials from decaying mangrove trees; they are underlain by coral, shells, and marl at varying depths. This association occurs in several large areas of NSRR such as the Machos, Ensenada Honda, and Daguao River mangroves. These soils have no agricultural value and serve only as feeding and breeding areas for birds and crabs.

The second association is the Coloso-Toa-Bajura association, which occurs on nearly level (0 to 2% slope) floodplains as fine to moderately fine-textured sediments of mixed origin. The Toa soils of this association are moderately well drained and suited for agriculture, but occur on floodplains that prevent such usage. The Coloso and Bajura soils, deep and poorly drained, also occur on floodplains within NSRR (most notably the Daguao River floodplain in the vicinity of the golf course, but also the Quebrada Palma floodplain located on and near the extreme southwestern edge of NSRR).

The third association is the Mabi-Rio Arriba-Cayagua association, which occurs in areas ranging from 2 to 12% grade. The association occurs over a wide area of gently sloped lowlands from Gate 1 as far south as the northern extent of the Daguao River floodplain, typically on terraces and alluvial fans above floodplains such as the Ofstie Airfield. This association also characterizes areas along Boxer Drive, west of the Ofstie Airfield. These soils are either deep and moderately well-drained when occurring on steep slopes (2 to 5%), or somewhat poorly drained clay on gentler slopes (0 to 15%). Unfavorable drainage limits use of this association for farming; recreation and urban use of these soils is limited by a high to very high shrink-well potential and slow permeability.

The fourth association is the Caguabo-Mucara-Naranjito association, which consists of soils that were derived from residual material from weathered volcanic rocks. These soils are shallow to moderately deep, well-drained, and sloping to very steep and occur specifically on the foot slopes and side slopes in the Bundy area. Steep slopes (average of 40%), high erosion potential (runoff is very rapid), and shallow depth to bedrock are the main limitations for farming, recreation, and urban land uses.

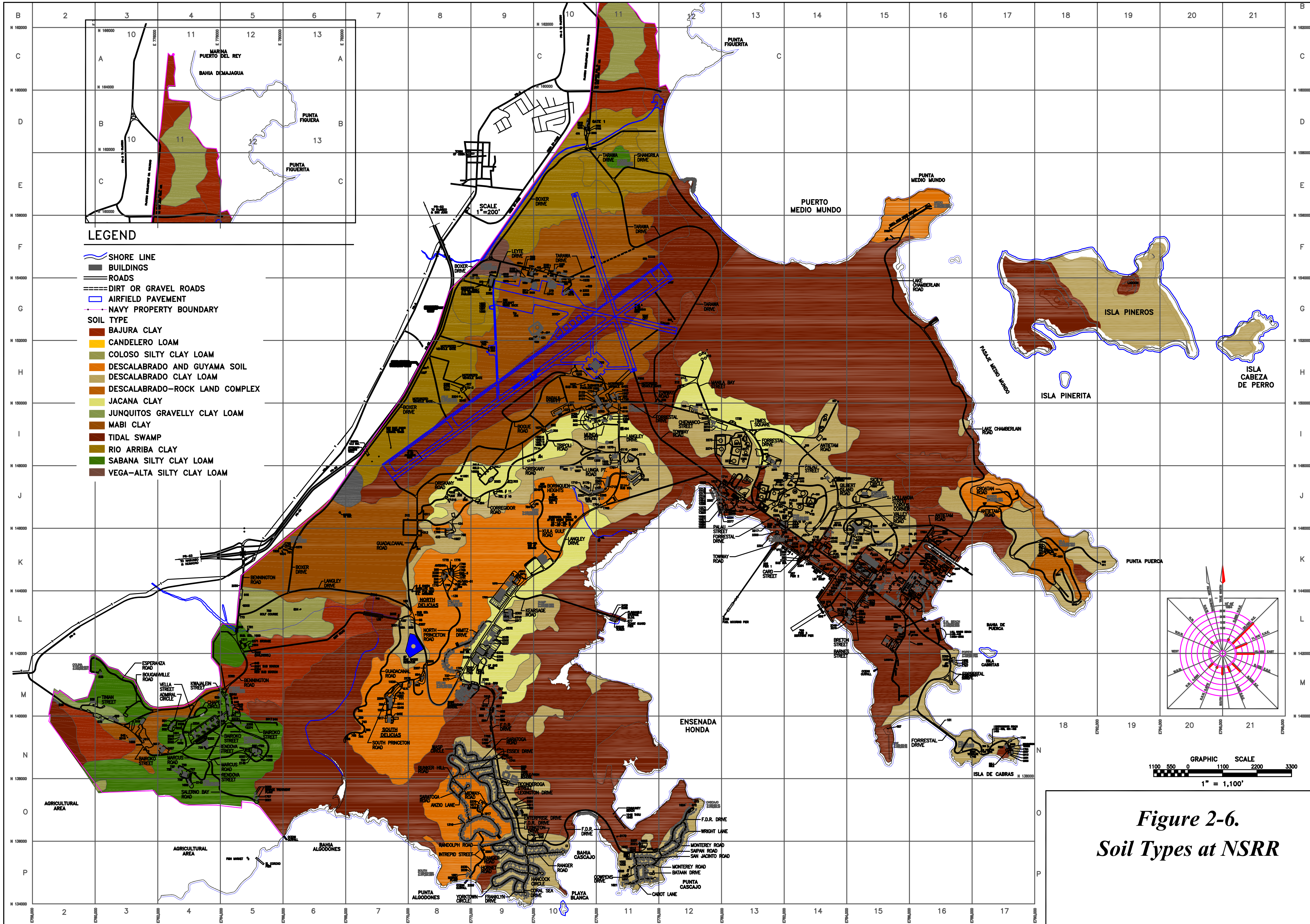


Figure 2-6.
Soil Types at NSRR

The fifth association is the Descalabrado-Guayama association. It consists of shallow, well drained, moderately permeable soils that formed in moderately fine-textured residuum derived from volcanic rock. Slopes range from 5 to 60%. These soils are characteristic of the steep volcanic coastal hills located within NSRR (south of Ofstie Field and north of Ensenada Honda); on peninsulas around Cascajo Bay; on Punta Puerca and Medio Mundo peninsulas; and on the islands of Cabras, North Cabras, and Piñeros . The association soils have severe limitations for septic tanks, landfills, roads and streets and moderate to severe limitations for recreational use. The soils have no value as cropland and are suited only for low-intensity grazing or wildlife habitat.

The sixth and final association is the Jacana-Amelia-Fraternidad association, of which only the Jacana soils occur on NSRR. The Jacana clay consists of moderately deep soils, formed from fine-textured sediments and residuum derived from basic volcanic rocks. Slopes range from 5 to 12%. On NSRR, Jacana soils are found where sediments derived from uplands (Descalabrado-Guayama soils/volcanic rock materials) have been deposited on the foot slopes, specifically the coastal hills north and east of Ensenada Honda. These clays have a high natural fertility. Limitations for farming, recreation, and urban land use involve a moderate rate of runoff, susceptibility to erosion, high shrink-swell potential, and shallow depth to bedrock.

Rock land is defined as areas where rock crops out on 50 to 70% of the land surface; loose rock and stones are common, with shallow soil material occurring in scattered areas between outcrops. The vegetative cover consists of brush. This type of land has very little value for farming or engineering, and is restricted mainly to wildlife habitat. On NSRR, two small peninsulas, one near Cascajo Bay and the other across from Cabras Island, have been designated as Rock Land by the USDA Soil Conservation Service.

A small portion of the Daguao River floodplain has been classified as Wet Alluvial Land. This type of land typically consists of lagoon-like areas or depressions on a floodplain where the water table is at or near the surface most of the time. Soils/sediments range in texture from clay to loam and are submerged during rainy periods. A high water table and lack of drainage outlets make this type of land suitable only for wildlife habitat (EEI 1987). Wetlands, mangroves, and other natural resources at NSRR are discussed in Section 2.9.

2.7 HYDROGEOLOGY

Available information on NSRR hydrogeology and groundwater formations is limited. Confined or partially confined groundwater conditions exist at NSRR. The confined conditions may be the result of the presence of the Daguao formation. This formation is composed of resistant volcanic rock and may act as a confining/semi-confining unit at NSRR. The dense nature of the volcanic rock and slow recharge rates observed in NSRR monitoring wells indicate low permeability and result in the Daguao formation acting as a confining/semi-confining unit (MNA 2003).

The available groundwater on NSRR is generally acceptable for most industrial and commercial uses. The "hardness" of this water shows a predominance of calcium, bicarbonate and magnesium ions, but is within normally acceptable ranges. As the depths of wells increase and distances to the sea decrease, the levels of salt-water intrusion rise. No wells have been developed on station. Several wells were once developed upgradient of NSRR in Ceiba, but were abandoned due to high levels of salinity. Under a 1942 agreement, NSRR gets raw water from the Rio Blanco watershed (NAVFAC Atlantic 1987).

Both Piñeros and Cabeza de Perro islands lack fresh surface water or groundwater resources (EEI 1992).

2.8 HISTORICAL AND CULTURAL RESOURCES

Based on the results of surveys conducted by the Navy, both archaeological and architectural sites have been documented on NSRR. Investigations on NSRR over the last 60 years have yielded evidence of settlement during the Archaic and Ceramic Ages, the Spanish Colonial period, as well as during the historic period of the twentieth century. The historic sites on NSRR generally appear to be small tenant sites related to agricultural use of the area prior to development of NSRR. The exceptions are a 19^{th} century Spanish Colonial domestic site located in an inundated coastal setting on the southern fringe of Enseñada Honda and a 19^{th} century sugar complex located near the Bundy area. The prehistoric sites on NSRR date from the period prior to Spanish influence in the Americas.

The Navy has performed surveys to identify cultural sites on NSRR in accordance with Section 110 of the National Historical Preservation Act. A total of 29 archaeological sites were identified: 4 Spanish Colonial, 17 Pre-Columbian, 4 multi-component sites that included both Spanish Colonial and Pre-Columbian materials, and 4 rock art sites. Of the sites identified, none is listed on the National Register of Historic Places (NRHP), 2 were determined to be eligible for listing, 20 were determined to be potentially eligible for listing, 3 were determined not to be eligible, and 4 were not evaluated (RCGA 1998). Figure 2-7 presents the archaeologically sensitive areas at NSRR.

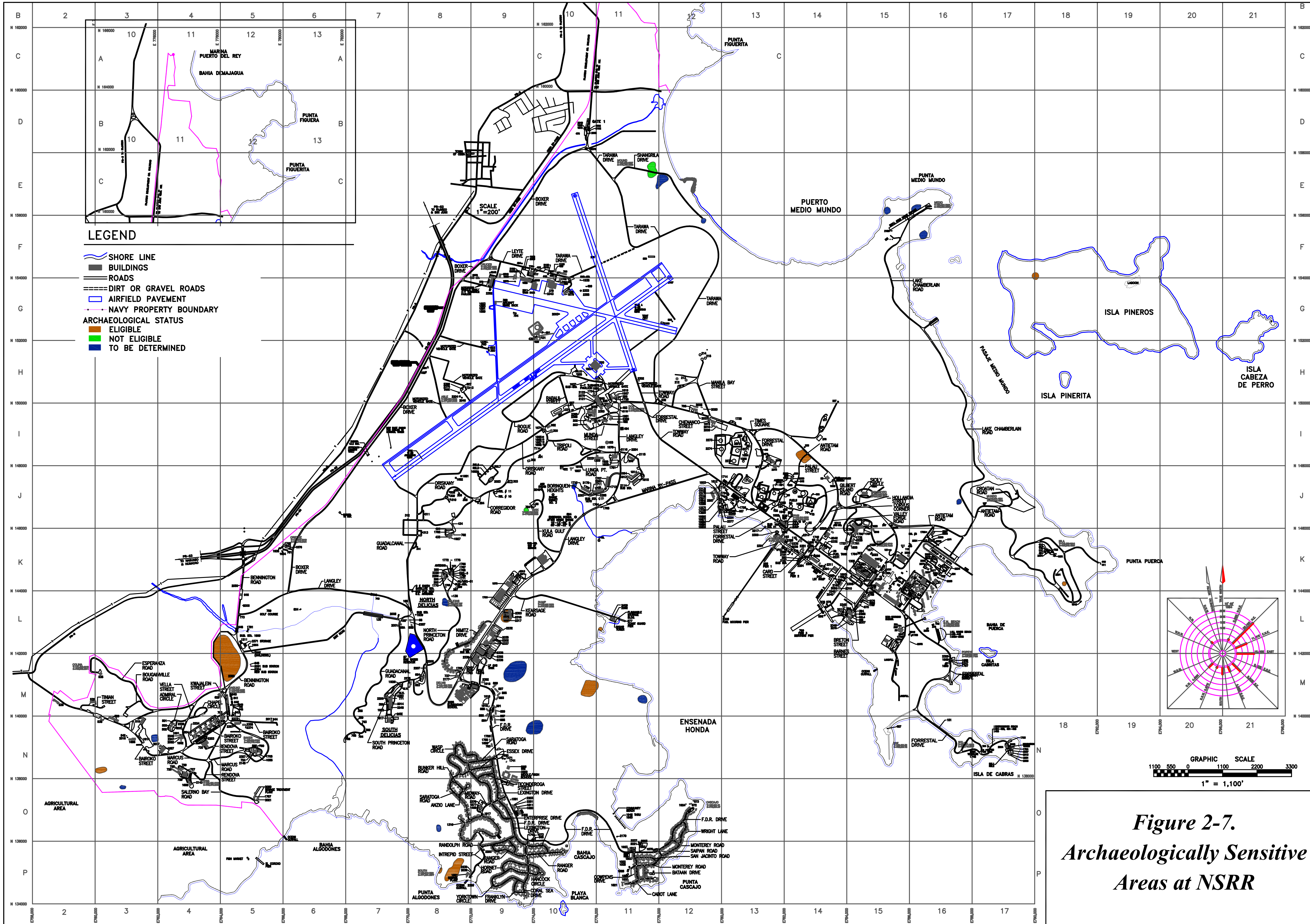


Figure 2-7.
Archaeologically Sensitive Areas at NSRR

In addition to these archaeological sites, a total of over 1,300 buildings and structures were documented within NSRR boundaries. No buildings on NSRR were identified as possessing those qualities of significance and/or integrity necessary for listing in the NRHP (RCGA 1999).

2.9 ECOLOGY AND NATURAL RESOURCES

Three different types of terrestrial resources are found at NSRR. These resources include vegetation, Conservation Zones, and wildlife.

Vegetation. Approximately 4,500 acres of indigenous vegetation occur on NSRR. The three primary vegetative cover types found on NSRR are upland forest, mangrove, and beach strand associations.

The upland forests generally consist of early successional stands of relatively small trees. As a result of periodic thinning, the stands are dense, with grasses and shrubs prevalent. Trees typically have compound leaves, or simple leaves that are succulent or leathery, and broad expansive crowns. Heights rarely exceed 40 to 50 feet. The upland forest vegetation has minimal commercial value, but does provide valuable watershed protection by preventing erosion and promoting groundwater recharge (EEI 1987).

Mangrove ecosystems are self-maintaining coastal landscape units that couple upland terrestrial and coastal estuarine ecosystems; they are perhaps the most important habitat type occurring at NSRR. Three species of mangroves occur on NSRR: the red, black, and white mangrove. The red mangrove flourishes in areas of high salinity and is generally found in pure stands on the seaward edge of a mangrove forest. Red mangrove detritus provides food for the minute organisms at the start of the food chain and is, therefore, ecologically a crucial species; the roots also bind together the soil at the water's edge preventing shoreline erosion. The black mangrove, though tolerant of high salinity, cannot endure prolonged periods of root submersion and usually is found just landward of the pure red mangrove stands. The white mangrove is found in the upland areas that are rarely subject to inundation by the sea (NAVFAC Atlantic 1980).

Beach Strand ecosystems, vegetated by a dense thicket of salt-tolerant shrubs and woody plants, occur on slightly elevated sandy ridges, such as old beach ridges, and are occupied by xerophytic plants. Common shrubs include the bay cedar and the seagrape. Trees include the coconut, the button bush, and the poisonous manzanillo (EEI 1987).

Conservation Zones. Approximately 2,900 acres of NSRR are designated wetlands, which imposes significant limitations on land available for development. Of the areas designated as wetlands, approximately 60% are mangroves. The mangroves themselves are not considered endangered; however, they are considered wetland areas and are protected under Federal law (DON 1998). Figure 2-8 depicts the wetlands at NSRR.

The only declared critical habitat on NSRR is for the yellow-shouldered blackbird. The area declared critical in 1976 included the entire land area of NSRR; however, a 1980 agreement with the U.S. Fish and Wildlife Service (USFWS) exempted certain areas on NSRR from this categorization (INRMP 1998). In 1996, a study was conducted to better delineate the areas that could potentially be used by yellow-shouldered blackbirds. According to the report, mangrove habitats should be considered the most important habitats for yellow-shouldered blackbirds (GMI 1998).

Wildlife. Because of its island ecosystem, abundance or diversity of terrestrial vertebrates is not found on Puerto Rico; the ocean barrier impedes natural dispersion. The major mammal population in and near NSRR consists of introduced species such as stray dogs and cats, Norway and gray-bellied rats, mice, and mongooses. The reptile population (especially snakes) has been significantly reduced as a result of the large mongoose population. More than 200 species of birds inhabit the island of Puerto Rico, approximately half of which can be found on NSRR throughout the year (TEC 1996).

Bird Aircraft Strike Hazard (BASH) has been a concern at NSRR due to ground-based flight operations and adjacent habitats. Species determined by a 1994 study to present a hazard to NSRR aircraft include: gulls, cattle egrets, frigate birds, raptors, blackbirds (grackles and cowbirds), and wading birds (GMI 1998).

Wildlife on Piñeros and Cabeza de Perro islands largely consists of various birds, including several sensitive species (i.e., brown pelican, white-cheeked pintail [*Anas bahamensis*], and whitecrowned pigeon [*Columba leucocephala*]). The mangrove portions of Piñeros Island contain habitat for the yellow-shouldered blackbird. This area was off-limits to training activities, thereby affording the birds sanctuary. The waters surrounding the islands contain habitat for sea turtles and manatees, both of which have been observed. Divers check for both sea turtles and manatees prior to underwater demolition activities to prevent harm to these species. Additionally, the beaches on Isla Piñeros and Cabeza de Perro provide potential habitat for nesting sea turtles. Isolation and limited access provide the best protection for wildlife species, while existing environmental restraints on training activities prevent environmental degradation and greatly limit potential threats to listed species (see below) (GMI 1998).

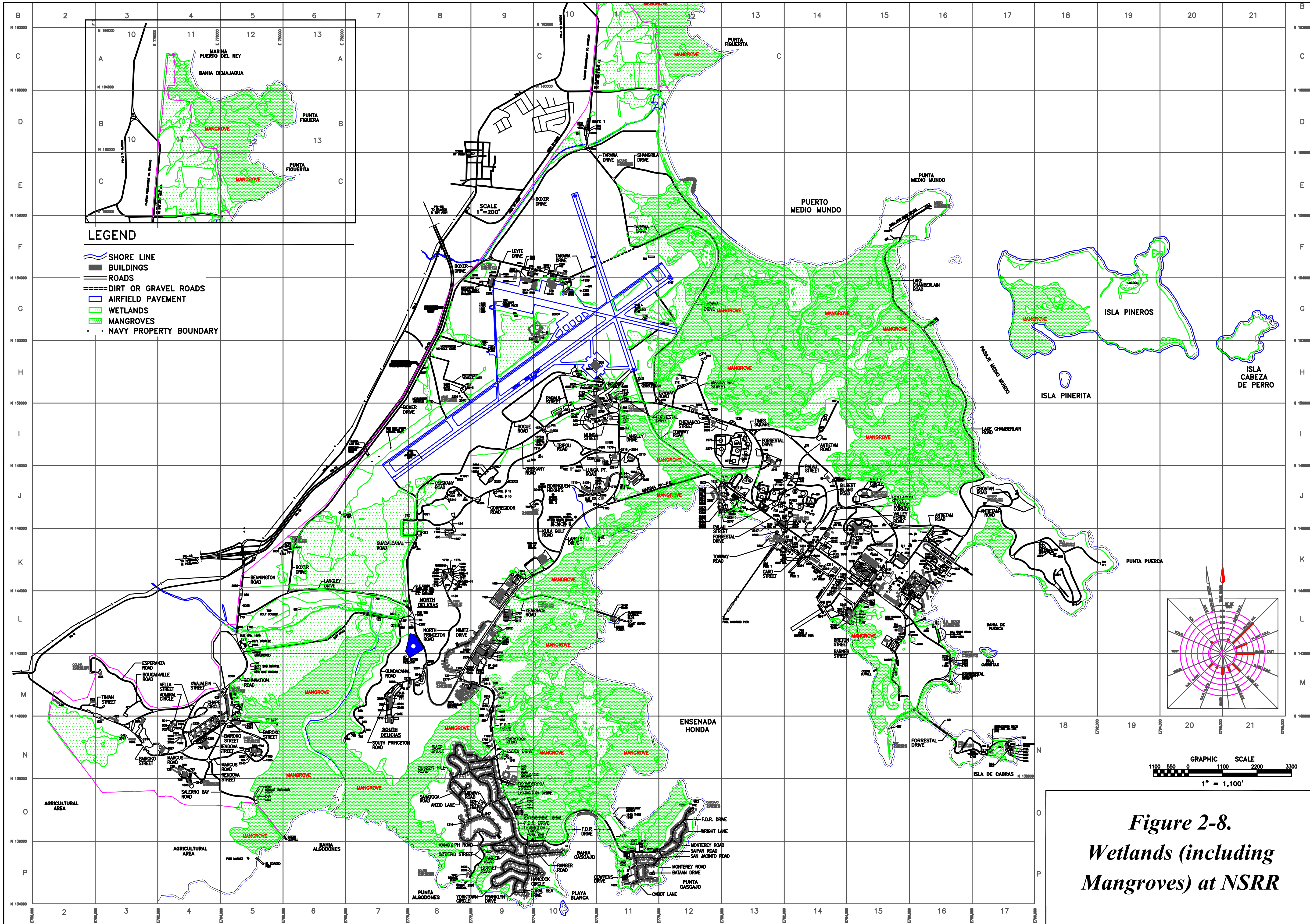


Figure 2-8. Wetlands (including Mangroves) at NSRR

2.9.1 Threatened and Endangered Species

NSRR supports a variety of biota that have been listed by either the federal government or the Commonwealth of Puerto Rico as threatened, endangered, or vulnerable (Commonwealth only). Table 2-2 lists these species.

Table 2-2. Listed Species Known to Occur on NSRR

Species	Federal Status	Commonwealth Status
Reptiles		
Green sea turtle	T	E
Loggerhead sea turtle	T	--
Hawksbill sea turtle	E	E
Leatherback sea turtle	E	E
Olive Ridley sea turtle	--	E
Puerto Rican boa	E	E
Birds		
Yellow-shouldered blackbird	E	E
Brown pelican	E	E
Peregrine falcon	--	E
Arctic Peregrine	--	--
Roseate Turn	T	--
Snowy plover	--	V
West Indian whistling duck	--	T
Caribbean coot	--	T
Ruddy duck	--	T
Least Grebe	--	T
Least tern	--	V
Piping plover	T	--
Mammals		
West Indian Manatee	E	E
Plants		
Cobana negra	T	--

Source: EEI 1984, confirmed through U.S. Fish and Wildlife Service website (2004)
T = threatened
E = endangered
V = vulnerable

3.0 CURRENT AND PAST USES OF NSRR

3.1 NSRR OWNERSHIP

A comprehensive and independent chain-of-title review was not conducted for this ECP Report. However, sufficient records were obtained from the NSRR PWD-Engineering Division, Real Estate Branch, to sufficiently identify ownership and other real property interests at NSRR. The Department of the Navy acquired the majority of property that now constitutes NSRR between 1941 and 1945 (see Table 3-1). This property was acquired in fee from private landowners (see Appendix E for a map depicting parcel ownership prior to U.S. Navy). As shown in Table 3-1, real property documents indicate that, since 1941, the U.S. Navy acquired a total of 8,655.373 acres, disposed of 223.57 acres, and retains 8,431.803 acres (not including permits and easements). The ECP did not identify any issues with respect to NSRR ownership.

Several significant outgrants and ingrants remain in-place for NSRR, as presented in Tables 3-2 and 3-3:

Table 3-2. Summary of Significant Outgrants at NSRR

Outgrant	**Size (acres)**	**Purpose**
U.S. Army	11.52	Army Reserve Center docking facilities
Private Citizen	176	Agricultural purposes (outside Gate 1)
PRWRA	30	Electrical line right-of-way
Commonwealth of PR	2.33	Los Machos public road
PR Highway Authority	11.67	Highway 53
Municipality of Ceiba	11.80	Los Machos beach access
Federal Bureau of Investigation	--	Bldg. 686
U.S. Customs	8,400 SF	Bldg. 2262 and Pier 2444
Department of Homeland Security	8,312 SF	Bldg. 386, South Delicias area

Source: DON 1998c; NSRR PWD Real Property Office, 2005

Table 3-1. Land Acquisition and Disposal at NSRR

Tract	Civil Case Number	Acquisition Date	Original Acres Acquired	Type of Acquisition	Disposed Acres	Remaining Acres	Records Locator	Legislative Jurisdiction
1	2782	14 Jul 42	601.68	FEE	173.43[H]	428.25	PROPERTY 635, PAGE 182, VOL. 19 de Ceiba	Exclusive
2	2435	31 Jan 42	2217.33	FEE	-0-	2217.33	PROPERTY 620, PAGE 97, VOL. 19 de Ceiba	Proprietary
3	2316	18 Nov 41	1,284.04	FEE	-0-	1,284.04	PROPERTY 619, PAGE 86, VOL. 19 de Ceiba	Exclusive
	N/A	N/A	163.50	FILLED LAND	-0-	163.50		N/A
4	2601	5 May 42	1,304.49	FEE	4.73[F]	1,299.76	VOL. 14 IS TOTALLY DETERIORATED	Proprietary
5	2712	26 Jun 42	2,120.24	FEE	31.37[G]	2,088.87	PROPERTY 633, PAGE 12, VOL. 24 of Ceiba PROPERTY 1682, PAGE 7, VOL. 49 of Humacao PROPERTY 1797, PAGE 213, VOL. 53 of Humacao PROPERTY 1799, PAGE228, VOL. 53 of Humacao PROPERTY 1798, PAGE 222, VOL. 53 of Humacao PROPERTY 2, PAGE 108, VOL. 25 of Humacao PROPERTY 1250, PAGE 39, VOL. 32 of Humacao PROPERTY 1568, PAGE 97, VOL. 50 of Humacao PROPERTY 6808, PAGE 295, VOL. 295 Humacao	Exclusive = 1,679.10 Acres Proprietary = 441.14 Acres
6	2970	20 Oct 42	370.73	FEE	-0-	370.73	PROPERTY 641, PAGE 213, VOL. 19 of Ceiba	Exclusive = 3.89 Acres Proprietary = 366.84 Acres
7	4271	27 Jan 45	576.175	FEE	7.72[E]	568.455	PROPERTY 541, PAGE 129, VOL. 17 of Ceiba PROPERTY 204, PAGE 53, VOL. 5 of Ceiba	Exclusive
	4271	27 Jan 45	15.628	EASEMENT	6.32[B&C]	9.308		Proprietary
8	85-0443	7 Dec 84	1.56	FEE	-0-	1.56	PROPERTY 620, PAGE 106, VOL. 19 of Ceiba	N/A
SUBTOTAL		--	**8,655.373**	--	**223.567**	**8,431.803**		
INGRANTS	NA	NA	112.73	PERMITS		112.73		Fee
	NA	NA	155.498	EASEMENTS		155.498		Fee
TOTAL			**8,923.601**		**223.567**	**8,700.031**		

Source: NSRR PWD Real Property Office, 2005
A = TRACT E-48 (Parcel 7)
B = TRACT E-87 (Parcel 17E)
C = TRACT E-81 (Parcel 11E)
D = TRACT E-82 (Parcel 12)
E = TRACT Portion of E-37
F = Parcel 110 (by Gate 2)
G = El Corcho Mangroves
H = Punta Figueras Mangroves
NOTE: TRACT E-76 (1.275 ACS) OF CIVIL CASE 4271 WAS EXCESSED BUT RETAINED AS EASEMENT ON QUITCLAIM DEED OF 9 DEC 1966. REFER TO EI-0686

Table 3-3. Summary of Significant Ingrants at NSRR

Ingrant	Size (acres)	Purpose
PR Water Resources Authority (PRWRA)	4.54	Water franchise at Rio Blanco
Private Citizens	56.59	Flight clearance
PR Land Administration	42.79	Airspace rights
Private Citizen	53.19	Rio Blanco water line
U.S. Coast Guard	20.43	Cabras Island

Source: DON 1998c; NSRR PWD Real Property Office, 2005

3.2 USES OF NSRR PRIOR TO THE U.S. NAVY

Prehistorically, South American aborigines and Caribbean Native American tribes who developed agricultural villages dependent mainly upon corn and cassava occupied the island of Puerto Rico. In the early 16th century, Spain began occupation of the east coast of Puerto Rico. By the middle of the 17th century, Puerto Rico had settled into a plantation existence whose economy was dominated by coffee, tobacco, and sugar plantations worked by African slaves. By the latter part of the 19th century, sugar became Puerto Rico's most important crop, with the United States as the major buyer, so that by the end of the 19th century, the east coast of the island had developed into a large-scale producer of sugar and sugar by-products. At the conclusion of the Spanish-American War, the Treaty of Paris signed on December 10, 1898, ceded Puerto Rico to the United States.

Prior to the Navy's presence on the property that now constitutes NSRR, most of the arable land was used primarily for sugarcane cultivation in the lowland area and for cattle grazing on the hillsides (USFWS 1993). In common with the main island of Puerto Rico, portions of Piñeros and Cabeza de Perro islands also were utilized for limited amounts of sugar production, until their acquisition by the U.S. Government in 1941 (RCGA 1998).

Review of available documents and photographs, and interviews with former and current station personnel, did not identify any significant industrial facilities at NSRR prior to U.S. Navy ownership. No environmental concerns were identified with respect to activities conducted on NSRR prior to U.S. Navy ownership.

3.3 USES OF NSRR BY THE U.S. NAVY

U.S. Military activity at NSRR began in 1941 with the establishment of Fort Bundy, located at the southwestern portion of the current NSRR, as U.S. Army headquarters for coastal artillery emplacements. In 1943, Naval Station Roosevelt Roads, consisting of the northeastern portion of the current NSRR, was commissioned as a Naval Operating Base to provide training and support to

Atlantic Fleet operations in the Caribbean. Both Fort Bundy and NSRR remained active until the end of World War II, and several of the "core" areas and buildings on NSRR were constructed during that time period. Between the end of World War II and 1957, both NSRR and Fort Bundy were deactivated and reactivated several times, and were essentially maintained in a "caretaker" status. In 1957, NSRR was reactivated, incorporated the former Fort Bundy, and designated as the home of the new Atlantic Fleet Guided Missile Training Operations Center. The base's initial major mission was to provide missile support facilities and missile training to the Atlantic Fleet's submarine units.

[Note: Historic maps depicting station development throughout the years are presented in Appendix E.]

In 1963, just a few months after the Cuban Missile Crisis, the Atlantic Fleet Weapons Training Facility (AFWTF) was created and commissioned as a separate activity to support communications and weapons technology, maintenance and operation of weapons testing and exercises, and military maneuvers training. AFWTF became responsible for the coordination and scheduling of Atlantic Fleet weapons testing exercises and land, sea and amphibious maneuvers. Its administrative functions were carried out from NSRR property, whereas the training exercises and facilities were located at Vieques and Culebra islands. The previous establishment of the Fleet Guided Missile Training Operation in 1957, and the commissioning of the AFWTF in 1963, and their attendant support and personnel functions comprised the greatest build-up activity at Roosevelt Roads, Vieques and Culebra. The development campaign peaked in 1969, with the construction of numerous operations, industrial, administrative and support facilities, decreasing significantly afterward (LAW 2001).

On October 1, 1979 a treaty between the United States and Panama required the departure of all U.S. military forces from Panama by 1999, resulting in the relocation of the Special Operations Command South (SOCSOUTH) to NSRR in 1999/2000. SOCSOUTH manages over 200 Special Operations Forces deployments annually, averaging 42 missions in 16 countries at any given time, providing a flexible means of accomplishing a wide range of missions.

NSRR's major mission since the early 1960s was to support the AFWTF training missions on Vieques Island. However, since the transfer of the Vieques Naval Training Range to the Department of the Interior on May 1, 2003, all AFWTF training activities on Vieques have ceased.

On Sept. 30, 2003, President George W. Bush signed the 2004 Defense Appropriations Act into law. Section 8132 of this act directs that NSRR be disestablished within 6 months, and that the real estate disposal/transfer be carried out in accordance with procedures contained in BRAC 1990. NSRR was officially closed on March 31, 2004. The U.S. Navy then established NAPR to serve as the caretaker of the real property associated with NSRR and to assist in the transfer of the property.

4.0 RECORDS REVIEW, ECP RECONNAISSANCE, SITE INVESTIGATION, AND SAMPLING

The records review, aerial photography analysis, physical site inspections, interviews, and site sampling constituted the investigative portion of the ECP, and are the basis for determining the property categorization types discussed in Section 1.2.

4.1 RECORDS REVIEW

The records review portion of the ECP was conducted continuously throughout the ECP process. The primary review of records available at NAVFAC Atlantic offices in Norfolk, Virginia, was conducted from October 20-24, 2003, prior to the initial ECP inspection. This allowed the ECP team to review and analyze data and focus NSRR inspections on critical areas and issues.

Records reviews were also conducted during ECP inspections at NSRR (see Section 4.4). All available and pertinent documents and drawings located in the NSRR Public Works Department (PWD) and applicable tenant organizations were reviewed to provide historic information regarding NSRR.

In addition to the records review conducted at NAVFAC Atlantic and NSRR, a records search was conducted at the National Archives Offices in Washington, D.C. and College Park, Maryland. Finally, the review included records and reports obtained from U.S. Navy/other federal contractors.

Relevant excerpts and data from the records reviewed are presented in the appropriate resource area subsections of Section 5 of this ECP Report. All relevant findings including ECP Sites (i.e., sites not identified in previous environmental investigations) identified as a result of the records reviews are discussed in the appropriate resource area subsections of Section 5.0.

4.2 COMMERCIAL DATABASE REVIEW FOR SUBJECT PROPERTY AND ADJACENT PROPERTIES

As part of the records review, a commercial database search was conducted for federal, commonwealth agency, and local records by Environmental Data Resources, Inc. (EDR). The EDR Report defines and summarizes the ASTM databases reviewed and notes if any sites were identified within the specified search areas [including U.S. Postal Service (USPS) zip codes 00735 and 00742]. NSRR is located in the Commonwealth of Puerto Rico, a United States Territory. The territory search results are categorized by zip code findings, city findings, and county findings. The zip code findings include federal records (EPA Region II), and the city and county findings include local and territory level records. The databases searched include the following:

- National Priorities List (NPL);
- Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS);
- CERCLIS-No Further Remedial Action Planned (CERCLIS-NFRAP);
- Corrective Action Reports (CORRACTS);
- Resource Conservation and Recovery Information System - Treatment, Storage and Disposal Facilities (RCRIS-TSD);
- RCRIS Large Quantity Generators (LQGs);
- RCRIS Small Quantity Generators (SQGs);
- Emergency Response Notification System (ERNS);
- Commonwealth Hazardous Waste Sites (SHWS);
- Registered Underground Storage Tanks (USTs); and
- Leaking USTs (LUSTs).

The information gathered in the EDR Reports for adjacent properties are addressed in Section 4.2.2. A complete copy of the EDR Report is included in Appendix C.

Table 4-1 provides a list and summary description of all databases searched and the number of sites ("hits") that were identified for each database as provided in the EDR Report produced 3 February 2004. A summary of these listings is provided below.

NSRR is listed in several federal and commonwealth environmental records databases searched by EDR, and are discussed in the subsections below. Other sites (adjacent properties) within the zip codes identified that are included in either federal or state databases are also shown in Table 4-1 and discussed below.

The potential for an identified adjacent property to have an impact on NSRR is based on one or more of the following:

- Readily available information from regulatory files;
- The presence of a documented release of hazardous substances or wastes in the regulatory files reviewed or as identified in the database report; and

- The level of contamination, the relative distance and directional location from NSRR, and known or anticipated ground water flow direction.

Table 4-1. Federal and Commonwealth Database Summary

Database	Radius Searched	Sites Found
FEDERAL DATABASES		
National Priorities List (NPL) The NPL is EPA's list of uncontrolled or abandoned hazardous waste sites identified for priority remedial actions under the Superfund program. A site must meet or surpass a predetermined hazard ranking score, be chosen as a state's top priority site, or meet three specific criteria set jointly by the U.S. Department of Health and Human Services and the U.S. EPA in order to become an NPL site.	Zip codes 00735 and 00742	0
Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) The CERCLIS list contains sites, which are either proposed to or on the NPL, and sites that are in the screening and assessment phase for possible inclusion on the NPL. The information on each site includes a history of all pre-remedial, remedial, removal and community relation's activities or events at the site, financial funding information for the events, and unrestricted enforcement activities.	Zip codes 00735 and 00742	0
CERCLIS-No Further Remedial Action Planned (NFRAP) NFRAP sites may be sites where, following an initial investigation, no contamination was found, contamination was removed quickly, or the contamination was not serious enough to require Federal Superfund action or NPL consideration.	Zip codes 00735 and 00742	0
Resource Conservation and Recovery Information System (RCRIS Generator) RCRA small quantity generators (SQG) are facilities, which generate less than 1,000 kg/month of non-acutely hazardous waste. RCRA large quantity generators (LQG) are facilities, which generate at least 1,000 kg/month of non-acutely hazardous waste (or 1 kg/month of acutely hazardous waste).	Zip codes 00735 and 00742	9 (includes NSRR)
Resource Conservation and Recovery Information System – Treatment, Storage, or Disposal Facilities (RCRIS - TSD) The EPA's RCRA Program identifies and tracks hazardous waste from the point of generation to the point of disposal. The RCRA facilities database is a compilation by the EPA of facilities, which report generation, storage, transportation, treatment, or disposal of hazardous waste. RCRA TSDs are facilities, which treat, store and/or dispose of hazardous waste.	Zip codes 00735 and 00742	0
Corrective Action Report (CORRACTS) Treatment, storage, and disposal facilities subject to corrective action under RCRA.	Zip codes 00735 and 00742	0
Emergency Response Notification System (ERNS) The ERNS database is a national database containing records from October 1986 to December 1998 and is used to collect information for reported releases of oil and hazardous substances. The database contains information from spill reports made to federal authorities including the EPA, the US Coast Guard, the National Response Center, and the Department of Transportation.	Zip codes 00735 and 00742	90 (includes NSRR)

Table 4-1. Federal and Commonwealth Database Summary (continued)

Database	Radius Searched	Sites Found
COMMONWEALTH DATABASES		
Commonwealth Hazardous Waste Site (CHWS) The SHWS is the state/commonwealth equivalent to the federal CERCLIS, and includes priority sites planned for cleanup.	City of Ceiba	0
Registered Underground Storage Tanks (USTs) This is a database of USTs that are registered with the Puerto Rico Environmental Quality Board. USTs are regulated under Subtitle I of RCRA and must be registered with the department responsible for administering the UST program.	City of Ceiba	0
Leaking Underground Storage Tanks (LUSTS) This database is maintained by the Environmental Quality Board and includes cases that have or have had leaking USTs, other below ground releases, spills and inspections. LUST sites may also be referred to as Oil Control Program Cases (OCPCASES).	City of Ceiba	5

4.2.1 NSRR Listings

4.2.1.1 Federal ASTM Standard Databases

RCRIS SQG

Table 4-1 includes nine (9) federal database hits that are RCRIS sites shown to be located within approximately ¼ mile of NSRR. Four (4) of the nine sites are NSRR, and are listed as regulated Conditionally Exempt Small Quantity Generators (RCRIS-CESQG) of hazardous wastes with no recorded violations. The remaining five (5) sites are discussed in Section 4.2.2.1.

A more detailed and accurate description of the regulatory status of NSRR with respect to hazardous waste is presented in Section 5.2.2.

ERNS

Table 4-1 includes ninety (90) federal database hits that are Emergency Response Notification System (ERNS) sites shown to be located within approximately ¼ mile of NSRR. The ERNS database is populated by information from the National Response Center and the United States Coast Guard and contains records of reported releases of oil and/or hazardous substances. Eighty-eight (88) of the ninety sites are NSRR. No additional database description is provided for these sites in the EDR Report. The remaining two (2) sites are discussed in Section 4.2.2.1.

A description of releases that have occurred at NSRR is presented in Section 5.2.4.

4.2.1.2 Commonwealth ASTM Standard Databases

LUST

The Leaking Underground Storage Tank (LUST) database, also known as the Oil Control Program Cases (OCPCASES) database, includes cases with leaking underground storage tanks and other belowground releases, spills, and inspections. There are five (5) LUST cases identified in Table 4-1.

Two (2) of the five listed sites are located on NSRR. The first listing includes a confirmed release on 6 September 2000 at the South Delicias Building No. 1817 on NSRR. The release was identified during the removal of a UST at this site. No additional information regarding this listing was provided in the EDR Report. The second listing includes a reference to NSRR, but states that no release was identified. No additional information regarding this listing was provided in the EDR Report. The remaining three (3) sites are discussed in Section 4.2.2.2.

A more detailed and accurate description of LUST sites at NSRR is presented in Section 5.5.1.

4.2.2 Adjacent Property Listings

[Note: the results of a visual inspection of property adjacent to NSRR are presented in Section 6.0]

4.2.2.1 Federal ASTM Standard Databases

RCRIS SQG

As stated previously, Table 4-1 includes nine (9) federal database hits that are RCRIS sites shown to be located within approximately ¼ mile of NSRR. Four (4) of the nine sites are NSRR (see Section 4.2.1.1). The remaining five (5) off-site listings are owned by private and public entities and include the following: (1) the United States Postal Service facility located at 305 Ave Lauro Pinero in Ceiba, PR, (2) the Department of Education facility located on Calle Francisco Gauthier URB in Ceiba, PR, (3) the R. H. Products facility located at Parque Ind Ceiba Carr 979 in Ceiba, PR, (4) the Ceiba Municipal Government facility located at Sector Capa St-Carlos Figueroa in Ceiba, PR, and (5) the Puerto Rico Aqueduct and Sewer Authority (PRASA) Ceiba facility located at KM 53.2 on State Road #3 in Ceiba, PR.

The United States Postal Service facility is listed as a RCRIS-CESQG of hazardous wastes with no recorded violations, and is not considered to be of concern to NSRR. The Department of Education facility, listed under the facility name of Santiago Iglesias Pantin, is listed as a regulated Small Quantity Generator (RCRIS-SQG) of hazardous wastes with no recorded violations, and is not considered to be of concern to NSRR.

The R. H. Products facility is listed as a regulated RCRIS-SQG of hazardous wastes with five recorded violations on 13 July 1998 and two recorded violations on 29 January 1999. The seven violations are all related to manifest (e.g., recordkeeping) requirements and other SQG requirements. All seven violations were addressed through written informal enforcement actions. The facility achieved compliance on the five 13 July 1998 violations by 14 May 1999, and achieved compliance on the two 29 January 1999 violations by 17 February 1999.

The Ceiba Municipal Government facility, listed under the facility name of Alberto Culver at Ceiba DTOP, is listed as a regulated RCRIS-CESQG of hazardous wastes with no recorded violations, and is not considered to be of concern to NSRR. The Prasa Ceiba facility is listed as a regulated RCRIS-SQG of hazardous wastes with no recorded violations, and is not considered to be of concern to NSRR.

These facilities are federally regulated facilities, currently in compliance, and are not considered to be of concern to NSRR.

ERNS

As stated previously, Table 4-1 includes ninety (90) federal database hits that are ERNS sites shown to be located within approximately ¼ mile of NSRR. The ERNS database is populated by information from the National Response Center and the United States Coast Guard and contains records of reported releases of oil and/or hazardous substances. Eighty-eight (88) of the ninety sites are NSRR (see Section 4.2.1.1). The two (2) remaining listings are related to one private facility identified as Puerto Del Rey Marina and Resort, which is located in the city of Fajardo, PR. This facility lies outside the ASTM radius for this database, and is not considered to be of concern to NSRR.

4.2.2.2 Commonwealth ASTM Standard Databases

LUST

There are five (5) LUST cases identified in Table 4-1. Two (2) of the five listed sites are located on NSRR (previously discussed in Section 4.2.1.2). The remaining three (3) cases are associated with gas stations located along State Road #3, which runs parallel to the western boarder of NSRR, and include the following: (1) a Texaco station located at KM 53.7 on State Road #3 in Ceiba, PR, (2) an ESSO station located at KM 56.9 on State Road #3in Ceiba, PR, and (3) an ESSO station located at KM 5.2 on State Road #3 in Ceiba, PR.

The listing for the Texaco station at KM 53.7 indicates that no release was identified and no additional information is provided in the EDR Report. The listing for the ESSO station at KM 56.9 indicates a release was confirmed on 7 November 2001 through observation of free product in a well. No additional information related to this site was provided in the EDR Report. The listing for the ESSO station at KM 5.2 indicates that no release was identified, but an UST was removed on 9 December 2002. No additional information for this site was provided in the EDR Report. These three LUST sites, however, were observed to be located at sufficient distances from NSRR to not be considered a specific concern to NSRR.

4.3 AERIAL PHOTOGRAPHY ANALYSIS

In addition to the records review, the Navy conducted an extensive analysis of aerial photography (covering the period 1936-1999) from multiple sources, as presented in Table 4-2.

All of these photographs were evaluated for the Navy by a firm specializing in the analysis of aerial photography. The aerial photographic analyses were used to:

- Identify any anomalies (e.g., large spills/stains, ground scars, debris piles, pits, possible disposal areas, etc.) that were not identified in previous investigations;

- Track the history of NSRR operations from pre-Navy occupation (pre-WW II) to the present; and

- Verify the history, location, and extent of previously identified sites of known or suspected contamination.

Table 4-2. Aerial Photography Analyzed during ECP

DATE OF AERIAL PHOTOGRAPHY	SOURCE	SCALE	FILM TYPE[1]
3-7-36	PRHTA[2]	1:18K	BW
6-18-58	NARA[3]	1:6K	BW
10-19-61	NOS[4]	1:15K	BW
10-26-61	NOS	1:30K	BW
2-15-62	NOS	1:10K	CC
1-15-64	PRHTA	1:20K	BW
3-5-65	NOS	1:10K	CC
12-6-76	NOS	1:20K	CC
2-xx-77	PRHTA	1:20K	BW
12-18-77	NOS	1:60K	BW
12-18-77	NOS	1:35K	B
12-20-77	NOS	1:60K	B
12-20-77	NOS	1:35K	BW
2-1-79	EPA[5]	1:12K	CC
2-1-79	EPA	1:25K	CC
2-1-79	EPA	1:23K	CC
2-1-79	EPA	1:24K	CC
3-8-79	EPA	1:9K	CIR
12-28-79	EPA	1:12K	CIR
1983	EPA	1:40K	CIR
1985	PRHTA	1:20K	BW
1989	EPA	varies	CC
1-11-91	USGS[6]	1:33K	CC
10-xx-95	PRHTA	1:20K	BW
9-22-95	USGS	1:33K	CIR
1999	PRHTA	1:20K	BW

1. Film types: BW-Black-and-white, CC-Conventional color, CIR-Color infrared
2. Puerto Rico Highway and Transportation Authority
3. National Archives and Records Administration
4. National Ocean Service, U.S. Department of Commerce
5. Environmental Protection Agency
6. U.S. Geological Survey, U.S. Department of the Interior

The aerial photographic analysis was conducted by viewing stereo frames of film transparencies through a zoom stereoscope; the film transparencies were backlit on a light table. Stereoscopic viewing creates a three-dimensional effect, which, when combined with viewing at various magnifications, enables an analyst to identify signatures associated with various features and environmental conditions. (The term "signature" refers to a combination of visible characteristics, such as tone, shadow, texture, size, shape, pattern, and association, which enable an analyst to recognize a specific object or condition on aerial photography.) At least one other senior imagery analyst reviewed the analysis to ensure completeness and consistency; this quality control step is standard practice in the field of photo interpretation.

Mosaics were made from select years of aerial photography, and findings [referred to as photo-identified (PI) sites] from the analysis were digitized and included as a data layer on the mosaics.

While informative, aerial photographs alone are rarely conclusive. Anomalies may be attributable to a number of causes unrelated to environmental concerns. Therefore, the results of the aerial photographic analyses were evaluated and cross-referenced with the:

- Results of the records review (see Section 4.1);
- Results of previous/ongoing investigations;
- Results of physical site inspections conducted pursuant to the ECP, including site inspections conducted solely for the purpose of investigating ("ground-truthing") potential areas of contamination uncovered by the aerial photographs (see Section 4.4); and
- Results of interviews with current and former NSRR employees as to the types of activities conducted at each of the PI sites (see Section 4.5).

PI sites that, through a combination of the above-listed factors, were determined to be of a potential environmental concern, were deemed "ECP Sites" and are discussed in further detail in Section 5.4.

Table 4-3 presents a summary of the findings for the PI sites investigated during the ECP. Figure 4-1 shows the location of each of the PI sites. In addition, Appendix D presents aerial photograph mosaics for 1936, 1958, 1961, 1964, 1976, 1977, 1985, and 1995 that show the location of each of the PI sites.

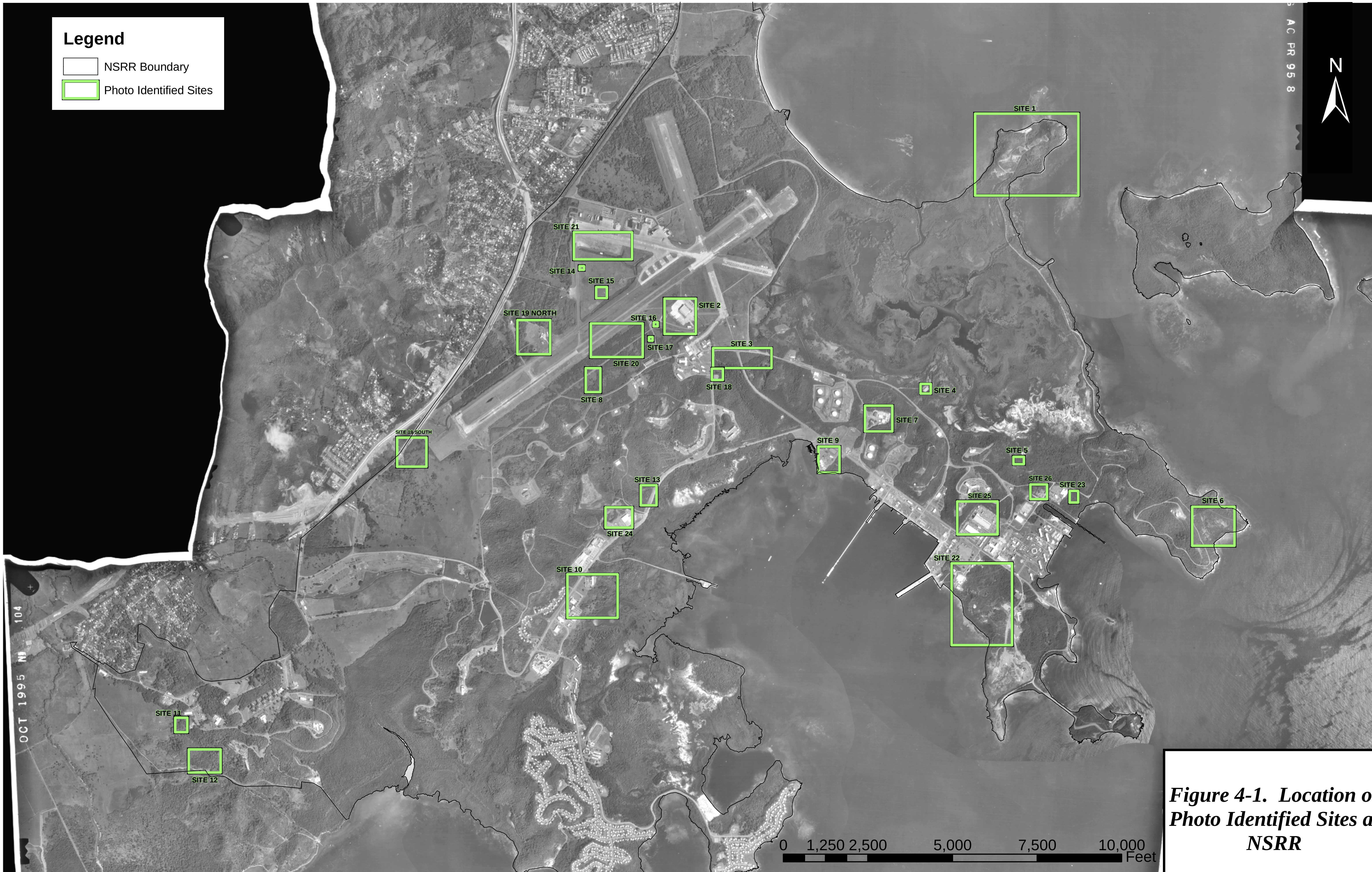


Figure 4-1. Location of Photo Identified Sites at NSRR

Table 4-3. PI Sites at NSRR

PI Site **ECP Site**	**Years Observed in Aerial Photos** **Description of Area**	**Investigation Findings**
PI Site 1 ECP Site 1	1958-current Small-arms ranges, on the northeast side of the station at Punta Medio Mundo. In 1958, three pits, potentially for munitions disposal or detonation, were immediately southwest of the current pistol range area.	Records review (RR), physical site inspection (PSI), and interviews confirmed use of various portions as small arms ranges. However, RR, PSI, and interviews did not confirm or repudiate use of pits for munitions disposal or detonation.
PI Site 2 ECP Site 2	1958-1965 Aircraft apron NW of Hangar 200, observed stains/liquid extending off the edge of the hardstand to a drainage ditch.	RR did not identify area as wash rack or disposal site, and PSI did not observe any significant stains or stressed vegetation. However, interviews confirmed numerous past spills of petroleum, oil, and lubricants (POL) and hazardous materials (HM), and use as an aircraft wash rack likely.
PI Site 3	1958 Large area with numerous piles of mounded material located SE of the corner of Forrestal Dr. and Langley Dr.	RR did not identify source of mounded material. PSI did not observe evidence of mounded material or waste disposal; appeared to be filled area. Interviews confirmed area was filled to prevent flooding; no indication of use of contaminated fill material. **NO FURTHER INVESTIGATION RECOMMENDED.**
PI Site 4 ECP Site 3	1958-current Rectangular concrete pad (Facility No. 278) located N of Antietam Rd. used to store drums presumed to contain POL. Staining observed on concrete pad and surrounding soil.	RR confirmed area as POL drum storage, and PSI observed staining on pad but no significant stressed vegetation. Interviews confirmed POL and potentially other hazardous HM stored at site with numerous small spills and releases throughout usage period.
PI Site 5	1958 Small area located N of Antietam Rd. and Hospital, observed piles of building debris and/or concrete rubble.	RR did not identify source of debris. PSI did not observe evidence of debris or rubble. Interviews did not confirm or repudiate use of area for disposal of debris or rubble. **NO FURTHER INVESTIGATION RECOMMENDED.**
PI Site 6 ECP Site 4	1958 Former rifle range structures observed on Punta Puerca.	RR, PSI, and interviews all confirmed use of the area as a rifle range in the 1940's. Exact usage dates and frequency of use unknown.
PI Site 7 ECP Site 5	1958-1985 Former Vehicle Maintenance and refueling area on E side of Forrestal Dr. (includes Bldgs. 377, 2344, 2345). Observed drums, vehicle racks, stains, and fuel islands.	RR, PSI, and interviews all confirmed use as Former Vehicle Maintenance and refueling area. Final disposition of USTs at fuel islands unknown. Numerous spills and leaks of POL and HM throughout years of usage.
PI Site 8	1958 Observed two USTs located S of the Ofstie Airfield's main runway.	RR and interviews confirmed former presence of two USTs (Nos. 210 and 211) at this location. USTs removed in 1995; no contamination identified. **NO FURTHER INVESTIGATION RECOMMENDED.**
PI Site 9 ECP Site 6	1958 Solid waste and scrap metal disposal area located near/at station marina area.	RR and interviews confirmed former use of area as a landfill. PSI observed only small quantities of scrap metal in area. Majority of area now covered by marina.

Table 4-3. PI Sites at NSRR (cont.)

PI Site ECP Site	Years of Observation Description of Area	Investigation Findings
PI Site 10 SWMU-1	1958-1965 Observed solid waste disposal piles, a trench, and open burning located immediately E of Langley Dr. and S of Kearsage Rd.	Area observed in aerial photography is currently being investigated/addressed under the IRP as SWMU-1.
PI Site 11 ECP Site 7	1958 Observed two areas of former building/structures, disturbed ground, two horizontal storage tanks, drums, and staining in open storage/maintenance area southwest of Bldg. 1686.	RR and PSI did not confirm or repudiate use of area for maintenance activities or HM storage. No observed evidence of historic releases. Interviews confirmed historic use of area for Bundy area maintenance activities.
PI Site 12 ECP Site 8	1958-1961 Observed a disposal or fill area with multi-toned, mounded material located at S end of station in Bundy area.	RR and interviews did not identify area as disposal area. PSI observed numerous piles of mounded gravel and suspected charcoal, metal and building debris, and two empty 55-gallon drums.
PI Site 13 ECP Site 9	1958 Observed a cleared rectangular area with ground scarring located W of Langley Dr. and N of Commissary. Area was becoming overgrown and appeared to be unused.	RR identified area as former pistol range. Interviews did not confirm or repudiate use of area as pistol range. PSI did not observe evidence of former pistol range; area currently disturbed/covered by new bachelors enlisted quarters (BEQ) construction.
PI Site 14	1958 Observed an excavation or pit containing liquid on NW side of the Ofstie Airfield between a taxiway and a building foundation or concrete hardstand.	RR, PSI, and interviews did not identify any former structure(s) or possible disposal pits in this area. **NO FURTHER INVESTIGATION RECOMMENDED.**
PI Site 15 ECP Site 10	1958 Observed two small structures in an open grass area near the SW end of the Ofstie Airfield.	RR identified a skeet range in this location. PSI did not observe evidence of former skeet range. Interviews confirmed use of area for skeet range. Exact usage dates and frequency of use unknown.
PI Site 16 ECP Site 11	1958 Observed a depression/disturbed ground SW of Hangar 200 suggesting an existing or former UST location.	RR identified this area as the former location of UST No. 208. No records available as to final disposition of UST. PSI observed no evidence of UST. Interviews did not confirm or repudiate use of UST in the area or removal of UST.
PI Site 17 ECP Site 12	1958 Observed a depression/disturbed ground SW of Hangar 200 suggesting an existing or former UST location.	RR identified this area as the former location of UST No. 209. No records available as to final disposition of UST. PSI observed no evidence of UST. Interviews did not confirm or repudiate use of UST in the area or removal of UST.
PI Site 18 ECP Site 13	1958 Observed a small building on the E side of Langley Dr. N of tennis courts.	RR identified structure as gas station; no records available as to final disposition of fuel storage tanks. Interviews confirmed former use as a gas station; however, no knowledge as to final disposition of fuel storage tanks. PSI observed building foundation, but no evidence of USTs.
PI Site 19 ECP Site 14	1961-1964 Observed a circular, graded area with an aircraft fuselage and two stained areas located near the southwest end of the Ofstie Airfield.	RR did not identify a fire training area at this location. Interviews confirmed former use as a fire training area; dates of usage and fuel used unknown. PSI observed disturbed area consistent with that of a fire training area, but no stressed vegetation or stained soils.

Table 4-3. PI Sites at NSRR (cont.)

PI Site **ECP Site**	**Years of Observation** **Description of Area**	**Investigation Findings**
PI Site 20	1961-1979 Observed dark-toned, possibly stained areas and aircraft scrap on a concrete pad located S of the main runway on the SW side of the Ofstie Airfield.	RR did not identify any activities in this area. PSI observed remnants of a concrete pad, but no staining or stressed vegetation. Interviews identified the area as the storage pad for aircraft arresting gear; no storage or disposal of POL or HM occurred. **NO FURTHER INVESTIGATION RECOMMENDED.**
PI Site 21 ECP Site 15	1977-1985 Observed an extensive stain on the hardstand located at the operations area on the north side of the Ofstie Airfield. Three ASTs also observed in vicinity.	RR identified the area as part of the aircraft apron. PSI observed that most of the area is now covered by expanded aircraft apron; no stains or stressed vegetation observed at edges of concrete. Interviews identified the area as an aircraft apron; numerous past spills of POL and HM likely.
PI Site 22 ECP Site 16	1976-1983 Observed a suspect disposal area with disturbed ground, debris, a cleared or graded area, and stressed vegetation covering a large area SE of Bldg. 394 and NW of the current station landfill. In addition, containers or drums had been discarded in a vegetated area north of the main disposal area.	RR did not identify any activities in this area. PSI observed numerous piles of construction debris (metal, concrete, PVC piping), but no drums or evidence of stains or stressed vegetation. Interviews confirmed area as construction and/or solid waste disposal site, including potential disposal of POL or HM containers.
PI Site 23	1976-1977 Observed light-toned material/debris in a vegetated area N of the former dry dock.	RR did not identify source of material or debris, or location of a former disposal area. Interviews did not confirm or repudiate use of area for disposal. PSI observed small piles of concrete rubble, but no metal, drums, or evidence of stains or stressed vegetation. **NO FURTHER INVESTIGATION RECOMMENDED.**
PI Site 24 ECP Site 17	1976-1983 Observed numerous drums in open storage on the south side of the former quarry/rock crusher site; at least 25 drums were near the rock crusher, and staining was on the ground adjacent to them. Current location of Commissary parking lot.	RR identified area as former quarry site, but no records pertaining to drum storage or disposal. PSI observed remnants of quarry area, but no signs of disposal, stains, or stressed vegetation. Interviews confirmed both storage and disposal of drums containing a tar-like substance in area, which were uncovered during construction of the Commissary parking lot. Extent of disposal area unknown.
PI Site 25 ECP Site 18	1958-current Observed numerous small stains, spills, and stressed vegetation in area surrounding Bldg. 31.	RR confirmed area as location of the PWD. PSI observed numerous stains on pavement surrounding building. Interviews confirmed historic location of PWD, with outdoor maintenance activities and numerous spills and leaks of POL and HM occurring throughout period of use.
PI Site 26 ECP Site 19	1976-current Observed large quantities of scrap metal and numerous small stains, spills, and stressed vegetation in area surrounding the DRMO Scrap Metal Recycling Yard.	PSI observed numerous small spills and stains of presumed POL, primarily from large pieces of construction equipment stored in the yard. RR, APA, and interviews confirmed use as the DRMO Scrap Yard since the 1970s, and that numerous pieces of equipment and vehicles stored at the site for extended periods of time, resulting in numerous small releases of POL throughout the usage period.

4.4 *PHYSICAL SITE INSPECTIONS*

The physical site inspections (PSIs) were conducted from 10-21 November 2003, 8-19 December 2003, and 9-13 February 2004. The purpose of the PSIs was to obtain records (including maps and photographs) pertaining to NSRR (see Section 4.1), conduct interviews with persons familiar with historic operations at NSRR (see Section 4.5), and physically inspect both current and historical areas at NSRR and surrounding property (see Section 6.0) where environmentally significant activities occur/occurred, to include PI sites.

It is important to note that at the time of the PSIs, numerous facilities and areas of former industrial activity were vacant due to the recent departure/relocation and downsizing of military units from the station. Therefore, the PSI included both current and historic areas and facilities, with an emphasis on those involved with industrial activities, petroleum, oils, and lubricants (POL) and hazardous materials (HM) use or storage, hazardous waste (HW) generation and storage, industrial wastewater generation, industrial solid waste generation and storage, contractor staging, and military training activities (e.g., small arms ranges).

In addition, all known areas of environmental concern (e.g., SWMUs, spills) were surveyed to identify any significant changes in site conditions.

The PSIs did not include individual housing units, administrative buildings, or other facilities not known to pose issues of environmental significance. [Note: The results of the ACM and LBP surveys of base housing and other facilities will be provided when completed.]

The PSIs consisted of a visual inspection of accessible areas of NSRR and surrounding areas for any signs of a release of hazardous substances or petroleum products (e.g., stained soils or stressed vegetation), to include:

- Signs of soil staining, stressed vegetation, and dead or ill wildlife;
- Unusual odors, such as petroleum or chemical;
- ASTs and USTs;
- Drums, lagoons, waste piles, or similar waste management units;
- Current or former waste storage or treatment areas;
- Water supply, monitoring, injection, or dry wells;

- Local depressions (possibly indicative of tanks or other buried objects) or fill material that could conceal waste;
- Surface topography and surface water drainage and runoff patterns;
- Wastewater, storm water, and other discharge or emission points; and
- Oily sheen or other unusual appearances of surface water.

All observations of a significant environmental concern (including newly identified ECP Sites) are discussed in the appropriate resource area subsections of Section 5.0. Select photographs from PSIs are included in Appendix A.

4.5 INTERVIEWS

Interviews were conducted with both current and former employees of the NSRR public works department (PWD) and numerous other operational and environmental managers, shop chiefs, and shop personnel associated with the various organizations and tenants on station. These persons were interviewed to collect information on both current and historic activities conducted at NSRR, the status of known environmental resource areas and contaminated sites, identify other (new) potential areas of environmental concern, and to determine past uses of various sites that had been previously identified through the aerial photography analysis and the PSIs. All relevant findings from the interviews are discussed in the appropriate resource area subsections of Section 5.0. Table 4-4 presents a list of the more relevant interviewees for the ECP.

At the time of the PSIs (November 2003-February 2004), operations at NSRR, particularly tenant activities, had drawn down significantly. Many operations had ceased entirely; others had reduced to a form of caretaker status. As a result, the availability of “old-timers” to interview concerning the details of past operations was minimal. Similarly, documents detailing the history of numerous previous tenant operations were scarce to non-existent.

Table 4-4. NSRR ECP Interviewees

Name	Area(s) of Responsibility	Years familiar with Station	Contact Information
Antonio Frontera	Engineering Division	1958-1988	787-863-3197
Carlos Brown	Fuels Division	1983-present	787-865-4080
Carmen Perea	PWD – Real Property	1982-present	787-865-4152 x448
Cesareo Nieves	PWD – Real Property	1986-2003	787-865-4152 x448
Chief Abren	MMC	1994-present	787-865-2764
Chief Bundy	Explosive Ordnance Disposal	1992-present	787-368-0115
Chief Green	Weapons	1995-present	787-865-4132
Chief Padin	Ofstie Airfield manager	1990-present	787-865-4950
Chief Roetzer	Naval Communications Station		787-865-4491
Damarys Irizarry	PWD – Environmental	1993-present	787-865-4152 x414
David Velez	AFWTF Technical Director	1943-2004	787-370-2131
Edgar W. Garcia	PWD – Environmental	1993-present	787-865-4152
Eliud Burgos	PWD – Environmental	1991-present	787-865-4152 x414
Felix Mestey	PWD – Environmental	1978-1990	202-685-9313
Francisco Mendez	Base Services Contract – Environmental Manager	1992-present	787-865-3121
Gary Torres	SOCSOUTH Environmental Mgr.	1999-2004	787-397-1799 x3920
Guillermo Aponte	PWD – Asbestos	2000-present	787-865-4152 x425
Hiram Rivera	Navy Exchange Environmental Mgr.	1994-present	
Jesus Mitchell	PWD – Maintenance Division	1967-present	787-865-4152
Jose Ruiz	PWD – Maintenance Division	1969-1999	787-876-2574
Madeline Rivera	PWD – Environmental	1991-present	787-865-4152
Miguel Sierra	PWD and AFWTF Facilities	1978-present	787-865-4152 x455
Mirta Concepcion	Station Hospital	1997-present	787-865-5773
Mr. Marcano	US Army Reserves, Shop Supervisor	2000-present	787-865-5457
Pedro Ruiz	PWD – Environmental	1990-present	787-865-4152
Phillip Datko	PWD – Maintenance Division	1983-present	787-865-4152
Ruben Ortiz Montero	PWD – Maintenance Division	1976-present	787-865-4152
Sergeant Gazzia	Marine Corps Reserve Shop Supervisor	2000-present	787-865-3680
Sindulfo Castillo	PWD – Environmental	1990-present	787-865-4152
Wilfredo Rivera	PWD – Environmental	1981-present	787-865-4152
Winston Martinez	PWD – Environmental	1990-present	787-865-4152

4.6 PHASE II INVESTIGATION

The Phase II ECP field investigation was conducted based on the recommendation presented in the Draft Phase I ECP Report dated 31 March 2004 (NAVFAC Atlantic, 2004a). The Phase II portion of the ECP was performed to determine if a release/disposal actually occurred at any of the newly identified Phase I ECP sites and, if so, whether any potential risk to human health is present (i.e. a qualitative risk evaluation).

The primary objective of the Phase II ECP investigation was to determine whether or not the new ECP sites identified in the Draft Phase I ECP Report have negatively impacted the environment at NSRR. The field investigation was performed to acquire the necessary information to not only address the current condition of each potentially contaminated site, but also to collect the necessary data to accurately depict the qualitative risk for each site. The Phase II ECP investigation is also intended to assist with the identification of areas subject to the notification and covenant requirements of CERCLA [section] 120(h) relating to the deed transfer of contaminated Federal real property (42 USC 9601 et seq.), as amended by CERFA.

4.6.1 Sampling and Analytical Parameters

The sampling procedures utilized in the field as well as the details of the laboratory analysis program are included in their entirety in Appendix F. A summary of the number, location, and media type (e.g., soil, water) of the samples collected as well as relevant analytical results is presented for each ECP site in Section 5.4.

4.6.2 Qualitative Risk Analysis

Generally, human health risk assessment is a quantitative process whereby potential carcinogenic risks and noncarcinogenic hazards are calculated from exposure point concentrations (developed by averaging site data for contaminants of potential concern (COPC) for each media sampled) combined with toxicity criteria for the COPCs and assumed exposure pathways and values for exposure variables for a given land use (e.g., inadvertent ingestion of soil at a work place with an ingestion rate of 50 mg/day of soil). EPA has developed simple algorithms for each exposure pathway and toxicity criteria based on the health effects seen at various doses of chemicals in toxicological studies. The qualitative (or semi-quantitative) approach used for this report uses the same general risk assessment principles but with less rigor and in a slightly different order. By comparing chemical data collected from a site to risk-based criteria developed for each chemical, qualitative conclusions can be drawn regarding the degree of risk to human receptors posed by conditions at a site.

4.6.2.1 *Land Use and Potential Receptors*

To focus on developing practicable and cost-effective remedial alternatives and to streamline the environmental cleanup process, EPA ("Land Use in the CERCLA Remedy Selection Process," (EPA, 1995)) and DoD (Longuemare, 1997) guidance direct that site clean up should reflect the reasonably anticipated land use.

All of the ECP sites are located in an industrial area of NSRR. Future property use at the sites is expected to remain industrial for the duration of Naval operations and likely even afterwards. As a result, potential human exposure is reasonably anticipated to reflect an industrial or commercial property use, now and in the foreseeable future.

The assumption of EPA's default industrial/commercial exposure scenario accounts for long term exposure (workers are assumed to be at each site eight hours per work day for twenty-five years) and is used to reflect future land use. Although future onsite residential land use was conservatively used for screening criteria, it is not considered reasonably anticipated.

4.6.2.2 *Risk-Based and Other Comparison Criteria*

As discussed above, comparison of the chemical data to screening criteria provides the basis for the qualitative risk assessment. EPA Region III Risk-based Concentrations (RBCs) are the primary criteria used. RBCs are derived by EPA Region III using default exposure parameter values for a given land use and the most recent toxicological criteria available. The RBCs used for this report are those issued in April 2004 (EPA, 2004) and are based on conservative residential exposure for soil and residential tap water exposure for groundwater. [The target risk used to calculate the RBCs is $1x10^{-6}$, while the target hazard quotient (HQ) is 0.1 to account for potential addictive effects from multiple contaminants.] Industrial RBCs are also used to account for the less intensive exposure expected for a worker at a site compared to a resident. RBCs are not available for lead due to its unique toxicological characteristics. EPA's residential action level of 400 mg/kg (EPA, 1996) for soil is used to account for potential adverse health effects to children by exposure to lead.

Inorganic constituents are naturally present in all environmental media. The term "background" is used to refer to the natural levels of the constituents. A limited study was performed at NSRR to develop the base background criteria for surface and subsurface soil. Concentrations of two times the arithmetic mean of these analytes from the background samples are used as the comparison criteria to screen surface and subsurface soil.

Marine sediment screening criteria were developed throughout the ecological risk assessment process for other sites at NSRR and are based on potential health effects to ecological receptors.

Puerto Rico Water Quality Standards are regulatory criteria developed separately for surface water and groundwater. The surface water criteria, as with the sediment criteria, are based on potential health effects to ecological receptors.

Maximum Contaminant Levels are federal standards for U.S. drinking water supplies (EPA, 2002). Although strictly applicable only to public water supplies, they are sometimes applied as *de facto* groundwater standards and are presented in this report only for comparison.

4.6.2.3 Methodology

The methodology for performing the site-specific qualitative risk assessments has a simple structure. The environmental chemical data presented in site-specific and media-specific tables in Section 5.4 are first screened against chemical-specific, conservative screening criteria to identify the analytes retained for further evaluation (i.e., chemicals of potential concern or COPCs). Then the COPCs are evaluated further by a number of qualitative criteria in order to discuss their potential to pose unacceptable risks and to place the conditions of the site in a more realistic context with respect to human health risk.

<u>Selection of COPCs</u>

COPCs are those contaminants detected in an environmental medium at a site whose maximum concentration exceeds the defined criteria and are retained for further evaluation. For surface and subsurface soil, the residential RBC is used to identify COPCs. For inorganic analytes, the base background criteria also must be exceeded to be included as COPCs. The criteria used for identifying COPCs in sediments are the marine sediment screening criteria. These criteria are based on potential health effects to ecological receptors. Although not relevant to human health *per se*, because human exposure to sediments is unlikely and of short duration the marine sediment criteria are useful for screening in lieu of human health-based sediment criteria. Similarly, the ecological receptor-based Puerto Rico water quality standards are used as screening to identify COPCs in surface water. Finally, residential tap water RBCs are used as screening criteria to identify COPCs for groundwater.

Other Considerations for Qualitative Risk

A number of different considerations are used to develop the potential risk discussion section for each site. These considerations are specific to each site; however, points that are raised repeatedly are listed below, along with examples of their use.

- Distribution of data – Although the maximum concentration of each analyte and each media is used for COPC screening, the risk actually posed by conditions at a site is based on the exposure point concentration or average concentration. In the risk assessment framework a receptor is assumed to be equally likely to be exposed to any potion of the site (unless specific information exists to say otherwise). Therefore, the distribution of the data from the various samples is taken into account to place the potential risk into proper perspective. For example, a site with seven samples each with the same concentration of a contaminant is of greater concern to potential risk than the same site with only one of the samples having this concentration.

- Comparison to other criteria – Conservative comparison criteria are used for the screening of COPCs. However, these criteria do not reflect the reasonably anticipated land use, nor, in the case of surface water and sediment, are they even relevant to human receptors. Therefore, other relevant criteria may be used for comparison of the data to more accurately reflect potential exposure conditions at the site. For example, industrial RBCs are used for surface and subsurface soil.

- Likelihood of exposure – The RBCs used for screening assume a level of exposure that may or may not occur at a site. For example, the tap water RBC includes assumptions about drinking two liters of water per day for an entire lifetime. Given that drinking water at NSRR is supplied from El Yunque it is unlikely (but not impossible) that shallow groundwater will be used for this purpose currently or in the future. Likely exposure is of more concern than unlikely exposure. Similarly, the duration of the potential exposure compared to that assumed in the development of the RBC may also be discussed. Although using the residential and industrial RBCs may be used to conservatively evaluate potential exposure to sediment, actual exposure to sediment would be of considerably shorter duration.

- Degree of exceedance or concentration – The amount of risk posed by exposure to site conditions is proportional to the concentration of the contaminants exposed to. Therefore, if a risk-based criteria is exceeded by the data by a greater amount, it is of greater concern. Furthermore, the risk-based criteria include an assumption of acceptable level of risk for carcinogenic contaminants or hazard quotient for noncarcinogenic contaminants. The

RBCs for noncarcinogens presented in the Section 5.4 tables are based on a target hazard quotient of 0.1, rather than the generally accepted criteria for requiring remediation of a site of 1.0, to account for the possibility of additive toxic effects from multiple COPCs. In other words, if ten noncarcinogenic COPCs in a given medium at a site were each detected at a concentration equal to the screening values presented in the tables in Section 5.4, the total hazard index posed by exposure to the site would be 1.0 and cleanup would probably be warranted. In order to place noncarcinogenic COPCs in the context of potential remedial actions in the site-specific discussions below, the data is sometimes compared to single contaminant RBCs that are based on a target hazard quotient of 1.0. For carcinogenic constituents, EPA recommends use of the 1×10^{-6} cancer risk level as a starting point for analysis of remedial alternatives. This reflects EPA's preference for managing risks at the more protective end of the risk range (EPA, 1991; NCP preamble, 55 *Federal Register* 8718-9). However, this same EPA guidance presents some flexibility in target risk levels. So the degree of exceedance with respect to potential remedial actions at a site is relevant to the qualitative discussion of risk.

– Background – Other background criteria than presented in the Section 5.4 tables for each site may be used to qualitatively evaluate the potential that inorganic analytes are naturally occurring. For example, arsenic data for soil collected by USGS in order to establish background soil concentrations for Puerto Rico as a whole is used to demonstrate that background concentrations of arsenic may be higher than reflected in the limited background sampling that was used to determine the base background criteria.

– Data Quality – Although the chemical data has not been rigorously validated, the laboratory places modifying flags on the data to reflect various qualifications of the data. Mention of these modifiers is made in some cases in the site-specific discussions below to point out the potential uncertainty in some of the data.

– Mixtures – Analyses of mixtures of chemicals (i.e., gasoline-range organics (GRO) and diesel-range organics (DRO)) were performed at some sites to assess the potential for contamination by fuels. Concentrations of mixtures cannot be evaluated for potential risk unless the concentration of all of the constituents of the mixture is known because the risk assessment process requires knowledge of the identity, concentration, and potential health effect from exposure to each contaminant. Therefore, GRO and DRO data are not discussed in Section 5.4. However, the most toxic constituents of these mixtures are also analyzed for and are evaluated if detected.

A concise summary of the sampling, analystical results, and qualitative risk analysis conducted in the Phase II ECP field investigation are presented in the appropriate subsections of this report in Section 5.4. The entirety of the Phase II ECP Report is included in Appendix F.

5.0 FINDINGS FOR STATION PROPERTY (NSRR)

5.1 USEPA, STATE, AND LOCAL NOTICES OF VIOLATION

In May 2002, NSRR was issued Notices of Violation (NOVs) for several UST systems (see Section 5.5.1):

- Release detection monitoring systems were not working properly for UST numbers 1686, 3176, 3178, 3179, 3180, and 3181.
- Two USTs, 56A and 56B, had been out of service for more than two years and had not been properly closed.

The following actions were taken in response to these NOVs:

- Repairs to the release detection monitoring systems were completed in March 2003, and a letter certifying the repair work and requesting closure of the NOV was sent to EPA in April 2003.
- USTs 56A and 56B were closed in May 2003 in accordance with EQB requirements, and a letter was sent to EPA in January 2004 requesting closure of the NOV. In a letter dated February 25, 2004 the EPA recognized closure of this NOV.

No additional recent NOVs were identified for NSRR.

5.2 HAZARDOUS MATERIALS, HAZARDOUS WASTE, AND PETROLEUM PRODUCT MANAGEMENT

5.2.1 Hazardous Materials

NSRR has historically used a wide variety of hazardous materials (HM) relating to vehicle maintenance, ship maintenance, aircraft maintenance, weapons systems maintenance, facility maintenance, and equipment maintenance. Materials used historically include fuels, oils and lubricants, solvents, cleaning compounds, paints, thinners, corrosives, and antifreeze. These materials were utilized throughout the various industrial shops on station.

Records were not available to precisely identify all historic hazardous materials use and storage locations since 1941. However, records were available to identify the majority of significant buildings/areas of historical hazardous material use and storage, particularly over the last 20 years [Most of these facilities/areas are no longer in use; in some instances, buildings/structures have been partially or totally demolished]. The PSIs specifically included over 180 of these facilities/areas to identify any significant stains or stressed vegetation that would indicate historic releases of hazardous materials. Any facilities/areas where significant stains or stressed vegetation were observed are discussed further in Section 5.4, ECP Sites. These are in addition to previously identified sites that have been/are being addressed under the IRP (see Section 5.3).

At the time of the ECP PSIs, industrial activities and shops at NSRR still used a wide variety of hazardous materials relating to vehicle maintenance, aircraft maintenance, weapons systems maintenance, facility maintenance, and equipment maintenance, which include fuels, oils and lubricants, solvents, cleaning compounds, paints, thinners, corrosives, and antifreeze. It is important to note that because almost all industrial operations at NSRR have ceased or been downsized as a result of station closure, the quantities of hazardous materials at the station have significantly declined, and many historically significant locations of hazardous materials were no longer in use during the conduct of the PSIs. As explained previously, all known areas of former hazardous materials use and storage were surveyed as part of the PSIs.

During the PSIs, six significant storage areas for HM were observed:

- **Building 2335** - a “new product storage” building located approximately 50 yards north of Building 27. Stored in this building were approximately eight to ten 5-gallon containers of each of the following products: lubricants, disc grease, aircraft grease, aliphatic hydrocarbon (dry-cleaning solvent), and isopropyl. No evidence of spills or other environmental concerns were identified (see photos A-56 through A-59).

- **Buildings 1757, 1758, 1691 -** the three NSRR wastewater treatment plants (Bundy, Forrestal, and Capehart, respectively), described in Section 5.13.2. Stored in these buildings were a methanol tank, sodium hydroxide tank in containment, several chlorine cylinders, and several sulfur dioxide cylinders associated with the wastewater treatment process. No evidence of spills or other environmental concerns were identified (see photos A-63 through A-67).

- **Building 2298** - the Army Reserve vehicle maintenance facility, located just south of the Army Reserve training center, Building 2297. The following were identified: a fully-enclosed hazardous materials storage shed adjacent to the building; a semi-enclosed hazardous material storage area approximately ten yards to the east of the building (one metal wall, one fenced side, two open ends, elevated 3.5 ft cement base); eight 55-gallon drums used to store anti-freeze, transmission fluid, and other vehicle fluids; more than fifty 1-gallon paint containers; and twelve 5-gallon paint containers. With the exception of minor spot staining associated with the parking/staging of military vehicles in the lot surrounding the building, no environmental concerns were observed at this facility (see photos A-3 through A-5).

- **Building 31** – the Public Works building, located in the eastern portion of NSRR, northeast of Forrestal Drive. The building is shared by the NSRR Public Works Department and the Base Operation Service (BOS) contractor. The following were observed at this location: new car and truck batteries and associated acids, welding gas stored outside the building, paint (aerosols and 1- and 5-gallon containers) stored in various locations within and around the building, gear oil, lubricants, acids, coil cleaner (for a/c repair), hydraulic oil, and other hazardous materials and containment areas. In addition, stains of possible POL origin of various sizes were observed on the paved ground of the maintenance areas within and surrounding Building 31 (see Section 5.4, ECP Sites, for additional information regarding Bldg. 31). [See photos A-6 through A-10, A-107 and A-108]

In addition to these six locations, numerous buildings observed during the PSIs contained various small amounts of HM associated with industrial shop activities. Except as otherwise noted in this ECP Report, no environmental concerns were observed at these locations.

5.2.2 Hazardous Waste

As with hazardous materials, NSRR has historically generated a wide variety of hazardous waste (HW) related to vehicle maintenance, ship maintenance, aircraft maintenance, weapons systems maintenance, facility maintenance, and equipment maintenance. A majority of the hazardous waste generated can be attributed to POL (e.g., contaminated oil, solvents) (JTI 2001).

Records were not available to precisely identify all historic HW generation and storage locations at NSRR since 1941. It is presumed that prior to creation of the Defense Reutilization and Marketing Office (DRMO – formerly the Defense Property Disposal Office/DPDO) in the early 1970s, HW was disposed of at NSRR landfills or other deposition areas located at NSRR (EEI 1984). [Note: Prior to enactment of RCRA in 1976, and its new statutory definition/regulation of HW, it was considered common practice (and legal) to dispose of HW in the same location as other solid waste.]

Several known or suspected areas of historic HW releases/deposits have been/are being addressed under the IRP, and include the following:

- SWMU 17 – consists of a fully enclosed, concrete and steel building (Building 1973) at the DRMO facility located along Forrestal Drive. This site serves as the main non-flammable hazardous waste container storage facility for the station.

- SWMU 18 – consists of a fully enclosed metal building (Building 2009) located within the southwest portion of the DRMO storage yard along Forrestal Drive. This site serves as the container storage building for ignitable hazardous wastes.

- SWMU 19 – consisted of a concrete, bunker-like building (Building 121) located northeast of the Public Works Department Building 31. This site had been used to hold surplus and discarded pesticides for indefinite, long-term storage. Building 121 was closed in 1996 and demolished in 1998.

- SWMU 20 – consisted of a tank truck located in front of Building 860 (Aerial Target Systems Department), and south of Building 1980. This site was formerly used to temporarily store waste oil, fuels, and solvents generated at the drone refurbishing area.

- SWMU 25 – consisted of an open area within the DRMO storage yard along Forrestal Drive. This site was formerly used to store ignitable hazardous wastes.

- SWMU 31 – located in the Public Works Department storage yard, near the Transportation Shop (Building 31) and Building 2022. This SWMU consists of an outdoor, curbed, concrete pad used for temporary storage of containers of waste oil. There is also a 500-gallon tank for collection of waste oils.

- SWMU 32 – located in the Public Works Department storage yard, near the Transportation Shop (Building 31). It was described in the 1988 RFA as an outdoor area where discarded batteries were stored.

- SWMU 33 – consisted of a curbed, roofed, concrete pad, formerly located along the north wall of Building 379 (aircraft maintenance building). This SWMU was used for temporary storage of various wastes generated during aircraft maintenance.

- SWMU 34 – consists of a curbed, uncovered, concrete pad located at the northeastern edge of the Ofstie Airfield. This pad was used for temporary storage of waste fuels and paints.

- SWMU 37 – consists of a covered, open-sided, concrete pad, which is curbed (not curbed during 1988 VSI). The pad is located behind Hangar 200, and serves as a container storage area for waste gasoline, oils, and other wastes.

- SWMU 40 – consisted of a mobile 300-gallon tank in the Alpha Company Maintenance Yard, which was used as a temporary collection and storage point for waste oils.

- SWMU 46 – located along Valley Forge Road in the Forrestal portion of the station consists of a large, roofed, open-sided, uncurbed, concrete pad utilized in the past by the Public Works Department as a storage area for transformers, miscellaneous electrical equipment, and drums of PCB-contaminated material.

- SWMU 47 – consists of undefined "satellite disposal areas".

- SWMU 48 – consists of a mobile, open air, metal-curbed, container storage near Building 3102. This SWMU was first identified during the 1993 follow-up inspection, and is utilized as a temporary (less than 90 days) storage facility for waste oils and oil contaminated soils.

- AOC B – consists of the site of the now demolished Building 25. According to the Navy, the demolished building formerly contained hazardous waste materials.

- AOC C – located near Building 2042 along Valley Forge Road and consists of three outdoor, uncovered, concrete pads that were used primarily for storage of discarded transformers; however, other discarded electrical materials, including batteries were observed in the past.

These SWMUs and AOCs are discussed in further detail in Section 5.3.

The ECP investigation did identify the majority of significant buildings and areas of historical HW generation and storage, particularly over the last 20 years. The PSIs specifically included these facilities and all known HW storage areas to identify any significant stains or stressed vegetation that would indicate historic releases of HW. Any previously identified facilities or areas where significant stains or stressed vegetation were observed are discussed further in Section 5.4, ECP Sites. It is important to note that because most operations at NSRR have either ceased or been significantly downsized as a result of station closure, the quantity of HW generated has significantly declined, and many historically significant locations of HW generation/storage were no longer utilized during the conduct of the PSIs.

During the PSIs, HW generation/storage was observed predominantly at Bldg. 31 (see photos A-6 through A-10, A-107 and A-108), although HW storage in minor quantities was observed at twenty additional buildings on NSRR (see Table 5-1). Typical hazardous waste generated at Bldg. 31 consists of waste POLs, paints, oily rags, absorbent materials, lead-acid batteries, and filters. The Bldg. 31 waste oil accumulation and battery collection areas are being investigated under the IRP as SWMU 31/32, two former SWMUs combined into one (see Section 5.3.31). The SWMU 31/32 area encompasses the general area surrounding the northern corner of Building 31.

Under both commonwealth and federal law, NSRR has historically been classified as a RCRA large quantity hazardous waste generator (i.e., more than 1,000 kilograms per month) (EnSafe 1999). Records identify three types of hazardous waste storage areas utilized at NSRR, particularly over the last 20 years:

- HW Storage Facilities (HWSF), the permitted storage facilities at which HW is stored prior to offsite transport and disposal;
- Short-term work center HW Accumulation Areas (HWAAs) at which more than 55 gallons can be stored for up to 90 days prior to treatment or disposal; and
- Work center Satellite Accumulation Areas (SAAs) where up to 55 gallons can be stored indefinitely.

Approximately twelve HWAAs and approximately thirty-nine SAAs existed on NSRR immediately prior to station closure; most are currently unused. The permitted HWSFs at NSRR consisted of current DRMO Buildings 1973 and 2009 in use since 1981, in addition to four portable HW storage buildings 2009A, B, C, and D (see Figure 5-1). These HWSFs are currently under closure as approved by EPA letter of January 11, 2005. Furthermore, two work centers at NSRR are permitted 180 day HWAAs, whose restrictions are the same as the typical short-term areas except that the time limit is extended to 180 days (EnSafe 1999). These storage areas, Army Reserve Center Bldgs. 2300 and 2298, are operated under a separate RCRA permit from all other storage areas on NSRR (NSRR 2004). Each NSRR storage area is equipped with a separate spill containment structure to allow maximum flexibility in segregating incompatible wastes (EnSafe 2001a). HW storage areas have been eliminated due to station closure. Table 5-1 presents a listing of NSRR HW storage areas as of March 2004, with their status as of March 2005.

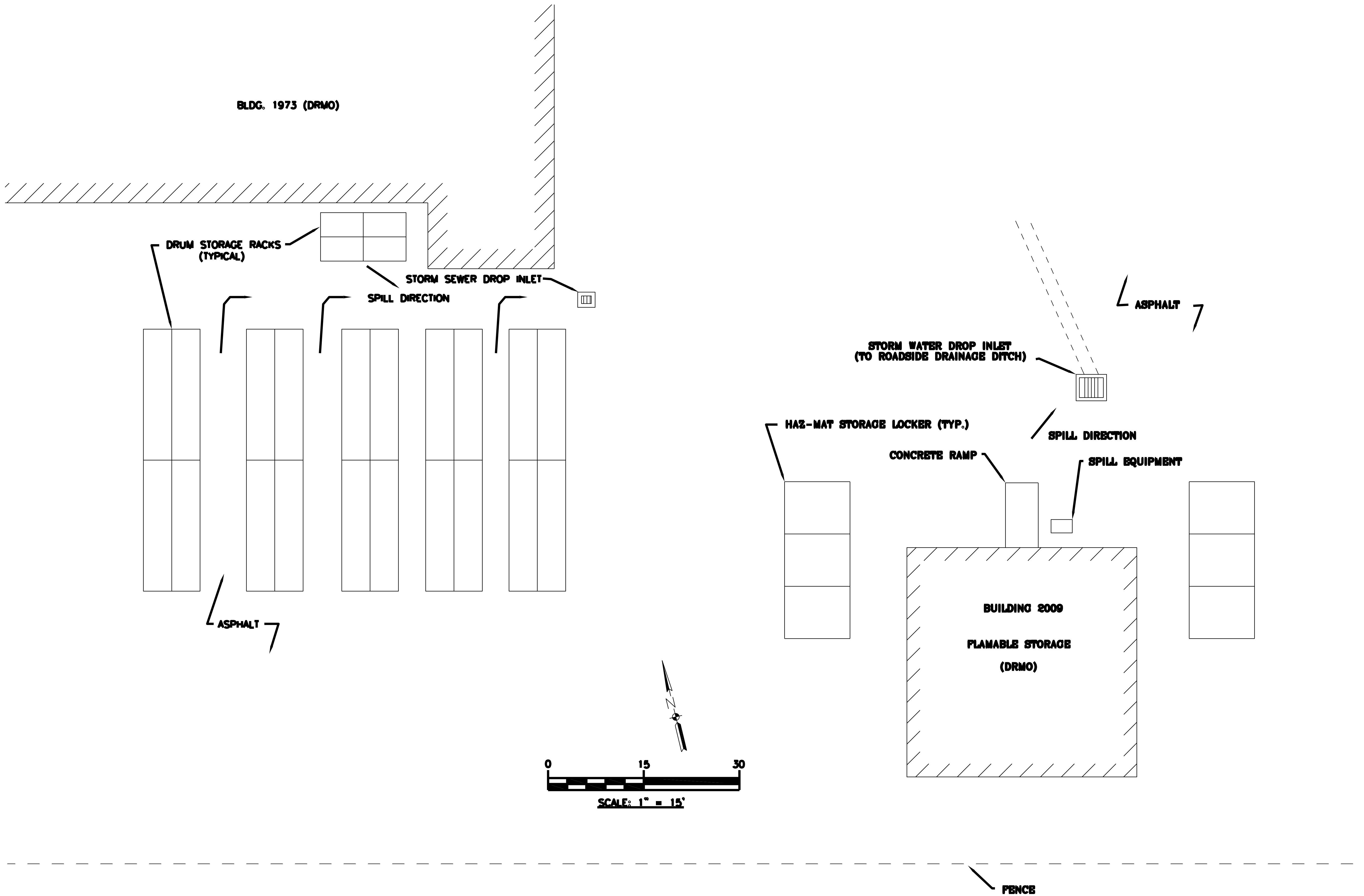


Figure 5-1. NSRR Permitted Hazardous Waste Storage Facility at DRMO

Table 5-1. NSRR Hazardous Waste Storage Areas

Activity Name	Location	Type Storage	Type Waste[1]	Status[2]
Antilles Central School System	High School (Bldg. 2200)	Satellite	Lab Packs	No longer in use
Atlantic Fleet Weapons Training Facility (AFWTF)	Marine Ocean Eng. (Bldg. 2279)	< 90 day	HW, NR	No longer in use
	MK-30 (Bldg. 2245)	Satellite	HW, U	No longer in use
	Torpedo Shop (Bldg. 832)	< 90 day & Satellite	HW, NR, U	No longer in use
	Aerial Target Systems (Bldg. 860) - SWMU 20	< 90 day & Satellite	HW, NR, U	No longer in use
	CLCC (Bldg. 1967)	Satellite	HW, NR	No longer in use
	RTS (Bldg 825)	Satellite	HW, NR	No longer in use
Aircraft Intermediate Maintenance Department (AIMD)	Bldg. 826A	< 90 day	HW, NR	No longer in use
	Bldg. 1930	Satellite	HW, NR	No longer in use
	Raytheon Aerospace (Bldg. 379) - SWMU 33	Satellite	HW, NR	No longer in use
Air Operations (AIROPS)	200 Hangar - SWMU 37	< 90 day	HW, NR	No longer in use
	Tent City	Satellite	HW, NR	No longer in use
	Aircraft Fire Station (Bldg. 827/2008)	Satellite	HW, NR	No longer in use
	DN2-3	Satellite	HW, NR, U	No longer in use
Army Reserve Center (Under a separate RCRA permit)	Boat Maintenance (Bldg. 2300)	180 day	HW, NR	In use
	Vehicle Maintenance (Bldg. 2298)	180 day	HW, NR	In use
Dental	Bldg. 2338	Satellite	NR	No longer in use
Defense Reutilization and Marketing Office (DRMO)	Bldg. 1973, 2009, 2009A-B-C-D - SWMU 25	HWSF	HW, NR, U	Under closure
Flying Club	Bldg. 182	Satellite	HW, NR	No longer in use
Hospital	Bldg. 1790	Satellite	NR	No longer in use
Base Operating Service Contractor (BOSC)	Poleyard	< 90 day	HW, NR, U	In use
	Bldg. 31 yard - SWMU 31/32	Satellite	HW, U	In use
	Bldg. 1686	Satellite	HW	No longer in use
	Bldg. 31 – Maint. Bay	< 90 day	HW	In use
	Mobile Fuel Tanker Maint. (Bldg. 31)	Satellite	HW	No longer in use
Marine Reserve Center	Bldg 2358	Satellite	HW	In use
Morale, Welfare and Recreation Department (MWR)	Bldg 377	Satellite	HW, NR	In use
	Bldg 201	Satellite	NR	No longer in use
	Bldg 2334	Satellite	HW, U	In use
	Bldg 2371	Satellite	NR	No longer in use
NAVCOMTELSTA	Bldg. 1817	Satellite	HW, NR	No longer in use
Navy Exchange (NEX)	Pep Boys (Bldg. 2339)	Satellite	NR, U	No longer in use
	Bldg. 1686	Satellite	HW	No longer in use
	Bldg. 1796	Satellite	HW	No longer in use
	Bldg. 1788	Satellite	NR	No longer in use
Naval Mobile Construction Battalion (NMCB)	Bldg. 3158 SWMU 39	< 90 day	HW, NR, U	No longer in use
	Bldg. 3188 SWMU 49	Satellite	HW, NR	No longer in use
	Bldg. 3166 - SWMU 50	Satellite	HW, NR	No longer in use
Naval Special Warfare Unit (NSWU-4)	Bldg. 2275	Satellite	HW, NR, U	No longer in use
	Bldg. 2283	Satellite	HW, NR	No longer in use
Photo Lab	Bldg. 790	Satellite	NR	No longer in use

Table 5-1. NSRR Hazardous Waste Storage Areas (cont.)

Activity Name	Location	Type Storage	Type Waste[1]	Status[2]
Supply/CHRIMP	Bldg. 2335	< 90 day	HW, NR	No longer in use
	Bldg. 56 (diesel filter house S fuels)	Satellite	HW, NR	This structure was demolished.
	Bldg. 1205 (NSRR qrtr deck/supply)	Satellite	HW, NR	No longer in use
Surface Operations	Bldg. 2086	< 90 day	HW, NR	No longer in use
	Bldg. 2036	Satellite	NR	No longer in use
Early Warning/Fleet Composite Squadron	Bldg. 1625	< 90 day	HW, NR	No longer in use
Patrol Squadron	Bldg. 200 - SWMU 37	< 90 day	HW, NR, U	No longer in use
WEAPONS	Bldg. 376/Bldg. 1674	Satellite	HW, NR	No longer in use
SOCSOUTH	Bldg. 5007	Satellite	HW, NR	No longer in use

1. HW = Hazardous Waste, NR = Non-regulated Waste, U = Universal Waste Source Source: EnSafe 1999 and NSRR 2004
2. Status as of March 2005

5.2.3 Petroleum Products

Petroleum products at NSRR are stored in ASTs, USTs, and small container storage (55-gallon drums or other smaller containers). Small container storage occurs in HAZMAT lockers or with spill containment equipment. These storage locations and their respective methods of containment are presented in Table 5-2. ASTs and USTs at NSRR are discussed in Section 5.5. As noted in other sections, as a result of downsizing associated with station closure, the number and locations of POL storage locations continues to decline.

Table 5-2. POL Container Storage Locations and Secondary Containment Methods

Facility	Building	Type of Containment
AFWTF	860	Drum clamshells
AFWTF	2366	Containment Pallets
AFWTF	860	Concrete Dike
Ofstie Airfield	826a	Concrete curb
Ofstie Airfield	200	Concrete curb
Ofstie Airfield	2403	Concrete curb
Ofstie Airfield	1625	Concrete Curb
Camp Moscrip	3188	Containment Pallets
FRT	2036	None
Public Works	2252	Concrete Dike
Public Works	Pole Yard	Concrete curb
Public Works	1973	None
Public Works Department	2009	Storage Building Lockers
Public Works	2262	None

Source: Baker 2003

NSRR has historically provided for the receipt, storage and issuance of aviation fuels (Avgas, JP-5), lubricants, gasoline and diesel fuel marine (DFM). It is important to note that because most operations at NSRR have either ceased or been significantly downsized as a result of station closure, the volume of petroleum products utilized and managed at the station has significantly declined. Although records were not available to precisely identify all historic petroleum utilities and management practices since 1941, it is known that Fuels Division activity required the utilization and maintenance of a number of bulk fuel storage tanks since 1941. A discussion of past and present UST and AST systems at the station, including POL tanks, is presented in Sections 5.5.1 and 5.5.2 and Tables 5-7 and 5-10.

Until construction in 1992 of the current fuel mooring facility located adjacent to Pier 1 (see photos A-110 and A-111), Pier 1 was the primary fuel receiving point of NSRR since its construction in the 1940s. From Pier 1 (see photo A-96), fuels would be piped to their respective tanks at the Ofstie Airfield (Tank 429), DFM Hill, or the Tow Way Fuel Farm via an underground fuel piping system. The refueling of vessels was historically accomplished at Pier 3 (see photo A-112), and aircraft refueled (JP-5 fuel) at the high-speed refueling hydrants (see photos A-42 through A-44) at the Ofstie Airfield (supplied via tank 429). Avgas, as distinguished from JP-5, was supplied to aircraft by refueler vehicles from former USTs 208, 209, 210, and 211 (EEI 1984).

As mentioned above, the fuel mooring facility (see photos A-96, A-110 and A-111) was the primary fuel receiving point of NSRR. From this facility, fuels were piped directly to their respective tanks, which, in February 2004, consisted of three JP-5 tanks, three DFM tanks, and one motor gasoline (mogas) tank, totaling 7,116,000 gal. Figure 5-2 presents the layout of the NSRR JP-5 and DFM systems. The tanks associated with these systems are currently empty, and are being cleaned as part of the "mothballing" process.

In 1995, NSRR evaluated the integrity of part of the Tow Way Fuel Farm in terms of system leaks/releases to the environment. This evaluation utilized the installation of 1,026 probes to study the soil near six bulk storage tanks, approximately 20,000 feet of the JP-5 distribution pipeline, and approximately 10,000 feet of the DFM pipeline. Two of the tanks evaluated are currently being investigated under the IRP as part of SWMU 9 (see Section 5.3). The four remaining tanks are identified ECP Sites, and are discussed further in Section 5.4.20. Table 5-3 below presents the storage tank integrity evaluation results.

Table 5-3. Storage Tank Integrity Evaluation Results

Tank ID[1]	Evaluation Results	Prior/Subsequent Action(s)	Current Status
212	High TVHC[2] concentrations	Contamination addressed as part of IRP (SWMU 9)	Empty
213	Failed integrity test	Leak repaired; contamination addressed as part of IRP (SWMU 9)	Empty
381	Failed integrity test	Leak repaired; contamination not addressed, part of ECP Site 20	Empty
429	High TVHC concentrations	Contamination not addressed, part of ECP Site 20	Empty
1084	High TVHC concentrations	Contamination not addressed, part of ECP Site 20	Empty
1086	Failed integrity test	Leak repaired; contamination not addressed, part of ECP Site 20	Empty

1. See tank location map, Figure 5-74, in Section 5.5 Source: DMG 1995
2. TVHC = Total volatile hydrocarbons

The JP-5 line evaluation identified leaks at two locations and repair of the line was recommended. No remedial action has since taken place. Other inspection results indicated historic petroleum product impacts to soil at various locations throughout the tested portion of the JP-5 and DFM pipelines (see Figure 5-2). No action has since been taken at these locations (DMG 1995). The locations have also been identified as ECP Site 20 (see Section 5.4.20).

NSRR currently operates and maintains two motor vehicle refueling stations. Bldg. 124 (see photo A-2), the refueling station just east of PWD Bldg. 31, consists of three USTs (two mogas, one diesel) and three pumps for the dispensing of diesel and mogas; this refueling station has been in operation since 1956. The three USTs were installed in 1996 to replace 4 similarly sized tanks that were removed in the same year and currently being addressed under the Monitored Natural Attenuation (MNA) study, discussed in further detail in Section 5.5.1.1. The Marina consists of two ASTs (one mogas, one diesel) used for refueling both privately owned boats in the Marina as well as privately owned motor vehicles for the remaining NAPR personnel. The PSI did not identify any signs of stressed vegetation or stains/spills of fuel at the tanks, fill ports, pumps, or in the immediate vicinity of these gas stations.

The Naval Exchange (NEX) refueling station at Bldg. 2339 was in operation from 1994 until June 2004. The NEX refueling station (see photo 101) consisted of three USTs and eight pumps for the dispensing of mogas. The PSI did not identify any signs of stressed vegetation or stains/spills of fuel at the tanks, fill ports, pumps, or in the immediate vicinity of this gas station.

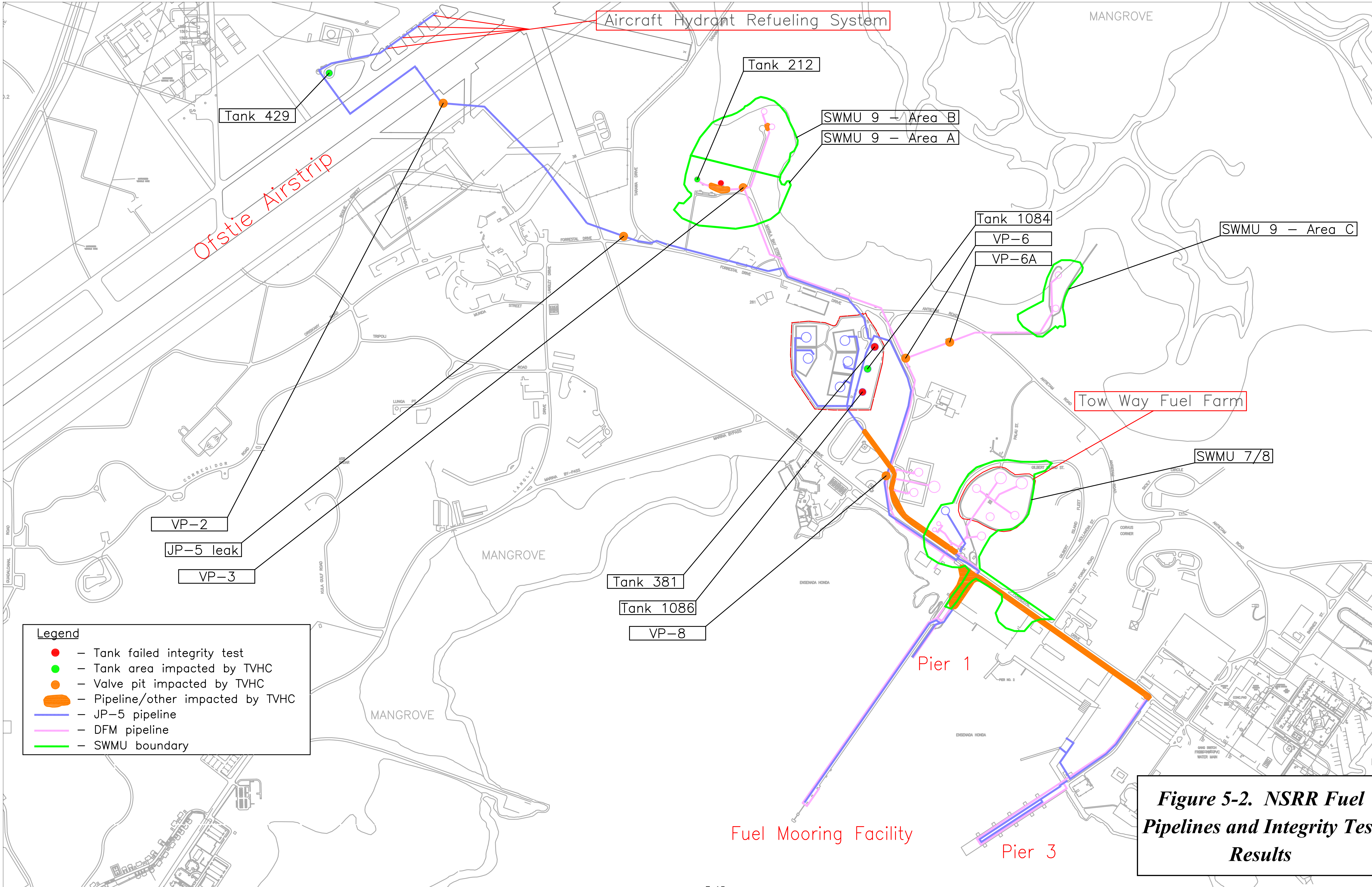


Figure 5-2. NSRR Fuel Pipelines and Integrity Test Results

The Navy is currently monitoring two former refueling stations as part of its MNA study, MNA sites 520 and 1738. Site 520 was the location of 4 former USTs, each removed in 1996: 2 containing mogas, 1 containing diesel, and 1 containing waste oil. Site 1738 was the location of 4 former USTs as well, each removed in 1995: 3 containing mogas and 1 containing diesel. The MNA study is further discussed in Section 5.5.1.1. In addition, two historic vehicle service stations are identified as ECP Sites, and discussed further in Section 5.3 (ECP Site 5 and ECP Site 13).

5.2.4 POL Spills

Numerous spills of POL products (or their derivatives) have occurred over the course of historical operations at NSRR. Documentation regarding spills that occurred prior to 1986 is minimal. The 1984 Initial Assessment Study (IAS) is the earliest identified record that attempted to document historic POL spills. The IAS identified two major areas of petroleum releases, as follows:

- The Tow Way Fuel Farm (see photo A-82 and A-96), located in the "Waterfront" area of the station, has been the site of several large releases of petroleum products:
  - 1957/1958 – Approximately 420,000 gallons of fuel leaked from UST Number 82,
  - 1960s/1970s/1980s – A cumulative volume of approximately 420,000 gallons of fuel leaked from UST numbers 56A and 56B,
  - 1971/1972 – Approximately 3,900 to 7,500 cubic yards of fuel and sludge was removed from UST Numbers 83 and 1080 and was buried in pits excavated adjacent to the UST's,
  - 1978 – Approximately 65,000 gallons of fuel leaked from UST Number 1080, and
  - 1986 – Approximately 91,000 gallons of JP-5 leaked from UST Number 85.

  Due to the large number and quantity of fuel released in this area and the disposal of fuel sludge in this area, it was designated as several SWMUs (SWMU-7, 8, 9) under the IRP, and is currently being addressed under the RCRA Corrective Action permit for the station (see Section 5.3 for details regarding all SWMUs).

- In 1981, an estimated 210,000 gallons of diesel fuel spilled into Enseñada Honda and along the shoreline adjacent to Berthing Pier 3, Community Beach, the mangrove swamp north of Community Beach, and the area south to Punta Cascajo. The fuel spill occurred when the Arco Prestige, a civilian tanker ship that was chartered by the U.S. Navy, developed a problem with the piping system while anchored in the vicinity of Berthing Pier No. 3. Cleanup operations were conducted using an oil separator barge and absorbent pads. An estimated 110,000 gallons of fuel were recovered, while the remainder either blew into the Enseñada Honda mangroves or sank. There is no record of further investigation or remedial action.

Various documentation exists for spills that have occurred since 1986. The vast majority of these spills were small, and would not be presumed to present a significant environmental concern to NSRR. Three large spills have occurred at NSRR since 1986, and are described as follows:

- In 1986, a spill of approximately 10,000 gallons of fuel occurred from UST number 85. This release is being investigated as part of SWMU-7/8 (see Section 5.3).

- In 1989, a spill of over 10,000 gallons occurred after five vessels sank during Hurricane Hugo. In order to raise the vessels, their fuel was released into boomed areas and substantially recovered using skimmers. No further investigation or remediation was conducted as a result of this release.

On 19 October 1999 at the Ofstie Airfield, 110,000 gallons of JP-5 fuel were released during the transfer of JP-5 fuel from Fuel Tank No. 381 to Fuel Tank No. 429 (Baker Spills Report). Recovery, using underflow dams, skimmers, vacuum trucks, and sorbent materials, was conducted where possible. Given the limited accessibility of the mangroves, little cleanup was possible. An estimated 15% to 20% of the product was recovered; the remainder evaporated or remains unaccounted for, presumably migrating into the mangroves or being absorbed into the soils near the spill site (GMI, 2002).

Surface water and surface soil sampling was conducted in 1999 to assess the adequacy of the post-spill containment. Samples were collected around Tank No. 429, and along Tow Way Drive, Forrestal Drive and the Marina Bypass down gradient from where the spill occurred. Results of the soil sampling indicate that the JP-5 fuel entered the storm drainage system in the Ofstie Airfield area and resulted in soil contamination southeast through the mangrove areas located in the vicinity of Tow Way Drive and Enseñada Honda. Surface soil samples collected outside of the direct spill path revealed TPH concentrations below EPA cleanup criteria. Analytical results from the water samples indicate that the JP-5 spill did not adversely affect the surface water in the spill area (Baker 2003). Further delineation and remediation alternatives for the surface water and soil within the spill area are still being considered.

In addition to the surface soil and surface water sampling, a Natural Resource Damage Assessment (NRDA) for the area impacted by the spill was conducted in

February 2002. Based upon the assessment, the spill appears to have impacted 29.25 acres of mangrove community, with a reduction in area and density of all three species of mangrove (red, white and black). Impacted mangrove in this location is still evident as a result of the spill (see photos A-17 and A-18). (GMI, 2002)

Secondary impacts affecting the area were the temporary loss of leaves, death of cattails and ferns; impacts to canopy structure and thus nesting birds; stressed or dead vegetation; exposure of the trees and shrubs between the forest canopy and the ground cover; and eventual expansion of cattails. Based upon the monitoring survey, it does not appear that any chronic or long-term impacts to marine resources (sea grass species) have occurred from the spill (GMI, 2002).

5.3 INSTALLATION RESTORATION PROGRAM (IRP) SITES

Since 1983, all environmental investigation and remediation activities at NSRR, with the exception of USTs, were conducted under the Department of the Navy's (DoN) IRP, which follows a CERCLA pattern. In 1993, NSRR submitted a RCRA Part B Permit application for the storage of hazardous waste on the station. RCRA regulations provide a procedure to investigate and remediate areas that may have been affected by a release of hazardous wastes. The first steps for investigating a site are the RCRA Facility Assessment (RFA) and the RCRA Facility Investigation (RFI). These assessments and investigations are designed to determine if there has been a release of hazardous waste, and to quantify such releases. If it is determined that a release has occurred, a Corrective Measures Study (CMS) is performed to identify the most appropriate corrective measure for a given site. Recognizing that corrective action would apply to unpermitted waste management units, the Navy performed a Supplemental Site Investigation (SSI) at a variety of units to provide additional site characterization information to the EPA to assist in their permitting decisions.

An RFA was performed in 1988 and updated in 1993 by A.T. Kearney, Inc. for EPA to identify SWMUs and AOCs, and to assess the potential for the release of hazardous constituents from any areas or units. The RFA identified 52 SWMUs and 4 AOCs, and recommended additional investigation at 25 of the SWMUs and three of the AOCs.

On October 20, 1994, a Final RCRA Part B permit was issued by the EPA Region II to NSRR as RCRA/HSWA Permit No. PR2170027203. The corrective action provisions of the permit contained specific requirements for investigation, and potentially, remediation, as well as required RFI activities at 25 SWMUs and 3 AOCs. Two additional SWMUs (53 and 54) were identified during May of 2000 for investigation bringing the total to 27 SWMUs and 3 AOCs. On February 24, 2004 the EPA requested that the potential source area and associated TCE plumes at the Tow Way Fuel Farm (SWMUs 7 and 8) be designated as a new SWMU (SWMU 55) since the TCE releases do not appear to be associated with either SWMU 7 or 8. Therefore, a total of 28 SWMUs and 3 AOCs are required for RFI activities.

Section 5.3 describes the current regulatory status and current physical and environmental condition of the SWMUs/AOCs in the IR program at NSRR. Table 5-4 provides a brief summary of each SWMU and AOC, including IR program designation (IR Site No.), type of RFI required in the RCRA Part B Permit, operable unit number, current work status, as well as comments on the current standing of each unit.

The SWMUs and AOCs listed below can be found spatially on Figure 5-3.

Table 5-4. Summary of SWMUs and AOCs at NSRR

SWMU	SWMU Name	Former IRP Designation	RFI Required	Operable Unit (OU)	Status*	Comments
1	Former Army Cremator Disposal Site	Site 5	Full	3	5, 6, 7	Corrective Measures Study (CMS) initiated. An Ecological Risk Assessment (ERA) through Step 3a was completed and indicates that there will be a need to proceed to Step 3b - Baseline ERA.
2	Langley Drive Disposal Area	Site 6	Full	3	5, 6, 7	CMS initiated. An ERA through Step 3a was completed and indicates that there will be a need to proceed to Step 3b - Baseline ERA.
3	Station Landfill	Site 7	Full	4	3	Remedial Feasibility Investigation (RFI) completed. Semi-annual groundwater monitoring in accordance with Puerto Rico Environmental Quality Board (EQB) Solid Waste Management Regulations Park IV-D is required.
4	Drone Fuel Oil/Water Separator	Site 8	None	--	1	RFI not required.
5	Dumpsters	--	None	--	1	RFI not required.
6	Building 145	Site 11	First Phase	1	4, 9	CMS Final Report submitted recommending no further action (NFA). NFA proposed in RCRA Part B permit renewal.
7	Tow Way Fuel Farm	Site 12	Full	2	8, 12	Free product removal performed on monthly basis as an Interim Corrective Measure. CMS Final Report will determine proposed remedial action. Part B Permit modification by EPA will be required before the implementation of the proposed remedy.
8	Tow Way Road Fuel Farm Sludge Disposal Pits	Site 12	Full	2	8, 12	Combined with SWMU 7 into one unit.
9	Tanks 212-217 Sludge Burial Pits	Site 13	Full	2	6, 7	Potential non-carcinogenic human health risk exists at Areas A and C and a potential ecological risk exists at Areas A&B for lead. Additional Data Collection Investigation Report recommended Step 3b of ERA. Awaiting EPA review.
10	Substation 2/Building 90	Site 15	Contingent	1	4, 9, 12	CMS initiated and completed. NFA recommended in RCRA Part B permit renewal, however contamination level is greater than residential risk based concentration (RBC) value requiring a deed restriction.

Table 5-4. Summary of SWMUs and AOCs at NSRR (cont.)

SWMU	SWMU Name	Former IRP Designation	RFI Required	Operable Unit (OU)	Status*	Comments
11	Old Power Plant/Building 38	Site 16	Full	3	3	Building 38 interior was recharacterized and because engineering controls have been placed on the building, there is no risk to human health or environment. NFA recommended; awaiting EPA review.
12	Fire Training Pit Oil/Water Separator	--	First Phase	1	4	No contaminants of concern (COCs) identified during the RFI. NFA proposed in RCRA Part B permit renewal.
13	Old Pest Control Shop/Building 258	Site 18	First Phase	1	9, 10	CMI Work Plan Design Package submitted and EPA approved. EPA is to modify permit with the proposed CMI.
14	Fire Training Pit Area	Site 17	First Phase	1	13	Further action is deferred until site is closed.
15	Station Hospital Incinerator	--	None	--	1	No knowledge or evidence of systematic and routine releases of hazardous wastes or constituents from this unit; RFI not required. Incinerator removed from this site in the fall of 1999.
16	Waste Explosives Storage Building 1666	--	None	--	1	RFI not required.
17	Building 1973 - Non-Flammable Hazardous Waste Storage	--	None	--	1	RFI not required.
18	Building 2009 - Ignitable Hazardous Waste Storage	--	None	--	1	RFI not required.
19	Building 121 - Pesticide Storage	Site 21	Contingent	--	1, 11C	RCRA closure submitted in June 1994 and approved by EPA.
20	Tank Truck/Concrete Storage Pad near Building 860	--	None	--	1	RFI not required.
21	Mobile Floating Tanks	--	None	--	1	Not a unit in which hazardous waste is stored, therefore, not considered a SWMU.
22	Mobile Barges/SWOBS	--	None	--	1	Not a unit in which hazardous waste is stored, therefore, not considered a SWMU.
23	Oil Spill Oil/Water Separator Tanks	Site 21	First Phase	1	4	NFA proposed in the RCRA Part B permit renewal. Contamination to be addressed through deed restrictions.
24	Oil Spill Oil/Water Separator and Adjoining Pad	Site 22	First Phase	1	4	NFA proposed in the RCRA Part B permit renewal.
25	DRMO Storage Yard	Site 23	First Phase	1	13	Further investigations being completed under the RCRA operating permit closure.
26	Building 544 Area	Site 24	First Phase	1	4	NFA proposed in the RCRA Part B permit renewal.
27	Domestic Sewage Treatment Plant (Capehart Area)	--	None	--	1	RFI not required.
28	Domestic Sewage Treatment Plant (Bundy Area)	--	None	--	1	RFI not required.

Table 5-4. Summary of SWMUs and AOCs at NSRR (cont.)

SWMU	SWMU Name	Former IRP Designation	RFI Required	Operable Unit (OU)	Status*	Comments
29	Wastewater Treatment Plant (Industrial Area)	--	None	--	1	RFI not required.
30	Former Incinerator Area	Site 25	First Phase	1	4	NFA proposed in the RCRA Part B permit renewal. A deed restriction is necessary to prevent groundwater usage.
31	Waste Oil Collection Area/Building 31 and 2022	Site 26	First Phase	1	9, 10	Final CMI Work Plan Design Package submitted, EPA approved and awaiting public comment. A deed restriction is anticipated.
32	PWD Storage Yard/Battery Collection Area	Site 27	First Phase	1	9, 10	Final CMI Work Plan Design Package submitted, EPA approved and awaiting public comment. A deed restriction is anticipated.
33	Storage Pad Area/Building 379	--	None	--	1	RFI not required.
34	Temporary Storage Area Fleet Squadron Eight Airfield	--	None	--	1	Conrete pad is currently empty. RFI not required.
35	Oil/Water Separator Building 396	--	None	--	1	RFI not required.
36	Oil/Water Separator Berthing Pier	--	None	--	1	RFI not required.
37	Waste Oil Storage Area/Hangar 200	Site 28	First Phase	1	4	Replaced by another similar facility. NFA proposed in the RCRA Part B permit renewal. A deed restriction is required due to contamination.
38	Below Ground Sanitary/Storm Sewers	Site 29	None	--	1	RFI not required.
39	Building 3158/Former Battery Drain Area	--	First Phase	1	4	NFA proposed in the RCRA Part B permit renewal. A deed restriction is required to prevent unrestricted site usage.
40	Alpha Company Maintenance Yard Mobile Oil Tank	--	None	--	1	This unit is no longer present. RFI not required.
41	Building 3152 Wash Pad	--	None	--	1	RFI not required.
42	Water Purification Plant Lagoons	--	None	--	1	RFI not required.
43	Target Drone Drainage Ditch/Building 860	Site 8	None	--	1	RFI not required.
44	Aerial Target Systems Yard Drainage Ditch	Site 8	None	--	1	RFI not required.
45	PCB Spill Area/Old Power Plant	Site 16	Full	3	5, 6, 7, 12C	CMS initiated. An ERA through Step 3a was completed and indicates a need for Step 3b-Baseline ERA.
46	Pole Storage Yard Covered Pad	Site 30	First Phase	1	9, 10	CMI Work Plan Design Package submitted and EPA approved. EPA is to modify permit with the proposed CMI.
47	Satellite Disposal Areas	--	None	--	1	RFI not required.

Table 5-4. Summary of SWMUs and AOCs at NSRR (cont.)

SWMU	SWMU Name	Former IRP Designation	RFI Required	Operable Unit (OU)	Status*	Comments
50	Drum Storage Area/Building 3166	--	None	--	1	Fenced area at the corner of Building 3166 has been removed. RFI not required.
51	New AIMD Storage Pad/Building 379	Site 31	First Phase	--	4	Former hazardous substance storage pad. NFA proposed in the RCRA Part B permit renewal. A deed restriction is required to prevent unrestricted site usage.
52	Storage Pad near Building 3158	--	None	--	1	RFI not required.
53	Building 64 - Malaria Control Building	--	First Phase	--	9	CMS Final Report submitted and approved by the EPA. CMI is currently being developed to demolish the building and remove the soils.
54	Building 1914 - Former NEX Repair/Maintenance Shop	--	First Phase	--	7	RFI Report submitted and EPA approved. CMS is pending to address TCE in groundwater.
55	Potential Source Area and Associated TCE Plume at Tow Way Fuel Farm	Site 12	First Phase	--	7	New SWMU added from SWMU 7 and 8. CMS needs to be performed to address TCE in groundwater.
AOC A	Torpedo Shop	--	None	--	1	Torpedo Shop is currently no longer in use. Building has been inspected and found clear of environmental issues. RFI not required.
AOC B	Former Building 25 Area	Site 10	Full	6	4, 9	CMS Final Report submitted which recommended NFA. Awaiting EPA review.
AOC C	Transformer Storage Pads near Building 2042	Site 32	First Phase	1	9, 10	CMI Work Plan Design Package submitted and EPA approved. Awaiting EPA to submit Part B Permit renewal/modification.
AOC D	Sediments	Site 33	First Phase	7	4	NFA proposed in RCRA Part B permit renewal. Sediment investigation conducted with associated SWMUs.

Notes:

*1 No work required
2 Investigations pending
3 Under Investigation
4 Removal from Permit pending
5 Additional Investigations required
6 Ecological Risk Assessment
7 Corrective Measures Study pending
8 Corrective Measures Study underway
9 Corrective Measures Study completed
10 Remedial Design
11 Corrective Measure Implementation
12 Interim Corrective Measure
A - Planned
B - Underway
C - Completed
13 Further action deferred
-- Not applicable

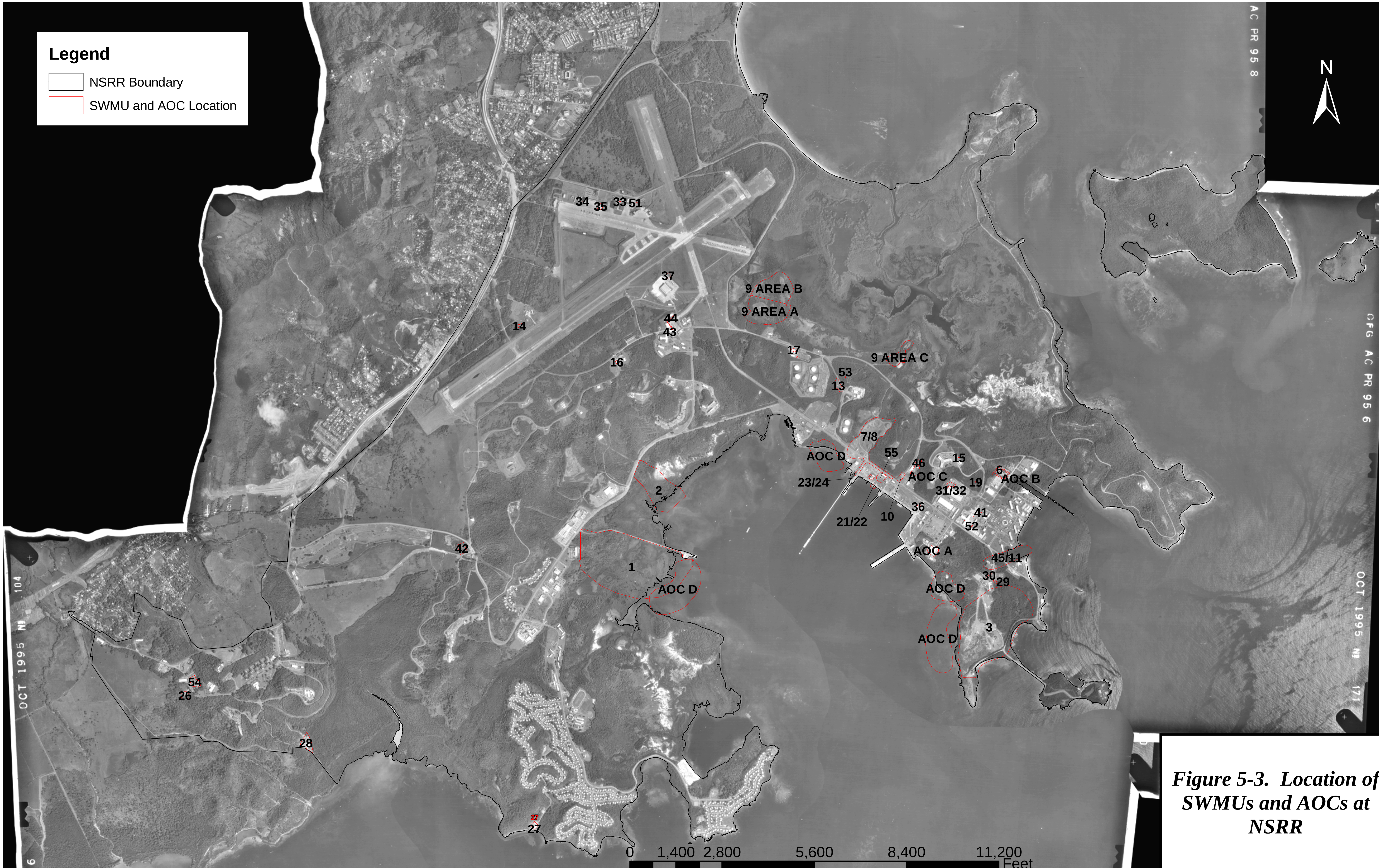


Figure 5-3. Location of SWMUs and AOCs at NSRR

5.3.1 *SWMU 1 - Former Army Cremator Disposal Site [IR Site 5]*

SWMU 1 is located east of the Navy Lodge and is bounded to the north by Kearsage Road leading to a pier, Ensenada Honda to the east and south, and the Navy Lodge and Bowling Alley to the west (see Figure 5-4).

SWMU 1, a part of Operable Unit (OU) 3, encompasses an area of roughly 36 acres and consists of an abandoned, unlined waste-pile/landfill, on the edges of, and encroaching into, the mangrove swamps along the shoreline of the Ensenada Honda. This site was the primary disposal site of the Station's solid waste from the early 1940's to the early 1960's. During the U.S. Navy's IR Program Round 1 investigations (1986) and Round 2 (1987), surface water, sediment, and groundwater samples revealed the presence of metals (arsenic, chromium, thallium, and selenium), low-level pesticides, and low-level organics. A RCRA Facility Investigation (RFI) encompassing soil, sediments, surface water, and groundwater was required in the permit.

A RFI encompassing soil, groundwater, sediments and surface water has been completed and approved by the EPA. The RFI found that SWMU 1 was minimally impacted by former landfilling operations and recommended that institutional controls related to land use restrictions be placed on the SWMU. These restrictions are to be addressed during the development of a CMS. The RFI also recommended that an ecological risk assessment (ERA) be performed as part of the CMS due to the findings of the RFI. Currently, an ERA through Step 3a has been completed. This screening level ERA has identified risks from soil and sediment. Additional evaluation was not recommended for estuarine wetland and Ensenada Honda surface water downgradient from SWMU 1. It is recommended that additional sampling be conducted for SWMU 1. This sampling is to include surface and subsurface soil sampling along with sampling of the sediments. The results from this additional sampling will be evaluated and presented in Step 3B of the Baseline ERA for SWMU 1. After the completion of the ERA the CMS will be initiated for this SWMU.

*Background aerial photograph from 1998

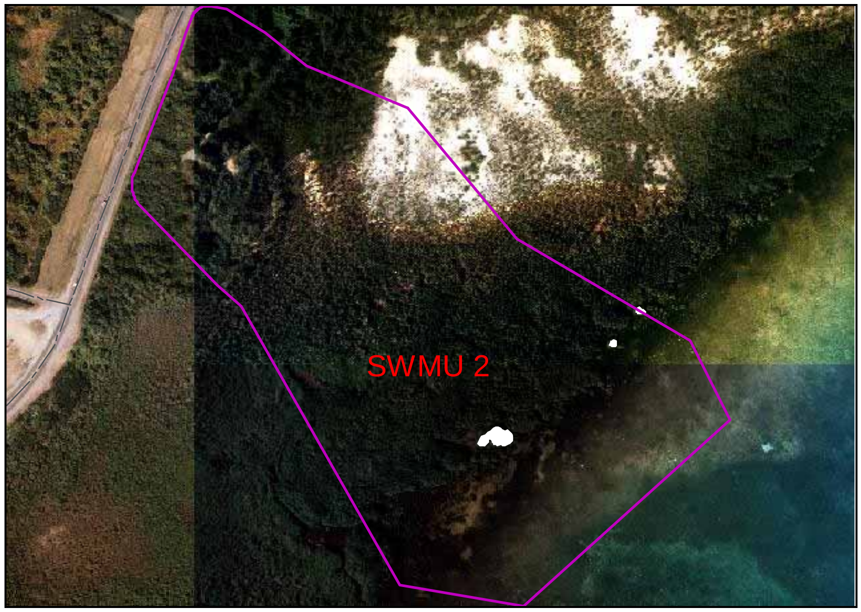
Figure 5-4. SWMU 1 - Former Army Cremator Disposal Site

5.3.2 SWMU 2 - Langley Drive Disposal Area [IR Site 6]

SWMU 2 is located along Langley Drive approximately 1,000 feet northeast of the Navy Commissary and encompasses an area of roughly 28 acres. The site extends from Langley Drive to the Estuarine Wetland System (see Figure 5-5).

This site is an abandoned, unlined waste-pile/landfill, which is part of OU 3, on the edges of, and protruding into the mangroves along the shoreline of Ensenada Honda. This site was utilized from 1939 to 1959 for disposal of solid and possibly hazardous wastes/constituents. During IR Round 1 (1986) and Round 2 (1987) investigations, investigations of soil, surface water, and sediment samples revealed the presence of metals (lead and selenium). An RFI encompassing soil, surface water, sediments, and groundwater was required by the permit.

A RFI encompassing soil, groundwater, sediments and surface water has been completed and approved by the EPA. The RFI found that SWMU 2 was minimally impacted by former landfilling operations and recommended that institutional controls related to land use restrictions be placed on the SWMU. These restrictions are to be addressed during the development of a corrective measures study (CMS). The RFI also recommended that an ecological risk assessment be performed as part of the CMS due to the findings of the RFI. Currently, an ecological risk assessment (ERA) through Step 3a has been completed. This screening level ERA has identified risks from soil and estuarine wetland sediment. Additional evaluation was not recommended for estuarine wetland surface water and Ensenada Honda sediment and surface water downgradient from SWMU 2. It is recommended that additional sampling be conducted for SWMU 2. This sampling is to include surface and subsurface soil sampling along with sampling of the estuarine wetland sediments. The results from this additional sampling will be evaluated and presented in Step 3B of the Baseline ERA for SWMU 2. After the completion of the ERA the CMS will be initiated for this SWMU.



*Background aerial photograph from 1998

Figure 5-5. SWMU 2 - Langley Drive Disposal Area

5.3.3 *SWMU 3 - Station Landfill [IR Site 7]*

SWMU 3, a part of OU 4, is currently an active landfill. It is unlined, and has been utilized since the early 1960's as a disposal site for solid wastes on approximately 85 acres of land in the southeastern area of the station (see Figure 5-6). It should be noted that a new vertical cell of 35 acres and located within the limits of the inactive 85-acre landfill was finished in March 1999 and was placed into operation in June 2000 in accordance with the Environmental Quality Board (EQB) Solid Waste Management Regulations. The design of the new cell included a 2-foot thick clay liner, and a run on/off collection pond. The method of disposal of the inactive landfill involved excavation of a trench to the water table, and then filling the trench with wastes, followed by covering with soil. During IR Round 1 (1986) investigation, eight groundwater monitoring wells were installed. Round 1 (1986) and Round 2 (1987) sampling of the groundwater found metals (arsenic, chromium, lead, and selenium) above Maximum Contaminant Level (MCL) levels. A RFI encompassing sediments and groundwater was performed and approved by the EPA.

As recommended and approved by EPA, this site will continue to be monitored semi-annually in accordance with EQB Solid Waste Management Regulations to ensure that groundwater in not being impacted by landfill operations. Currently the information obtained from the semi-annual groundwater sampling does not indicate that the operations of the facility are negatively impacting the groundwater with respect to human health or the environment. This analysis will continue until the landfill is closed.

*Background aerial photograph from 1998

Figure 5-6. SWMU 3 - Station Landfill

5.3.4 SWMU 4 – Oil/Water Separator Outside of Building 860 [Part of IR Site 8]

SWMU 4 consists of the below ground oil/water separator outside of the east side of Building 860 (see Figure 5-7). Target drones not destroyed at sea, were refurbished at Building 860, where the recovered drones were emptied of unused jet fuel/dyes/water by pouring into this below ground oil/water separator unit. This unit was installed in the mid-1970s to prevent any fuel/oil releases from the drone washdown procedure entering the drainage ditches. During the 1988 Visual Site Inspection (VSI) and 1993 follow-up inspection, no visual evidence of releases was observed. Permittee verbally indicated it had no knowledge or evidence of systematic and routine releases of hazardous wastes or constituents from this unit. A RFI was not required at this site.

Currently, there is no visual evidence of any releases observed based on the 2003 ECP investigation.

*Photograph from November 2003

Figure 5-7. SWMU 4 – Oil/Water Separator Outside of Building 860

5.3.5 SWMU 5

SWMU 5 is a "catch-all" for 114 metals dumpsters scattered throughout the station. By practice, these dumpsters are to receive only non-hazardous wastes. Permittee verbally indicated it had no knowledge or evidence of systematic and routine releases of hazardous wastes or constituents from these units. A RFI was not required.

5.3.6 SWMU 6 - Building 145 [IR Site 11]

SWMU 6 is located in a limited access area of NSRR. The site is located in a secure fenced storage yard located in the industrial area of NSRR (see Figure 5-8). The area is level and is a wide, open gravel and grass field.

SWMU 6, a part of OU 1, consists of a partially subterranean, concrete bunker (Building 145) formerly used as a long-term storage area for containers of surplus and discarded paints, polishes, etc. The Navy's 1984 Initial Assessment Study (IAS) indicated this building was used for more than 25 years for this purpose and, at the time of the IAS, contained a large quantity (sixty 55-gallon drums plus 100 five-gallon pails) of containers. The condition of the containers was mostly poor, with some resting in standing water, with tree roots penetrating through the top of the structure. According to the 1988 VSI, all contents formerly stored in this SWMU had been removed, the same finding resulted from the 1993 follow-up inspection. However, since there was never any sampling to confirm the absence of releases of hazardous constituents from this unit, and based on the condition of this unit as described in the 1984 IAS, a Phase I RFI for surface and subsurface soils was required in the permit.

A Phase I RFI was completed for SWMU 6, which indicated that a potentially unacceptable risk to future residents and adult on-site workers exists. The RFI recommended the performance of a CMS. The results of the revised risk assessment conducted for the development of corrective action objectives indicated that the only risk was a non-carcinogenic risk to future young child military residents. It was further demonstrated that the critical toxic effects for the two principal contaminants (arsenic and 4,4-DDT) demonstrated that the hazard indices should be segregated based on target organs, resulting in neither contaminant exceeding the acceptable level. Hence, COCs were not identified for any of the media at SWMU 6/AOC B, and there were no corrective action objectives calculated for SWMU 6/AOC B. The CMS was conducted and submitted to the EPA on June 21, 2001 recommending no further action for this site. No further action is proposed in the RCRA Part B permit renewal.

*Background aerial photograph from 1998

Figure 5-8. SWMU 6 - Building 145

5.3.7 *SWMU 7 - Tow Way Fuel Farm [IR Site 12]*

The Tow Way Fuel Farm (TWFF) (SWMU 7), a part of OU 2, consists of the areas impacted by releases from numerous large, partially in-ground, concrete fuel storage tanks located on a hillside along Forrestal Road north of Ensenada Honda (see Figure 5-9). Constructed prior to 1957, the fuel farm originally consisted of nine USTs containing diesel fuel marine (DFM), Bunker C fuel, and jet fuel (JP-5). That number has since been reduced to seven by the removal of two tanks. Over the years, documented spills, and leakage have occurred from these tanks.

A full RCRA Facility Investigation (RFI) was performed, which found that there was a benzene, toluene, ethylbenzene, and xylene (BTEX) plume within the groundwater at this SWMU. This plume appeared to be associated with the free product plume, as it occurs in advance of and down-gradient of the free product plume. Although there is no risk posed to human health from the BTEX plume, the RFI noted that there was a complete pathway for exposure to the environment by discharge to Ensenada Honda surface waters. Therefore, a CMS for the dissolved phase plume appeared warranted. The RFI also noted that there is a pattern of low level Polyaromatic hydrocarbon (PAH) and total petroleum hydrocarbon (TPH) within the soil of the upper and lower TWFF areas, respectively. Although there is no current risk to human health posed by the PAHs, there were no ecological risks assessed for the soil since there is not a complete pathway present and the area is entirely industrial. There were no human health risks assessed for the TPH because there was no corresponding risk based concentrations (RBCs) values. There were no ecological risk assessed for the TPH since there are no comparison criteria for TPH available and there is no complete pathway. The RFI also noted that an ICM was currently in progress at the TWFF that addresses the recovery of the free product. Therefore, based on the fact that there were no plans to ever use the site for anything but a fuel farm, the RFI recommended that a land use restriction be placed on this site that would limit use to industrial purposes only. The EPA approved the RFI recommending the performance of a CMS.

An Interim Corrective Measure Free Product Recovery System was designed and installed at the TWFF to address the identified PSH plume at the TWFF. The commissioning phase of the ICM was completed on April 30, 1997. PSH removal from the ICM began in March 1997 and was suspended in October 1999 for the performance of the pneumatic fracturing pilot study. PSH removal was resumed during March 2001 and is presently performed by removing PSH from any well with product through a portable pump.

Various pilot tests to evaluate remedial alternatives have been performed over the years at the TWFF. These Pilot tests have included a patented CleanOX® technology for the removal of contaminants from the subsurface media. Hydraulic Characteristics evaluation of the aquifer at the TWFF was conducted to determine aquifer yield and hydraulic characteristics of the unconsolidated strata within areas of the product plume. Also performed was a pilot test to enhance product recovery at the TWFF through pneumatic fracturing.

A CMS investigation work plan was developed, and the investigation was performed during the spring of 1998. The purpose of the investigation was to gather additional data with respect to the fuel related contamination to assist in the development of a CMS and selection of the most applicable remedial approach. As a result of the investigations mentioned above, and in support of ongoing efforts on the CMS, additional data requirements were identified. The results from this investigation identified a plume of TCE in the groundwater in the southeastern portion of the TWFF south of Forrestal Road. This was an independent plume from the PSH at the site. As such this portion of the site is being dealt with separately from the fuel related contamination at the site. Information related to the TCE plume at the TWFF is presented in the paragraphs below.

An additional data collection work plan was developed and approved by the EPA. The investigation was performed during the first part of 2002 to address the additional data requirements identified from the previous investigations, and to support the ongoing efforts of the CMS. This investigation included the installation of eleven additional monitor wells and eight soil borings. Surface and subsurface soil samples, groundwater samples, and sediment and surface water samples were collected during this investigation.

Based on the previous information gathered at the TWFF, a CMS Task I Report for the TWFF was designed to develop the corrective measure alternative or alternatives based on the corrective measure objectives and analysis of the preliminary corrective measure technologies. The CMS identified alternatives to address soil, groundwater and PSH constituents at the site. The EPA approved the CMS Task I Report and requested that the remaining steps of the CMS be completed.

A CMS Final Report was developed to meet the requirements of Tasks II, III, and IV under Module III, Appendix B (Scope of Work for a Corrective Measure Study) as contained in NSRR's RCRA Part B Permit. Task II of this report provided an evaluation of the identified alternatives with respect to technical requirements, environmental assessments, protection of human health, and institutional needs. Task III provided a recommendation and justification of the preferred alternative or alternatives. The CMS Final Report found that soil, groundwater and PSH areas with chemicals of concern (COCs) are, for the most part, not co-located. The location of the majority of the COCs for soil is in the upper TWFF. The location of the majority of the groundwater contamination is near the 470-wells in the western part of the lower TWFF. The primary locations of the PSH plumes are in the central portion of the lower TWFF just north of Forrestal Road. Because of this, the configuration of the alternatives allow for different process options to be used on different media in one alternative when one process option may be effective on more than one medium. Also, different processes may be used on the same medium, but in different locations. It was, therefore, logical to address the alternatives as a whole because the alternatives were configured to address all the media and all the COCs.

This report recommended that with all factors weighed, it is apparent that given enough time, Alternative 1 is effective at addressing all contaminants within each media of concern. Alternative 1 is the quickest to implement, the easiest to maintain, and offers a high level of protection to human health and the environment. Impacted groundwater has been limited to the 470-well area.

Previous sampling has showed that the dissolved plume has not moved and has favorable natural attenuation parameters. If the PSH could be removed from this area, the naturally occurring parameters should mitigate this plume. Soils are also addressed adequately under Alternative 1. Under this alternative, land use controls would be placed on the site to restrict building construction. The PSH must be reduced to 0.01 feet or less. Alternative 1 uses a simple, proven technology to capture the maximum PSH recoverable. Another positive aspect of the PSH skimming system is its flexibility. The design calls for at least two self-contained portable skimming systems to be used. These systems would be trailer mounted with small tanks for PSH recovery located on the trailer. Solar cells that charge on-board batteries would be used to operate the pumps and controls. These systems would allow the Navy to respond to newly identified wells with measurable PSH in them. The areas where the interim skimming system was used, still have PSH available for recovery. Alternative 1 would use the existing interim skimming system to the maximum extent practicable. A permanent skimming system would be placed in these wells to capture PSH. Currently, the EPA has provided comments on this report that the Navy is in the process of addressing.

A work plan was developed and approved by the EPA to address the TCE in groundwater at the TWFF. A TCE investigation was conducted in the summer of 1999 to delineate the TCE plume in the groundwater. The EPA approved the ensuing report on the TCE investigation. The report recommended that a detailed evaluation be conducted during the CMS for the TWFF to evaluate alternatives for the TCE plume. During the development of the CMS it was identified that additional data gaps needed to be addressed to facilitate the development of the CMS for the TWFF. A work plan was developed, field investigation performed, and the EPA approved Final Additional Data Collection Investigation Report for the TWFF was developed.

During the additional data collection effort, TCE concentrations in monitor well 7MW07 were found to have increased fourteen-fold, from 2,000J micrograms per liter (µg/L) in April 1998, to 28,000J µg/L in January 2002, a period of approximately four years. Because of this increase in concentration, additional characterization of the source of this TCE was recommended in the Draft Final Task I CMS prior to finalization of the CMS. It was also recommended that CMS for this portion of the TWFF be completed independently from the rest of the TWFF. This was done so as not to delay the evaluation of the remedial alternatives from the rest of the site. This was possible since the TCE and PSH portions of the site are independent and do not overlap each other. A work plan to address the TCE plume delineation and source investigation was developed and approved by the EPA. The field investigation was implemented in accordance with the EPA approved work plan. The Draft TCE Plume Delineation & Source Investigation Report was submitted on January 21, 2004. It was determined that no continuing source of TCE is apparent in the soil or groundwater at this site. The original source and/or location of the TCE contamination in this area of the

TWFF remains unknown, despite the gathering of historical information and the efforts of environmental sampling during two focused investigations. The TCE plume was delineated and a sentinel well was placed down gradient of the plume in order to determine, through subsequent sampling events, if contamination is approaching the Ensenada Honda. It was recommended that a CMS proceed for this site. The CMS should include screening level risk assessments for cis 1,2-dichloroethene, 1,2-dichloroethane, 1,1,1-trichloroethane, trans 1,2-dichloroethene, and tetrachloroethene in the groundwater at this site. These compounds were detected during this investigation at levels above those found in previous investigations. Once any new corrective action objectives (CAOs) are established, appropriate corrective measures to address the TCE contamination can be evaluated during the CMS process. The EPA provided comments on the Draft TCE Plume Delineation & Source Investigation Report on February 24, 2004. The EPA recommended that their comments be addressed in the CMS Report for the TCE site. The EPA also requested that the potential source area and associated TCE Plumes at the Tow Way Fuel Farm be designated as SWMU 55 pursuant to the requirements of Module III of the RCRA permit. This action was taken since the TCE releases do not appear to be associated with either SWMU 7 or 8, the currently defined SWMU at the Tow Way Fuel Farm. Information regarding the TCE at the TWFF will now be discussed as SWMU 55 per the EPA's request dated February 24, 2004.

*Background aerial photograph from 1998

Figure 5-9. SWMU 7/8 – Tow Way Fuel Farm

5.3.8 SWMU 8 - Tow Way Fuel Farm Sludge Disposal Pits [IR Site 12]

SWMU 8 is collocated with SWMU 7 (see Figure 5-9 above). This unit consists of unlined earthen pits adjacent to the TWFF fuel tanks where sludges were buried and covered with soil when the fuel tanks were periodically cleaned. This SWMU is part of OU 2, where benzene, lead and other hazardous constituents have been detected in groundwater above action levels, and evidence of soil contamination has been described. SWMU 8 was combined with SWMU 7 (with EPA approval) since the releases from each are inseparable. As such, see the description for SWMU 7 for details regarding this SWMU.

5.3.9 SWMU 9 - Tanks 212-217 Sludge Disposal Pits [IR Site 13]

SWMU 9 consists of unlined earthen pits in which petroleum sludges were buried after tank cleanings. These burial pits are associated with fuel tanks 212 through 217, located along Forrestal Drive. SWMU 9 has been divided into three separate areas due to the groupings of the tanks. Area A includes Tanks 212 and 213. Area B is Tanks 214 and 215, while Area C consists of Tanks 216 and 217 (see Figures 5-10 and 5-11). Although the unit is a part of OU 2, it is now treated as a separate entity since SWMU 7/8 is so complicated. The tanks were installed in 1940, and were cleaned approximately every five years, until 1978, resulting in burial of sludges. During the IR Round 1 (1986) Investigation, 11 groundwater monitor wells were installed. Rounds 1 and 2 sampling found benzene and toluene in the groundwater at levels above relevant action levels. In addition, during Rounds 1 and 2, 6 sediment samples were collected in the mangrove swamps, downslope from the tanks. Organic constituents (benzene, chlorobenzene, methylene chloride, toluene, TCE) and lead were detected in these sediment samples, but below relevant action levels. No soil borings were made for visual, odor, or organic vapor Photoionization Detector (PID) observations. An RFI encompassing soils and groundwater was required in the permit. Based on the results, investigations were required for surface water and sediments.

The RFI included three phases of investigations. The RFI indicated that Area A has been impacted by past fuel management activities. Human Health COPCs were identified for subsurface soil, groundwater, sediment, and surface water from Area A. The HHRA did not identify an incremental lifetime cancer risk greater than the EPA limits in Area A. Minimal noncarcinogenic risk may potentially exist for future military child resident and future construction worker in Area A. The results of the screening-level ERA are not sufficient to conclude that risks to the ecological receptors at Area A are negligible.

The RFI indicated that Area B has been impacted by past fuel management activities. The HHRA did not identify an incremental lifetime cancer risk greater than the acceptable EPA limits in Area B. There were no unacceptable noncarcinogenic risks associated with exposures to contaminants detected in Area B as estimated in the HHRA. The results of the screening-level ERA indicated that the assessment endpoints for Area B were not met. As such the results of the screening-level ERA are not sufficient to conclude that risks to the ecological receptors at Area B are negligible.

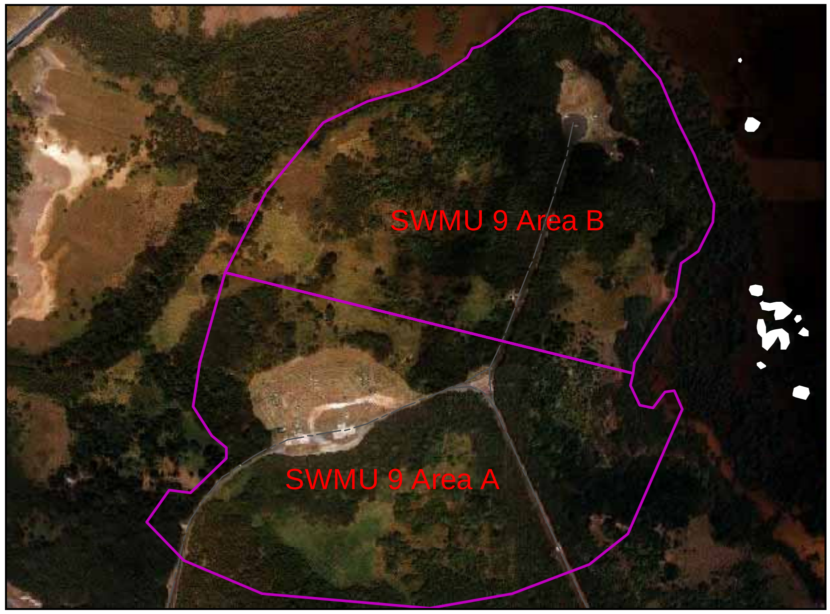
The RFI also indicated that evidence of the impact of past site operations on Area C surface and subsurface soil is limited. There is no evidence of the impact of past site operations on groundwater at Area C. The HHRA did not identify an incremental lifetime cancer risk greater than the acceptable EPA limits in Area C. Minimal noncarcinogenic risk may potentially exist for future young child military resident in Area C. The results of the screening-level ERA indicated that the assessment endpoints for Area C were not met. As such the results of the screening-level ERA are not sufficient to conclude that risks to the ecological receptors at Area C are negligible.

The RFI recommended the collection of additional surface water samples and background samples be collected. The RFI has been completed and approved by the EPA.

A CMS investigation was conducted and the additional data was utilized to perform a screening-level ERA for SWMU 9. Based on the results of the assessment, no further evaluation of ecological risk was recommended for Areas A and C surface soil, Areas A/B and C surface water, and Area C sediment. However, there appears to be a potential risk to both soil invertebrates and upper trophic level receptors at Area B from lead and zinc in surface soil. There also appears to be a potential risk to benthic invertebrates and upper tropic level receptors from lead detected in Area A/B sediment. It was recommended that additional sampling of surface soils be conducted in the vicinity of Tank 214 to characterize the extent of lead and zinc contamination and additional sampling of the sediment in the vicinity of Tank 214 to characterize the lead contamination. Once the characterization is completed Step 3A of the ERA should be reevaluated before making a decision of whether or not this site should move forward to Step 3B of move into the CMS stage. The EPA approved this document.

Additional data collection was conducted from SWMU 9 as recommended in the CMS Investigation Report. The results from the Additional Data Collection indicate that lead is considered a potential risk driver for terrestrial plant and omnivore populations at SWMU 9 Area B. Lead is also a potential risk driver to aquatic invertebrates and upper avian invertebrate consumers within the estuarine wetland downgradient from SWMU 9 Area B. It is recommended that the ERA process proceed to Step 3B (baseline risk assessment problem formulation). This document is currently under review by the EPA.

All three areas of this unit currently contain areas of grass and secondary growth vegetation, as well as wetland areas.



*Background aerial photograph from 1998

Figure 5-10. SWMU 9 – Tanks 212-215 Sludge Disposal Pits

*Background aerial photograph from 1998

Figure 5-11. SWMU 9 – Tanks 216 - 217 Sludge Disposal Pits

5.3.10 SWMU 10 - Substation 2 (Building 90) [IR Site 15]

SWMU 10, a part of OU 1, consisted of Substation 2 (Building 90) located near the intersection of Forrestal Drive and Valley Forge Road (see Figure 5-12). The site is relatively flat and surrounded by shallow drainage ditches associated with the roadways. Electrical transformers were formerly repaired, resulting in PCB containing transformer oils being poured on the ground. Building 90 is no longer present at this site, and there is no visual evidence of any releases observed from this unit based on the 2003 ECP inspection.

An ICM was performed (completed December 1994) to remediate the PCB contaminated soils at this site. A RFI was completed to verify that the underlying groundwater at this site had not been affected by the contaminated soils as requested by the EPA. The RFI concluded that there is no evidence of groundwater being impact related to the waste management activities that took place at this SWMU. However, at the request of the EPA to verify that all work performed to date was protective of human health and the environment, a CMS was initiated and completed, and no further action is proposed in the RCRA Part B permit renewal.

*Photograph from November 2003

Figure 5-12. SWMU 10 – Former location of Substation 2 (Building 90)

5.3.11 SWMU 11 - Old Power Plant (Building 38) [IR Site 16]

SWMU 11, a part of OU 3, at NSRR is the interior of Building 38, the "Old Power Plant" (see Figure 5-13). This building is located just north of the Station Landfill in the southeastern portion of NSRR. SWMU 11 includes a former concrete pad where transformers and transformer fluids containing PCBs were stored. Both the 1998 VSI and the 1993 follow-up inspection reported extensive staining. There were also indications of transformer fluids being discarded by pouring into subsurface cooling water tunnels associated with the Power Plant, which then empty into the embayment of Puerca Bay. The exterior of Building 38 is classified as SWMU 45 and is discussed separately below.

Building 38 is a large, all concrete building broken up into two distinct sections (northern and southern). The northern section, which contains the condensor tanks and piping, is approximately 142 feet long by 54 feet wide. The southern section, containing the compressor area, the steam boilers, and the lavatory, is approximately 142 feet long by 48 feet wide. There are a number of interconnected pits and tunnels that are located beneath the floor generally covered with wooden planking. The collected flow from these features is eventually directed to the cooling water discharge tunnel. The entire building is constructed of concrete approximately two to three feet thick. Currently, engineering controls have been implemented to restrict access to the interior of the building. These controls consist of both sets of the steel doors being padlocked with signage on the doors indicating that the building is a contaminated site under environmental investigation and no one is to enter the building. These controls have been put in place to prevent access by workers and/or trespassers to the interior areas of the building. An additional engineering control in place at Building 38 consists of the staircase leading to the upper level of the building being removed from the ground area, thereby preventing access.

An RFI investigation was performed in November of 1996 to characterize PCB contamination on the floors and walls inside of Building 38. Grab samples of the sludge's found in the floor pits from inside the building were also collected. Prior to preparation of the RFI Report a fire occurred within the building in 1997. The fire was largely contained to debris and the planks that cover the floor pits in the northern portion of the structure. No structural damage was done to the building and all firefighting water was contained within the pits. Because of the fire, the Navy considered the sampling data gathered to be unusable and, therefore, has not presented the results. In response to this incident, the Navy recharacterized the interior of Building 38 in the fall of 2003. The RFI Report has been developed, and the corresponding report is being reviewed by the EPA. The RFI determined that portions of the interior walls and floors have been impacted by past operations as evidence by the PCB contamination. The Navy has recommended that no further action be performed for this SWMU under the pending closure of the station. It is recommended that any future tenant of this building be informed of the contaminants present within the building so that they may evaluate their options for reuse of the structure. It should be noted that this change in ownership of real property contaminated with PCBs is not prohibited as outlined in the EPA August 14, 2003 Memorandum. [Note: According to a 1991 survey (Weston, 1991), asbestos containing materials are present in Building 38.]

*Photograph from November 2003

Figure 5-13. SWMU 11 - Old Power Plant (Building 38)

5.3.12 SWMU 12 - Fire Training Pit Oil/Water Separator

SWMU 12, a part of OU 1, consists of the Oil/Water Separator located north of the station airfield, serving the Fire Training Pit (see Figure 5-14). The fire training pit oil/water separator is an inground concrete tank measuring approximately 7 feet wide by 30 feet long by 10 feet deep covered by heavy grating. Waste oils are burned at the fire training pit (SWMU 14) during training exercises, with the excess oil and fire fighting water collected in SWMU 12. Water from the oil/water separator is pumped to the sewer and oils are pumped back into the pit to be reused. During the 1988 VSI, oil stains were observed on the concrete and rails around this unit, and dead vegetation adjacent to it, indicated past overflows onto the adjacent soils. A First Phase RFI encompassing surface soil sampling was required in the permit.

During the RFI, there were no signs of spills or releases at the time of the investigation. This was confirmed from the results of the surface soil sampling during the RFI. The RFI did not identify any chemicals or potential concern (COPCs) for this unit. Therefore, no further action is proposed in the RCRA Part B permit renewal.

Currently, there is no visual evidence of any releases observed from this unit based on the 2003 ECP inspection.

*Background aerial photograph from 1998

Figure 5-14. SWMU 12 - Fire Training Pit Oil/Water Separator

5.3.13 SWMU 13 - Old Pest Control Shop Area (Building 258) [IR Site 18]

SWMU 13, a part of OU 1, consists of the now demolished, Old Pest Control Shop Area (Building 258), and the surrounding area, including the drainage ditch behind the former Building 258 and along Forrestal Drive (see Figure 5-15). This site is located adjacent to Forrestal Drive, and southwest of SWMU 53 (Building 64). The Pest Control Shop operated at Building 258 from the late 1950s through 1983. Past practices and known spills indicate the release of pesticides into the soil and the adjacent drainage ditch, which discharges into the nearby bay (Ensenada Honda). In 1976, a 55-gallon drum of malathion, stored outside the building, ruptured. The spilled contents eventually washed into the drainage ditch located near the building. This ditch also regularly received rinse waters from the cleaning of pesticide application equipment over a storm drain that discharged to the ditch. Reported, excess pesticides also were poured into this ditch. Since the 1988 RFA, the building has been demolished. No visible signs of releases were identified in the RFA reinspection conducted in 1993. A RFI encompassing soils around the vicinity of the demolished building, and sediments in the adjoining drainage ditch was required in the permit. Provisions were made for additional groundwater investigations, contingent on the results of the soil and sediment investigations.

The RFI concluded the site had been impacted by past pesticide management, and that unacceptable environmental and human health risks exist due to levels of contaminants within the drainage ditches. Following the RFI, a CMS was developed and completed with the primary goal to identify the appropriate technical approach needed to address releases to the drainage ditches at this site. Upon completion of the CMS, a Corrective Measures Implementation (CMI) Work Plan Design Package was developed which proposed the excavation of the contaminated drainage ditch from the site. Subsequently, the EPA has approved the work plan and is to modify the RCRA permit with the proposed CMI.

The majority of this site is now covered with heavy secondary growth vegetation. Currently, there is no visual evidence of any releases observed from this unit based on the 2003 ECP inspection.

*Photograph from May 2003

Figure 5-15. SWMU 13 - Old Pest Control Shop Area (Building 258)

5.3.14 SWMU 14 - Fire Training Pit Area [IR Site 17]

SWMU 14, a part of OU 1, consists of the Fire Training Pit area located near the Fire Training Pit Oil/Water Separator (SWMU 12) (see Figure 5-16). The present day Fire Training Pit, which is concrete lined, was constructed in 1983. The new pit is constructed below grade, with a concrete apron. A drainage system encircling the apron intercepts any overtopping that may occur, which is directed to an oil/water separator. Currently, there is no visual evidence of any releases observed from this unit based on the 2003 ECP inspection.

Prior to 1983, two unlined fire-fighting pits were used. According to the Navy's 1984 IAS, visibly contaminated soils were removed from these two unlined pits during construction of the new pit in 1983. The IAS study indicated that one sample of the excavated soil was analyzed for PCBs, but none were detected. There was no indication that other sampling has been performed to establish the absence of other hazardous constituents in the soils underlying the pre-1983 unlined fire training pits, or the impact, if any, of released hazardous constituents on the groundwater. A RFI encompassing subsurface soils, down to the water table, was required in the permit. Groundwater investigations were made contingent on the subsurface soil sampling results.

A RFI for surface soil was conducted and a human health risk assessment was performed on these soils. The results of the Human Health Risk Assessment (HHRA) did not indicate an unacceptable cancer risk for any of the exposure scenarios or pathways. There are currently engineering controls in place to prevent subsurface soil and groundwater exposures to activities at the fire training pit. Additional site characterization of this site will be conducted once the site is no longer in operation. Therefore, a final decision of whether or not corrective action is necessary will not be determined until the usage of the area is terminated.

*Photograph from March 1995

Figure 5-16. SWMU 14 - Fire Training Pit Area

5.3.15 SWMU 15

SWMU 15 consisted of the station hospital incinerator (Former Building 1928) located north of Building 1776, and east of SWMU 31/32 (see Figure 5-17). There was no visual evidence of releases to the soils, surface water, or groundwater. Permittee verbally indicated it had no knowledge or evidence of systematic and routine releases of hazardous wastes or constituents from this unit. A RFI was not required for this SWMU.

The incinerator was taken out of operation in October 1998 and the Incinerator (Former Building 1928) was removed from this site in the fall of 1999. Currently, the area where the former Building 1928 existed is now grass covered. There is no visual evidence of any releases observed from this unit based on the 2003 ECP inspection.

*Photograph from November 2003

Figure 5-17. SWMU 15 – Station Hospital Incinerator Area (Former Building 1928)

5.3.16 SWMU 16

SWMU 16 consists of the Waste Explosives Storage Building (Building 1666) located south of Building 1674, and west of Building 300 (see Figure 5-18). This SWMU was not inspected during the 1988 VSI due to the special security clearances required to gain access to this facility. However, it was inspected during a follow-up VSI, conducted in June 1993. No evidence of releases from this building was observed. Permittee verbally indicated it had no knowledge or evidence of systematic and routine releases of hazardous wastes or constituents from this unit. A RFI was not required for this SWMU.

*Background aerial photograph from 1998

Figure 5-18. SWMU 16 – Waste Explosives Storage Building (Building 1666)

5.3.17 SWMU 17

SWMU 17 consists of a fully enclosed, concrete and steel building (Building 1973) at the DRMO facility located along Forrestal Drive (see Figure 5-19). This site serves as the main non-flammable hazardous waste container storage facility for the station. Good release controls are in place, and there is no evidence of releases of hazardous constituents. Permittee verbally indicated it had no knowledge or evidence of systematic and routine releases of hazardous waste or constituents from this unit. A RFI was not required for this SWMU.

*Background aerial photograph from 1998

Figure 5-19. SWMU 17 – Fully enclosed, concrete and steel building (Building 1973)

5.3.18 SWMU 18

SWMU 18 consists of a fully enclosed metal building (Building 2009) located within the southwest portion of the DRMO storage yard along Forrestal Drive (see Figure 5-20). This site serves as the container storage building for ignitable hazardous wastes. There is no evidence of releases of hazardous constituents. Permittee verbally indicated it had no knowledge or evidence of systematic and routine releases of hazardous wastes or constituents from this unit. A RFI was not required for this SWMU.

*Photograph from November 2003

Figure 5-20. SWMU 18 – Fully enclosed metal building (Building 2009)

5.3.19 *SWMU 19 - [IR Site 21]*

SWMU 19 consisted of a concrete, bunker-like building (Building 121) located northeast of the Public Works Department Building 31 (see Figure 5-21). This site had been used to hold surplus and discarded pesticides for indefinite, long-term storage. The building was demolished in 1998.

Based on the performance and completion of the closure plan submitted June 17, 1992 and its revisions, no further work is required. RCRA closure was submitted in June 1994 and approved by the EPA in 1996.

Currently, the site is overgrown with secondary growth vegetation, with no evidence of the building structure (Building 121) remaining. There is no visual evidence of any releases observed from this unit based on the 2003 ECP inspection.

*Background aerial photograph from 1998

Figure 5-21. SWMU 19 – Concrete, bunker-like building (Building 121)

5.3.20 SWMU 20

SWMU 20 consisted of a tank truck located in front of Building 860 (Aerial Target Systems Department), and south of Building 1980 (see Figure 5-22). This site was formerly used to temporarily store waste oil, fuels, and solvents generated at the drone refurbishing area. The wastes were disposed of by a contractor, which periodically emptied the tank truck. No visual evidence of releases was observed during the 1988 VSI. The 1993 follow-up inspection found that the tank truck was no longer present, but had been replaced by an open-air, bermed, concrete storage pad near Building 860. This storage pad now constitutes SWMU 20. During the 1993 follow-up inspection, this pad contained (19) 55-gallon drums of oil and a 500 gallon tank. No visual evidence of releases was observed during the 1993 follow-up inspection. A RFI was not required for this SWMU.

Currently, there is no visual evidence of any releases observed based on the 2003 ECP inspection.

*Photograph from November 2003

Figure 5-22. SWMU 20 – Open-air, bermed, concrete storage pad

5.3.21 SWMU 21

SWMU 21 consisted of 4 mobile, floating tanks ("donuts") utilized in the clean-up of marine oil/fuel spills. The spilled oil/fuel was gathered by skimmers and then pumped into the "donuts", which transport the collected oil/fuel/water mixture to a dock or other transfer point. These donuts are basically transport vehicles, not units in which hazardous wastes are stored. Therefore, these tanks are not SWMUs, and a RFI was not required.

5.3.22 SWMU 22

SWMU 22 consists of mobile barges known as ship waste offload barges (SWOBs) used to collect and transport bilge and ballast water from ships and oil/fuel from marine spills. These barges are transport vehicles, not units in which hazardous wastes are stored. Therefore, they are not SWMUs, and a RFI was not required.

5.3.23 SWMU 23 - Oil Spill Oil/Water Separator Tanks

SWMU 23, a part of OU 1, consisted of three rectangular steel oil/water separator tanks underlain by a curbed, concrete pad. This SWMU is located approximately 100 feet inshore from Pier 2 within Ensenada Honda, and is partially surrounded by asphalt pavement, with soil adjacent to the SWMU along one side. These tanks act as first stage, gravitational oil/water separators, where bilge and ballast water, and oil/fuel/water mixtures from spills are emptied from the SWOBs and "donuts" (SWMUs 21 and 22). During both the 1988 VSI and the 1993 follow-up inspection, the concrete pad and adjacent areas of asphalt pavement and soil outside the pad's curb were observed to be heavily stained. A first phase RFI for the soils surrounding the unit was required in the permit, which also made a groundwater investigation contingent upon the soil sampling results.

According to the RFI, one soil sample exhibited a concentration of benzo(a)pyrene that exceeded the residential Risk-Based Concentrations (RBCs); however, the concentration did not trigger an unacceptable human health risk. Because of the location of this SWMU within an industrial zone, the RFI stated that this site will never be utilized for residential development. There were no releases of hazardous waste or hazardous constituents evident at this site. The RFI did not recommend any further characterization efforts or corrective measures at this site. However, the RFI did recommend that some type of splash guard be installed on the southeast side of the containment pad area to prevent minor releases of petroleum product. No further action is proposed in the RCRA Part B permit renewal. During the 2003 ECP inspection it was noted that these oil/water separator tanks have been replaced.

Currently, there is no visual evidence of any releases observed based on the 2003 ECP inspection.

5.3.24 SWMU 24 - Oil Spill Oil/Water Separator and Adjoining Pad [IR Site 22]

SWMU 24, a part of OU 1, consists of an in-ground, concrete oil/water separator, which serves as the second stage separator of oils/fuels from the wastewater stream resulting from bilge and ballast water and marine oil/fuel spills. This SWMU is surrounded by asphalt paving on three sides, with bare ground on one side. Staining of the asphalt was observed during the 1993 follow-up inspection. Also, during the 1993 follow-up inspection, a bermed pad, with heavy oil staining, was identified as associated with this SWMU. A RFI for soils was required for this SWMU in the permit.

According to the RFI, only one constituent (trichloroethene) was detected at trace amounts in the samples collected. The RFI stated that the area of grass adjoining the oil water separator is extremely small and is located in the middle of an industrial use area. When not in use, the area is fenced in preventing casual contact. The risk assessment conducted during the RFI did not identify any COPCs at this site. There was no evidence of significant releases from this unit. The RFI did not recommend any further characterization efforts or corrective measures evaluation at this site. No further action is proposed in the RCRA Part B permit renewal. During the 2003 ECP inspection it was noted that these oil/water separator tanks have been replaced.

Currently, there is no visual evidence of any releases observed based on the 2003 ECP inspection.

5.3.25 SWMU 25 - DRMO Storage Yard [IR Site 23]

SWMU 25, a part of OU 1, consists of an open area within the DRMO storage yard (see Figure 5-23). This area was formerly used to store ignitable hazardous wastes. During the 1988 VSI, several areas of oil staining were observed; the 1993 follow-up inspection did not observe visual evidence of releases. In the RCRA permit, the EPA requested confirmatory soil sampling due to evidence of releases observed in 1988. A RFI for surface soils was required.

According to the RFI, several constituents exceeded the residential RBCs in the soil, however, none of these constituents exceeded the industrial RBCs. The human health risk assessment conducted during the RFI for soils and sediment did not find any unacceptable risk posed by the constituents detected. However, the RFI stated that there is the minor potential for ecological impact. As mentioned in the RFI, this area is totally devoted to industrial use with essentially no potential for residential development. Many of the constituents detected are subject to biodegradation as a natural process. There was no evidence of significant releases or potential for a future release from this unit. Therefore, the RFI did not recommend any further site characterization efforts or corrective measures evaluation at this site.

There is no visual evidence of any releases observed based on the ECP site inspections.

*Photograph from November 2003

Figure 5-23. SWMU 25 – DRMO Storage Yard

5.3.26 SWMU 26 - Building 544 Area [IR Site 24]

SWMU 26, a part of OU 1, consists of an open area behind former Building 544 where, during the 1988 VSI, approximately (25) badly rusted, 55-gallon drums of waste oil, or other substance, were observed to be lying (mostly on their sides) on bare soil (see Figure 5-24). At that time, it was indicated that the containers were in very poor condition, and partially overgrown with vegetation. A tar-like substance was observed to be leaking onto the ground. Subsequently, in June 1992, the Navy indicated that the containers were removed, "and no visual evidence exists of any soil staining". The 1993 follow-up inspection found no visual evidence of releases. However, as documented during the 1993 follow-up inspection, the area has the appearance of possible stressed vegetation, possible miscellaneous disposal activity, and mounds of excavated soil covered with plastic were observed. While this is the case, the 1993 inspection looked at areas not included in the SWMU. Since the 1993 reinspection, multiple contractors have used the area for a construction lay down area. The RCRA permit required a RFI for surface soils.

According to the first phase RFI, several constituents were detected at various constituents in the study area. However, no unacceptable human health or ecological risks were calculated for this site. The RFI stated that this area is in a remote section of the station, away from any family residential areas. This area was used at one time as a contractor laydown area for some nearby construction. However, the constructions was completed, and the area was cleaned and unused. The drums that originally caused the area to be labeled a SWMU have long been removed, and therefore, have removed the potential for a future release. No further site characterization or corrective measures evaluation efforts are necessary at this SWMU. However, the EPA requested that additional sampling be conducted within this area. After completion of the additional sampling of the RFI, it was concluded that no further action of any kind is required at this SWMU based on the results of the RFI. The EPA has approved this recommendation, and therefore, no further action is proposed in the RCRA Part B permit renewal.

The area is once again used as a construction laydown area for contractors. However, there is no visual evidence of any releases observed based on the 2003 ECP inspection.

*Background aerial photograph from 1998

Figure 5-24. SWMU 26 – Building 544 Area

5.3.27 SWMU 27

SWMU 27 consists of the wastewater treatment plant (WWTP) serving the Capehart housing area (see Figure 5-25). Based on information available (verbal statements, and Navy letters of August 31, 1993 and June 30, 1992), this unit does not manage or generate RCRA hazardous wastes or constituents. Permittee verbally indicated it had no knowledge or evidence of systematic and routine releases of hazardous wastes or constituents from this unit. A RFI is not required for this SWMU.

Currently, the Capehart WWTP is operational.

*Background aerial photograph from 1998

Figure 5-25. SWMU 27 – Capehart WWTP

5.3.28 *SWMU 28*

SWMU 28 consists of the WWTP serving the Bundy area (see Figure 5-26). Based on information available (verbal statements, and Navy letters of August 31, 1993 and June 30, 1992), this unit does not manage or generate RCRA hazardous wastes or constituents. Permittee verbally indicated it had no knowledge or evidence of systematic and routine releases of hazardous wastes or constituents from this unit. A RFI is not required for this SWMU.

Currently, the Bundy WWTP is operational.

*Background aerial photograph from 1998

Figure 5-26. SWMU 28 – Bundy WWTP

5.3.29 SWMU 29

SWMU 29 consists of the Forrestal WWTP for the “Industrial Area” of the station (see Figure 5-27). No visual evidence of releases of hazardous wastes or constituents was observed during the 1988 VSI, or 1993 follow-up inspection. The sludges generated by this unit have been tested since 1988 for “Characteristics of Hazardous Waste” pursuant to 40 C.F.R. Part 261, and found to be not hazardous by characteristic. Permittee verbally indicated it had no knowledge or evidence of systematic and routine releases of hazardous wastes or constituents from this unit. A RFI is not required at this site.

Currently, the Forrestal WWTP is operational.

*Background aerial photograph from 1998

Figure 5-27. SWMU 29 – Forrestal WWTP

5.3.30 SWMU 30 - Former Incinerator Area [IR Site 25]

SWMU 30, a part of OU 1, consists of the remains of an abandoned incinerator located south of Building 38 along the roadway leading to the landfill and Forrestal wastewater treatment plant (see Figure 5-28). This site was formerly used to burn contaminated fuels, waste oils and sludges. A previous incinerator at this same site was reportedly dismantled and removed in 1983, and the present incinerator installed at that time. The 1993 follow-up inspection found that a 500-gallon underground storage tank associated with this unit, was in the process of being removed. The Navy performed sampling of the subsurface soils, and the results indicated elevated levels of total recoverable petroleum hydrocarbon levels. Therefore a RFI for soils was required to fully characterize this release and define all constituents associated with it.

According to the RFI, there were no unacceptable human health risks calculated for the constituents detected within the surface soil or groundwater samples collected. The RFI stated that this SWMU occupies a thin strip of land between a steep rock slope and the Station Landfill access road. Immediately across the road is the Forrestal wastewater treatment plant, with the Station Landfill starting approximately 100 yards down the road. The RFI stated that based on the lack of risks, there appeared to be no significant release associated with this SWMU. The incinerator had remained unused for years and would not be used in the future, thereby, removing the potential for future release. However, the EPA requested additional sampling be performed at this site for surface and subsurface soils.

According to the Phase II RFI, although some human health and ecological risks were mentioned, no further actions were recommended at this site due to its location in close proximity to the Forrestal waste water treatment plant, as well as the Station Landfill. The EPA has approved this recommendation, and therefore, no further action is proposed in the RCRA Part B permit renewal.

Currently, there is no visual evidence of any releases observed based on the 2003 ECP inspection.

*Photograph from December 1999

Figure 5-28. SWMU 30 – Former Incinerator Area

5.3.31 SWMU 31 - Waste Oil Collection Area (Building 31 and 2022) [IR Site 26]

SWMU 31, a part of OU 1, is located in the Public Works Department storage yard, near the Transportation Shop (Building 31) and Building 2022 (see Figure 5-29). This SWMU consists of an outdoor, curbed, concrete pad used for temporary storage of containers of waste oil. There is also a 500 gallon tank for collection of waste oils. The 1993 follow-up inspection found extensive oil staining surrounding this storage pad. In addition, this SWMU is associated with Building 31, where the Navy's 1984 IAS reported past practices that included storing containers of unidentified wastes outside the building, and where creosote or solvent odors were reported. Presently, the entire area surrounding this SWMU is paved with asphalt. Since any hazardous constituents now released from the SWMU would likely be transported by storm water runoff, a RFI for surface soils surrounding the asphalt pavement was required. In addition, the EPA requested that subsurface soils be investigated beneath the asphalt.

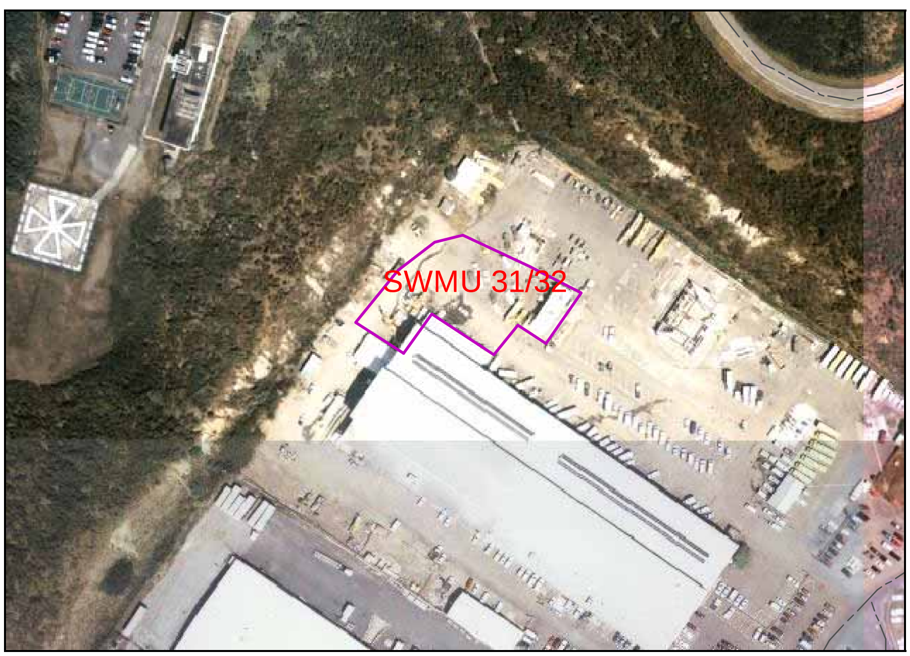
Since the time of the 1993 reinspection, and prior to the investigations being performed, the area has been reconstructed in a slightly different location. The former area not used in the new construction was paved over.

According to the RFI, the risk assessment indicated potentially unacceptable human health risks present for future and current on-site workers. The Navy recommended to place the SWMU under a land use restriction which would negate the risks posed to future residents. The RFI also stated 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. EPA requested that a CMS be completed, and additional dioxin sampling be conducted.

The CMS report recommended no further action based on the fact that a majority of the area is currently covered with asphalt, which mitigates the exposure pathway for dermal contact with the surface soil at this SWMU. The CMS also recommended that the remaining small area within SWMUs 31/32 be covered with asphalt to mitigate a potential exposure pathway. The existing and new pavement would be maintained to protect the integrity of the cap. Land use controls were also recommended to prevent the use of this SWMU for residential housing.

A Corrective Measures Implementation (CMI) Work Plan was submitted and subsequently approved by the EPA. The next step is for EPA to place this document out for public comment.

Currently, there is no visual evidence of any releases observed based on the 2003 ECP inspection.



*Background aerial photograph from 1998

Figure 5-29. SWMU 31 – Waste Oil Collection Area (Building 31 and 2022)

5.3.32 *SWMU 32 - PWD Storage Yard/Battery Collection Area Description [IR Site 27]*

SWMU 32, a part of OU 1, is located in the Public Works Department storage yard, near the Transportation Shop (Building 31). It was described in the 1988 RFA as an outdoor area where discarded batteries were stored. However, during the 1993 follow-up inspection, in addition to pallets of discarded batteries, numerous (estimated at 100-110) 55-gallon drums of contaminated jet fuel and soil were observed to be stored on wooden pallets resting on bare ground. Along with these drums, an area of stained soil was visible. In addition, the 1993 follow-up inspection, found associated with this SWMU a small, partially open, uncurbed, storage building ("paint locker"), containing approximately 200 various sized cans. The entire area is debris strewn, with an appearance of possible stressed vegetation. A first phase RFI for surface soils was required in the permit. It should be noted that the area has now been cleaned up and is used for the storage of spare parts and for equipment parking.

According to the RFI the risk assessment indicated potentially unacceptable human health risks were present for future and current on-site workers. The Navy recommended to place the SWMU under a land use restriction that would negate the risks posed to future residents. The RFI also stated 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. EPA requested that a CMS be completed, and additional dioxin sampling be conducted.

The CMS report recommended no further action based on the fact that a majority of the area is currently covered with asphalt, which mitigates the exposure pathway for dermal contact with the surface soil at this SWMU. The CMS also recommended that the remaining small area within SWMUs 31/32 be covered with asphalt to mitigate a potential exposure pathway. The existing and new pavement would be maintained to protect the integrity of the cap. Land use controls were also recommended to prevent the use of this SWMU for residential housing.

A CMI Work Plan was submitted and subsequently approved by the EPA. The next step is for EPA to place this document out for public comment.

Currently, there is no visual evidence of any releases observed based on the 2003 ECP inspection.

5.3.33 SWMU 33

SWMU 33 consisted of a curbed, roofed, concrete pad, formerly located along the north wall of Building 379 (aircraft maintenance building) (see Figure 5-30). This SWMU was used for temporary storage of various wastes generated during aircraft maintenance. During the 1988 VSI, visual evidence of possible releases to the soil was observed. However, the 1993 follow-up inspection was unable to locate this unit. The Navy indicated that a newly constructed building now covers the site of SWMU 33 and the soils associated with this unit were removed during the construction. A new storage area was constructed to take place of the old area (SWMU 33). The new area has been designated SWMU 51. A RFI was not required at this SWMU.

*Background aerial photograph from 1998

Figure 5-30. SWMU 33 – Former location of a curbed, roofed, concrete pad.

5.3.34 SWMU 34

SWMU 34 consists of a curbed, covered, concrete pad located at the northeastern edge of the Fleet Squadron Eight airfield (see Figure 5-31). This pad is used for temporary storage of waste fuels and paints. No evidence of releases was reported during the 1988 VSI, or 1993 follow-up inspection. A RFI was not required at this SWMU.

Currently, the concrete pad is empty, and there is no visual evidence of any releases observed based on the 2003 ECP inspection.

*Photograph from November 2003

Figure 5-31. SWMU 34 – Curbed, covered, concrete pad

5.3.35 SWMU 35

SWMU 35 consists of an inground, concrete oil/water separator located outside Building 396 (see Figure 5-32). This separator is used to collect and separate oil and washwaters generated during aircraft washdown. No evidence of releases was reported during the 1988 VSI, or 1993 follow-up inspection. Permittee had verbally indicated it had no knowledge or evidence of systematic and routine releases of hazardous wastes or constituents from this unit. A RFI was not required at this SWMU.

Currently, there is no visual evidence of any releases observed based on the 2003 ECP inspection.

*Photograph from November 2003

Figure 5-32. SWMU 35 – Inground, concrete oil/water separator

5.3.36 SWMU 36

SWMU 36 consists of an inground, concrete oil/water separator located near the Berthing Pier within the Ensenada Honda (see Figure 5-33). This separator is used to collect and separate oil and washwaters generated during vehicle washdown. No evidence of releases was reported during the 1988 VSI, or 1993 follow-up inspection. Permittee had verbally indicated it had no knowledge or evidence of systematic and routine releases of hazardous wastes or constituents from this unit. A RFI was not required at this SWMU.

Currently, there is no visual evidence of any releases observed based on the 2003 ECP inspection.

*Photograph from November 2003

Figure 5-33. SWMU 36 – Inground, concrete oil/water separator

5.3.37 SWMU 37 - Waste Oil Storage Area (Building 200) [IR Site 28]

SWMU 37, a part of OU 1, consists of a covered, open-sided, concrete pad, which is curbed (not curbed during 1988 VSI) (see Figure 5-34). The pad is located behind Hangar 200, and serves as a container storage area for waste gasoline, oils, and other wastes. During the 1988 VSI, oil stains were observed on the concrete pad. During the 1993 follow-up inspection, an area of stressed vegetation with soil yielding elevated organic vapor readings was observed adjacent to the backside of the pad. Based on the findings of the inspections, the EPA required a first phase RFI for surface soils.

According to the RFI, there appeared to be minor releases of petroleum products to the surface soils immediately adjacent to the storage unit. The concentrations observed do not indicate a pattern of disposal or widespread spillage, but are more likely container transference spills. The RFI stated that the potential for continuing or future release is relatively high. It was recommended that no site characterization be conducted at this site based on the low levels of constituents detected. Also stated within the RFI, no corrective measures appear warranted since no compounds exceed their respective RBCs. However, the RFI did recommend that containment dikes be placed on the pavement in the area southeast of the covered area. This would minimize the risk of spills reaching the soils and would make clean-up of any operational spillage within the unit much easier to address. EPA requested that additional measures be implemented to prevent future releases from coming into contact with the soil. SWMU 37 was replaced by another, similar facility, thereby, preventing any future release at this site. No further action is proposed in the RCRA Part B permit renewal.

Currently, there is no visual evidence of any releases observed based on the 2003 ECP inspection.

*Photograph from November 2003

Figure 5-34. SWMU 37 – Waste Oil Storage Area (Hangar 200)

5.3.38 SWMU 38

SWMU 38 consists of the below ground sanitary and storm sewer systems. Permittee had verbally indicated it had no knowledge or evidence of systematic and routine releases of hazardous wastes or constituents from this unit. A RFI was not required from this SWMU.

Currently, the below ground sanitary and storm sewer systems are operational.

5.3.39 SWMU 39 - Former Battery Drain Area (Building 3158) [IR Site 29]

SWMU 39, a part of OU 1, consists of a small building (Building 3158) with an attached, open sided, roofed pad, where it was noted during the 1988 VSI, that discarded batteries had their fluids drained into a tank, and stored there (see Figure 5-35). The tank had a curbed, concrete pad underlying it, which was observed to be cracked and stained. The 1993 follow-up inspection found this building was no longer used for drainage and storage of discarded batteries, but now contained assorted small cans of miscellaneous hydraulic fluids, etc. In addition, the roofed pad was gone including the concrete pad itself. No evidence of releases was observed during the 1993 follow-up inspection. However, the open-air, battery drain tank's curb was observed to be cracked and stained during the 1988 VSI, allowing releases onto adjacent soil. A first phase RFI was required in the permit for surface soils surrounding the building.

According to the RFI, there was no evidence of release from this unit, and no potential for future release since the unit is no longer used for battery storage. No unacceptable human health risk was calculated for soils at this SWMU. In addition, this SWMU is located within the Seabee industrial compound where the heavy equipment is staged for maintenance activities. There are no plans to use this area for residential development, nor is there any reasonable scenario under which this would be considered. Therefore, no further site characterization or corrective measure evaluation efforts are required at this SWMU. No further action is proposed in the RCRA Part B permit renewal.

Currently, the interior of Building 3158 is empty, and there is no visual evidence of any releases observed based on the 2003 ECP inspection.

*Photograph from November 2003

Figure 5-35. SWMU 39 – Former Battery Drain Area (Building 3158)

5.3.40 SWMU 40

SWMU 40 consisted of a mobile 300 gallon tank in the Alpha Company Maintenance Yard, which was used as a temporary collection and storage point for waste oils. Minor staining of the ground was observed during the 1988 VSI. The Navy indicated that this unit is no longer present, and that no soil staining was present in 1992. A RFI was not required at this SWMU.

Currently, there is no visual evidence of any releases observed based on the 2003 ECP inspection.

5.3.41 SWMU 41

SWMU 41 consists of an open air, curbed, concrete pad, surrounded by a sump drain covered with metal grating (see Figure 5-36. This concrete wash-pad is attached to Building 3152, which was used by the Seabee's as a pesticide storage building (Building 3152). The SWMU is used as a wash-pad to rinse off pesticide control equipment. The discharge point for the washwaters collected in the sump drains is not described in the RCRA Facility Assessment (RFA). The Navy has demonstrated that the sump drain surrounding the wash-pad discharges through a permitted outfall. A RFI was not required at this SWMU.

Currently, there is no visual evidence of any releases observed based on the 2003 ECP inspection.

*Photograph from November 2003

Figure 5-36. SWMU 41 – Open air, curbed, concrete pad surround by a sump drain covered with metal grating

5.3.42 SWMU 42

SWMU 42 consists of two unlined, naturally occurring lagoons, located northwest of Building 158 the water treatment plant (see Figure 5-37). This site is used for disposal of sludges from the water purifications plant. According to the 1988 RFA, the sludges consist of river mud, and aluminum sulfate and lime utilized during the water treatment process. Periodically (approximately every 7 years), the sludges are removed and disposed of off-site. There is no indication of hazardous wastes being managed at this SWMU, and no visual evidence of releases of hazardous wastes or constituents. Permittee had verbally indicated it had no knowledge or evidence of systematic and routine releases of hazardous wastes or constituents from this unit. A RFI was not required at this SWMU.

Currently, there is no visual evidence of any releases observed based on the 2003 ECP inspection.

*Background aerial photograph from 1998

Figure 5-37. SWMU 42 – Two unlined, naturally occurring lagoons

5.3.43 SWMU 43 – [Part of IR Site 8]

SWMU 43 consists of an in-ground, concrete trough/drainage ditch, covered with a metal grate, located along the entire front of Building 860 (see Figure 5-38). Prior to the mid-1970s, discarded fuel and oil from recovered target drones were emptied into this trough, when target drones recovered from the sea were brought to Building 860 for refurbishing. The Navy's 1984 IAS of NSRR stated that this practice occurred from about 1960 until the mid-1970s. However, since the mid-1970s, the drones have been emptied into an in-ground oil/water separator (SWMU 4). During Installation Restoration (IR) Round 1 and Round 2, a total of 6 sediment samples and 8 surface water samples were collected at points along storm drainage system, down-gradient of the trough/ditch in which the drone fuels were discarded. Hazardous constituents were not detected above proposed Subpart S action levels. The Navy had recommended that no further investigation be required. The 1993 follow-up inspection found no visual indication of releases; vegetation at the discharge points of the drain was lush; there were no stains, or oil sheens on the water in the drain. A RFI was not required.

Currently, there is no visual evidence of any releases observed based on the 2003 ECP inspection.

*Photograph from November 1998

Figure 5-38. SWMU 43 – In-ground, concrete trough/drainage ditch, covered with a metal grate

5.3.44 SWMU 44– [Part of IR Site 8]

SWMU 44 consists of the drainage ditch system along the northern perimeter of the Aerial Target Systems ("drone") yard and Building 860 (see Figure 5-39). It is the down-gradient extension of SWMU 43. As discussed in SWMU 43, the EPA is satisfied that this unit has been adequately investigated, and a RFI was not required.

Currently, there is no visual evidence of any releases observed based on the 2003 ECP inspection of the drainage ditch system.

*Photograph from November 1998

Figure 5-39. SWMU 44 – Drainage ditch system

5.3.45 SWMU 45 - PCB Spill Area/Old Power Plant [IR Site 16]

SWMU 45, a part of OU 3, consists of an area outside of Building 38, the old Power Plant (SWMU 11), located along an access road south of Forrestal Drive leading to the station landfill and Forrestal wastewater treatment plant (see Figure 5-40). This area extends from the property around Building 38 and includes the path of the cooling water intake tunnel from the embayment of Puerca Bay. The majority of SWMU 45 is covered with secondary growth vegetation.

Transformer oils containing PCBs were routinely discarded directly onto the ground during transformer maintenance at this site. There were also two abandoned 50,000-gallon underground fuel storage tanks associated with SWMU 45. SWMU 45 was initially addressed under the Navy's Installation Restoration Program (IRP), which followed a CERCLA pattern. Under the IRP, a Remedial

Investigation was performed. PCB contamination was found in soil immediately outside of Building 38. An Interim Corrective Measure (ICM) was designed for the affected soils, which included excavation of the contaminated soils; shipment off island for appropriate disposal, and sampling of the surrounding area to ensure that cleanup was achieved. The soil removal took place in 1994.

Therefore, a RFI encompassing soils, surface water, sediments, and groundwater was required in the permit for SWMU 45. A RFI was performed in 1996. The findings of the RFI confirmed those of the supplemental site investigation and indicated that USTs and cooling water tunnel represented a possible source of continuing release. On the basis of this finding, the Navy decided to perform an ICM to eliminate the potential for future release. The plans for the ICM, which were submitted to the EPA and approved, called for the cleaning and abandonment in place of the USTS and tunnel. Inflow of groundwater to the tunnel necessitated a field design change (approved by the EPA), which provided for the filling of the USTs and sealing the tunnel with low-density concrete. This approach entombed and effectively immobilized and residual contamination.

During the ICM on the tunnel, an excavation was made at a point along the outside of the tunnel in an attempt to ascertain how groundwater was entering the tunnel. Soils contaminated with petroleum were observed. A work plan to investigate the outside of the tunnel was submitted to and subsequently approved by the EPA. A RFI encompassing soil, groundwater, and sediments has been completed and approved by the EPA. The RFI found that the surface and subsurface soils within the Building 38 Underground Storage Tank (UST) area presented no significant impact from site activities, where as groundwater showed minimal impact. The soils found within the area encompassing the cooling water tunnel area, indicated a significant release of petroleum related compounds from the tunnels. However, no free product was found at any location within this area, and the zone of contamination is confined to the area immediately adjacent to the tunnels. The sediments found within Puerca Bay show obvious impact from tunnel discharges. The human health risk assessment performed on all media with exception of the Puerca Bay sediments, indicated that only risk was possible for future on-site residents. The Puerca Bay sediments did not contain a complete pathway for exposure. Because of the performance of the ICM within the Building 38 UST area, any environmental issues related to that area have been resolved. The source of continuing releases to the cooling water tunnel soils and the Puerca Bay sediments was removed when the tunnel was cleaned out and backfilled with concrete. The RFI recommended that a CMS be prepared to address the minimal risks posed by the residual hydrocarbons in the subsurface soil within the vicinity of the cooling water tunnels and to analyze ecological risk associated with the sediment contamination. Currently, an ecological risk assessment (ERA) through Step 3a has been completed. Based on the refined media-specific risk calculation and risk evaluation, Aroclor-1260 and copper have the potential to impact aquatic receptor communities (i.e., benthic macroinvertebrates) within the embayment downgradient from SWMU 45. Based on refined media-specific risk calculation and risk evaluation, additional evaluation is not recommended for chemicals detected in surface soil and surface water, respectively. It is recommended that Aroclor-1260 be carried on to Step 3b of the baseline ERA (baseline ERA problem formulation). To reduce the uncertainty associated with the identification of copper as a potential risk driver, an appropriate background sediment data set should be established for a surface water body that receives inputs from storm water discharges similar to those that discharge to the embayment. This data set should than be statistically compared to the embayment data set in Step 3b of the baseline ERA in accordance with Navy guidance (NFEC, 2002) to determine if copper warrants identification as a potential risk driver. It is recommended that additional sampling be conducted for SWMU 45 to develop an appropriate background data set. This sampling is to include sediments. The results from this additional sampling will be evaluated and presented in Step 3b of the Baseline ERA for SWMU 45 along with the further evaluation of Aroclor-1260 in the sediment. After the completion of the ERA the CMS will be initiated for this SWMU.

*Background aerial photograph from 1998

Figure 5-40. SWMU 45 – PCB Spill Area/Old Power Plant

5.3.46 SWMU 46 - Pole Storage Yard Covered Pad [IR Site 30]

SWMU 46, a unit of OU 1, located along Valley Forge Road in the Forrestal portion of the station consists of a large, roofed, open-sided, uncurbed, concrete pad utilized in the past by the Public Works Department as a storage area for transformers, miscellaneous electrical equipment, and drums of PCB-contaminated material (see Figure 5-41). Also, there are reports that, in the past, similar materials may have been stored in adjoining areas directly on the ground. Evidence of past oil spills here have been reported.

The unit now serves as the primary under 90 day storage area for hazardous wastes generated by the Base Operating Support (BOS) contractor during the performance of normal maintenance activities. There are now two pads, utilized for the same purpose, located at the site of similar construction. Based on the known site use, the EPA required a first phase RFI to be performed in the vicinity of the pad and the associated areas.

The RFI identified PCB contamination in the soils at this site and recommended the performance of a CMS. The CMS recommended the performance of a CMI to remove contaminated soils from the site. EPA has approved a CMI Work Plan Design Package to excavate contaminated soils from the site. The EPA is in the process of modifying the RCRA permit with the proposed CMI for public comment.

Currently, there is no visual evidence of any releases observed based on the 2003 ECP inspection.

*Photograph from May 2003

Figure 5-41. SWMU 46 - Pole Storage Yard Covered Pad

5.3.47 SWMU 47

SWMU 47 consists of undefined “satellite disposal areas”. Based on a March 1992 meeting between EPA and Navy representatives, these undefined satellite disposal areas are now classified as an Area of Concern (AOC). Permittee verbally indicated it had no knowledge or evidence of systematic and routine releases of hazardous wastes or constituents from these units. A RFI was not required.

5.3.48 SWMU 48

SWMU 48 consists of a mobile, open air, metal-curbed, storage container near Building 3102 (see Figure 5-42). This SWMU was first identified during the 1993 follow-up inspection, and is utilized as a temporary (less than 90 days) storage facility for waste oils and oil contaminated soils. No visual evidence of releases was observed. Permittee verbally indicated it had no knowledge or evidence of systematic and routine releases of hazardous wastes or constituents from this unit. A RFI was not required.

Currently, the mobile storage container is empty, with no visual evidence of any releases observed at this unit based on the 2003 ECP inspection.

*Photograph from November 2003

Figure 5-42. SWMU 48 - Mobile, open air, metal-curbed, storage container

5.3.49 SWMU 49

SWMU 49 consisted of a 500-gallon waste oil tank, identified during the 1993 follow-up inspection (see Figure 5-43). This tank was located west of Building 3188 and surrounded by a concrete dike. No visual evidence of releases was observed. Permittee verbally indicated it had no knowledge or evidence of systematic and routine releases of hazardous wastes or constituents from this unit. A RFI was not required at this SWMU.

Currently, the 500-gallon waste oil tank is no longer present. However, the concrete bermed pad next to Building 3188 is still present. There is no visual evidence of any releases observed based on the 2003 ECP inspection.

*Photograph from November 2003

Figure 5-43. SWMU 49 – Former location of a 500-gallon waste oil tank next to Building 3188

5.3.50 SWMU 50

SWMU 50 consisted of an open air, fenced area at the southwest corner of Building 3166, where several 55-gallon drums and other assorted materials were stored, either directly on the ground, or on pallets (see Figure 5-44). This unit was first identified during the 1993 follow-up inspection. The Navy has indicated that the materials that were stored here were product, and that there was no indication of systematic and routine spills of hazardous constituents. Therefore, this unit constituted an AOC, rather than a SWMU. No visual evidence of systematic and routine releases was observed during the 1993 follow-up inspection. A RFI was not required.

Currently, the fenced area at the southwest corner of Building 3166 is no longer present. There is no visual evidence of any releases observed based on the 2003 ECP inspection.

*Photograph from November 2003

Figure 5-44. SWMU 50 - Former open air, fenced area at the southwest corner of Building 3166

5.3.51 SWMU 51 - New AIMD Storage Pad (Building 379) [IR Site 31]

SWMU 51, a part of OU 1, consists of a curbed concrete storage pad located outside Building 379 (see Figure 5-45). This storage pad is roofed and enclosed with a cyclone fence. It was first identified during the 1993 follow-up inspection, and was utilized by the AIMD facilities in place of SWMU 33. Also at this SWMU was a 200 gallon tank which touched the storage pad, but was outside the curbed area. The entire pad area is surrounded by asphalt pavement. During the 1993 follow-up inspection, large oil stains were observed emanating from two drain valves in the curb surrounding this pad, and from the 200 gallon tank located outside the pad curb. As any releases from this SWMU would likely be carried by storm water runoff, a RFI for soils at the downslope edge of the asphalt pavement surrounding the SWMU was required in the RCRA permit.

A RFI was conducted for surface soils at this SWMU. Detected constituents appeared to be related to general site use rather than a release from the SWMU. No unacceptable human health risk was calculated for the samples. No further action is proposed in the RCRA Part B permit renewal.

Currently, the concrete storage pad is empty, with no visual evidence of any releases observed at this unit based on the 2003 ECP inspection.

*Photograph from November 2003

Figure 5-45. SWMU 51 - New AIMD Storage Pad

5.3.52 SWMU 52

SWMU 52 consists of an open air, uncurbed, concrete storage pad that was first identified during the 1993 follow-up inspection (see Figure 5-46). It was described as associated with Building 3158 (SWMU 39); however, it is in fact a separate unit. During the 1993 follow-up inspection, this storage pad contained approximately (120) 55-gallon drums of various oil products and other materials. The Navy has indicated that the materials that were stored here were product, and that there is no indication of systematic and routine spills of hazardous constituents. Therefore, this unit constituted an AOC rather than a SWMU. No stains or other evidence of systematic and routine release was observed during the 1993 follow-up inspection. A RFI was not required at this site.

Currently, there is no visual evidence of any releases observed at this unit based on the 2003 ECP inspection.

*Photograph from November 2003

Figure 5-46. SWMU 52 - Open air, uncurbed, concrete storage pad

5.3.53 SWMU 53 – Malaria Control Building (Building 64)

SWMU 53 consists of a building that is presently unoccupied and lies on approximately 1/8 acre approximately 200 feet away from Forrestal Drive (see Figure 5-47). SWMU 53 is located across Forrestal Drive from SWMU 13. The building was utilized to store pesticides, such as malathion, aldrin, and dichlorodiphenyltrichloroethane (DDT). It is not known if stocks of pesticides were maintained in the building for the entire duration. Although no direct evidence exists, it is assumed that mixing and other preparation for pesticide use was also performed at the building. No wastes are known to have been disposed at the unit. There are no known releases related to this unit. No other use of the site was identified. The information gathered from the visual site inspection by Baker and environmental staff at NSRR, revealed that there are no known wastes dumped at this facility, nor is there any evidence of source contamination. Baker observed signs of possible past leakage of chemicals on the storage shelves inside the building, as well as identified migration pathways along the floor leading to the outside. With this in mind, along with the activities known to have taken place at this SWMU, a site characterization was performed and identified a release of pesticides to the soils surrounding the building and recommended the performance of a RFI. The EPA approved RFI further characterized the soil contamination and recommended a CMS. The EPA approved CMS developed corrective action objectives for the protection of human health and the environment. The CMS recommended the demolition of Building 64 and the removal of soils. The CMI design package is currently being developed to demolish the building and remove the soils.

*Photograph from May 2003

Figure 5-47. SWMU 53 - Malaria Control Building (Building 64)

5.3.54 *SWMU 54 – Former NEX Repair/Maintenance Shop (Building 1914)*

SWMU 54 consists of Building 1914 (Former Naval Exchange [NEX] Repair/Maintenance Shop) built in 1979, which is currently unoccupied and lies on approximately 1 acre of land in the Bundy Area of NSRR. The building structure itself consists of a small concrete block building with a center office area and open bays on either side (see Figure 5-48). The building was used to perform maintenance on vehicles including oil changes, lubrications, etc. No wastes are known to have been disposed at the unit. SWMU 54 is located along Bairoko Street across from Building 1686 (Former Station Laundromat).

The information gathered from the visual site inspection performed by CH2MHILL and environmental staff at NSRR revealed that there were several areas of oil stained soil around the NEX Building 1914. For that reason, it was recommended that a sampling program be performed to characterize the areas around several structures in the SWMU 54 area. CH2MHILL also observed two open excavation locations south of the building, which contained algae stained water. With this in mind, along with the activities (oil changes, lubrications, etc.) known to have taken place at this SWMU, a site characterization was performed which identified TCE in groundwater and recommended a RFI be performed.

The RFI that characterized the groundwater at the site has been completed and approved by the EPA. The RFI recommended the performance of a CMS to address the groundwater contamination. The CMS has yet to start for this SWMU.

*Photograph from May 2003

Figure 5-48. SWMU 54 - Former NEX Repair/Maintenance Shop (Building 1914)

5.3.55 *SWMU 55 – Potential Source Area and Associated TCE Plume at the TWFF*

SWMU 55 consists of a flat lying grassy area located near the intersection of Forrestal Road and Card Street, in the vicinity of the concrete pad where former Building 46 once stood (see Figure 5-49). The EPA, in their February 24, 2004 comment letter, requested that the areas mentioned above be designated as SWMU 55 because the releases of TCE do not appear to be associated with either SWMU 7 or 8, the currently defined SWMUs at the Tow Way Fuel Farm (see Sections 5.3.7 and 5.3.8). The information provided below was conducted while this site was considered a portion of SWMU 7/8. This information is provided in this description to provide the complete history of the TCE plume at the TWFF (SWMU 55).

A Corrective Measures Study Investigation (CMSI) was conducted for the TWFF. During the CMSI, TCE was found in monitor well 7MW07. A work plan was developed and approved by the EPA to address the TCE in groundwater at the TWFF. A TCE investigation was conducted in the summer of 1999 to delineate the TCE plume in the groundwater. The EPA approved the ensuing report on the TCE investigation. The report recommended that a detailed evaluation be conducted during the CMS for the TWFF to evaluate alternatives for the TCE plume. During the development of the CMS it was identified that additional data gaps needed to be addressed to facilitate the development of the CMS for the TWFF. A work plan was developed, field investigation performed, and the EPA approved Final Additional Data Collection Investigation Report for the TWFF was developed.

During the additional data collection effort, TCE concentrations in monitor well 7MW07 were found to have increased fourteen-fold, from 2,000J micrograms per liter (µg/L) in April 1998, to 28,000J µg/L in January 2002, a period of approximately four years. Because of this increase in concentration, additional characterization of the source of this TCE was recommended in the Draft Final Task I CMS prior to finalization of the CMS. It was also recommended that CMS for this portion of the TWFF be completed independently from the rest of the TWFF. This was done so there was no delay in the evaluation of the remedial alternatives from SWMU 7/8. This was possible since the TCE and PSH portions of the site are independent and do not overlap each other. A work plan to address the TCE plume delineation and source investigation was developed and approved by the EPA. The field investigation was implemented in accordance with the EPA approved work plan. The Draft TCE Plume Delineation and Source Investigation Report was developed and submitted on January 21, 2004. It was determined that no continuing source of TCE is apparent in the soil or groundwater at this site. The original source and/or location of the TCE contamination in this area of the TWFF remains unknown, despite the gathering of historical information and the efforts of environmental sampling during two focused investigations. The TCE plume was delineated and a sentinel well was placed down gradient of the plume in order to determine, through subsequent sampling events, if contamination is approaching the Ensenada Honda. It was recommended that a CMS proceed for this site. The CMS should include screening level risk assessments for cis 1,2-dichloroethene, 1,2-dichloroethane, 1,1,1-trichloroethane, trans 1,2-dichloroethene, and tetrachloroethene in the groundwater at this site. These compounds were detected during this investigation at levels above those found in previous investigations. Once any new corrective action objectives (CAOs) are established, appropriate corrective measures to address the TCE contamination can be evaluated during the CMS process. The EPA commented on the Draft TCE Plume Delineation and Source Investigation Report in a letter dated February 24, 2004. The Navy will address the EPA's comments within the CMS Report for the TCE area. Any additional work conducted at the TCE plume at the TWFF will be designated as SWMU 55 as requested by the EPA in their letter dated February 24, 2004.

*Background aerial photograph from 1998

Figure 5-49. SWMU 55 - Potential Source Area and Associated TCE Plume at the TWFF

5.3.56 AOC A – Torpedo Shop

AOC A consists of the Torpedo Shop (see Figure 5-50). This AOC was not inspected during the 1988 RCRA VSI due to the special security clearances required to gain access to this facility. However, it was inspected during a follow-up VSI, conducted in June 1993. No evidence of releases of hazardous wastes or constituents was observed. Permittee verbally indicated it had no knowledge or evidence of systematic and routine releases of hazardous wastes or constituents from this unit. A RFI was not required at this site.

Currently, the Torpedo Shop is no longer in operation. The building has been inspected by environmental personnel on station, and found to be clear of any environmental issues related to this unit.

*Background aerial photograph from 1998

Figure 5-50. AOC A – Former Torpedo Shop

5.3.57 AOC B - Building 25 Area [IR Site 10]

AOC B is located in a limited access area of NSRR. The site is located in a secure fenced storage yard located in the industrial area of the station (see Figure 5-51). The area is level and is a wide, open gravel and grass field.

AOC B, a part of OU 6, consists of the site of the now demolished Building 25. According to the Navy, the demolished building formerly contained hazardous waste materials. The 1993 follow-up inspection found (17) 55 gallon drums of lubricating oils and diesel stored outdoors and unsheltered, resting directly on a bricked surface that was the former floor of Building 25. The area was surrounded by a sandbag dike. Extensive oil stains were observed on both the brick floor and the surrounding soils. Eight groundwater wells were installed throughout IR Site 10 and sampled both during Round 1 (1986) and Round 2 (1987) investigations. Hazardous constituents (arsenic, chromium, lead, and selenium) were detected in the groundwater at levels exceeding Subpart S action levels/MCLs. A RFI for soils, both surrounding the old Building 25 area and the soils underlying the remaining brick floor surface, was required in the permit. Also, a RFI for groundwater was required to fully characterize possible releases of hazardous constituents.

A Phase I RFI was completed for SWMU 6, which indicated that a potentially unacceptable risk to future residents and adult on-site workers. The RFI recommended the performance of a CMS. The results of the revised risk assessment conducted for the development of corrective action objectives indicated that the only risk was a non-carcinogenic risk to future young child military residents. It was further demonstrated that the critical toxic effects for the two principal contaminants (arsenic and 4,4-DDT) demonstrated that the hazard indices should be segregated based on target organs, resulting in neither contaminant exceeding the acceptable level. Hence, COCs were not identified for any of the media at SWMU 6/AOC B, and there were no corrective action objectives calculated fro SWMU 6/AOC B. The CMS was conducted and submitted to the EPA on June 21, 2001 recommending no further action for this site. No further action is proposed in the RCRA Part B permit renewal.

There is no visual evidence of any releases observed at this unit based on the 2003 ECP inspection.

*Background aerial photograph from 1998

Figure 5-51. AOC B - Building 25 Area

5.3.58 AOC C - Transformer Storage Pads [IR Site 32]

AOC C, a part of OU 1, is located near Building 2042 along Valley Forge Road and consists of three outdoor, uncovered, concrete pads that were used primarily for storage of discarded transformers; however, other discarded electrical materials, including batteries were observed in the past (see Figure 5-52). During the 1993 inspection, three transformers were observed well outside of the concrete pads sitting directly on bare soil. During the 1988 VSI, and 1993 follow-up inspection, oil staining inside the concrete pads and evidence of releases to soil were observed. A first phase RFI was mandated for this area in the RCRA permit.

The RFI identified PCB contamination in the soils at this site and recommended the performance of a CMS. The CMS recommended the performance of a CMI to remove contaminated soils from the site. EPA has approved a CMI Work Plan Design Package to excavate contaminated soils from the site. The EPA is in the process of modifying the RCRA permit with the proposed CMI for public comment.

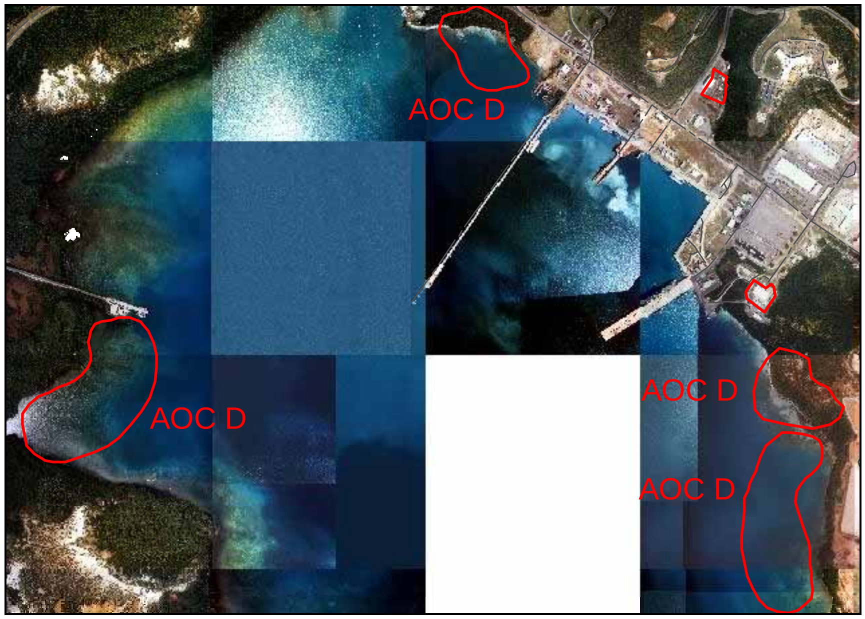
Currently, the three outdoor, uncovered, concrete pads are not visible due to the heavy secondary growth vegetation.

*Photograph from May 2003

Figure 5-52. AOC C - Transformer Storage Pads are not visible due to secondary growth

5.3.59 AOC D - Sediments [IR Site 33]

AOC D, a part of OU 7, consists of the marine sediments potentially impacted by the Station's outfalls, the Station's three large (one operating and two closed) littoral landfills, recurring major oil spills, the possible submarine discharge of contaminated groundwater from the Tow Way Fuel Farm area, and past waste disposal practices, which included routine disposal of hazardous wastes and/or constituents into storm water drains (see Figure 5-53). Three National Pollution Discharge Elimination Systems (NPDES) permitted wastewater outfalls, and an undetermined number of storm water outfalls are present at NSRR. A First Phase RFI for sediments underlying the surface waters adjacent to NSRR was required in the permit, with an emphasis on Ensenada Honda and other areas impacted by known or suspected releases.



*Background aerial photograph from 1998

Figure 5-53. AOC D - Sediments

The EPA approved the Navy's September 15, 1998 technical opinion that the sediments associated with SWMUs 2 and 45 be removed from the AOC D database. The sediments from SWMUs 2 and 45 are being addressed in the CMS for these sites. The Navy performed a new risk assessment on the new AOC D database that yielded no unacceptable human health risks. The RFI has been completed for AOC D with a no further action recommendation. No further action is proposed in the RCRA Part B permit renewal.

5.4 ECP SITES

ECP Sites are potential areas of environmental concern that were initially identified as a result of the records review, aerial photography analysis, physical site inspections, and interviews conducted as part of the ECP investigation. ECP Sites are sites not previously identified or investigated under existing environmental program areas (e.g., IRP, USTs, etc.) at NSRR, although a few border upon existing IRP sites. Table 5-5 presents a list of the ECP Sites, and Figure 5-54 presents the overall location of each of the ECP Sites.

Table 5-5. ECP Sites at NSRR

ECP Site No.	ECP Site Descriptor
1	Active Small Arms Ranges on Punta Medio Mundo
2	Hangar 200 Apron in Airfield Area
3	Facility No. 278 – POL Drum Storage Area North of Antietam Rd.
4	Former Rifle Range at Punta Puerca
5	Former Vehicle Maintenance and Refueling Area on East Side of Forrestal Dr.
6	Former Landfill at Marina
7	Former Bundy Area Maintenance Facilities South of Bldg. 1686
8	Former Disposal Area in Southwest Bundy
9	Former Pistol Range at New BEQ West of Langley Dr.
10	Former Skeet Range at Ofstie Airfield
11	Former UST No. 208 Southwest of Hangar 200
12	Former UST No. 209 Southwest of Hangar 200
13	Former Gas Station North of the Ofstie Tennis Courts
14	Former Fire Training Area in Southwest End of the Ofstie Airfield Area
15	Aircraft Parking Apron West and East of Ofstie Airfield Runway
16	Disposal Area Northwest of Station Landfill
17	Quarry Disposal Site at the Commissary Parking Lot
18	Building 31 – Public Works Department
19	DRMO Scrap Metal Recycling Yard near the Camp Moscrip Area and Dry Dock
20	Fuel Pipelines and Hydrant Pits
21	Building 976 – Fire Deluge Pumphouse in the Waterfront Area next to Pier 3
22	Building 2300 – US Army Reserve Boat Maintenance Facility
23	Piñeros and Cabeza de Perro Islands East of NSRR Proper

This section of the report is organized by ECP site and addresses each of the following topics for each ECP site:

1. Site History and Description

2. Site Hydrogeology

3. Field Investigation and Sampling

4. Nature and Extent of Contamination

5. Qualitative Risk Analysis

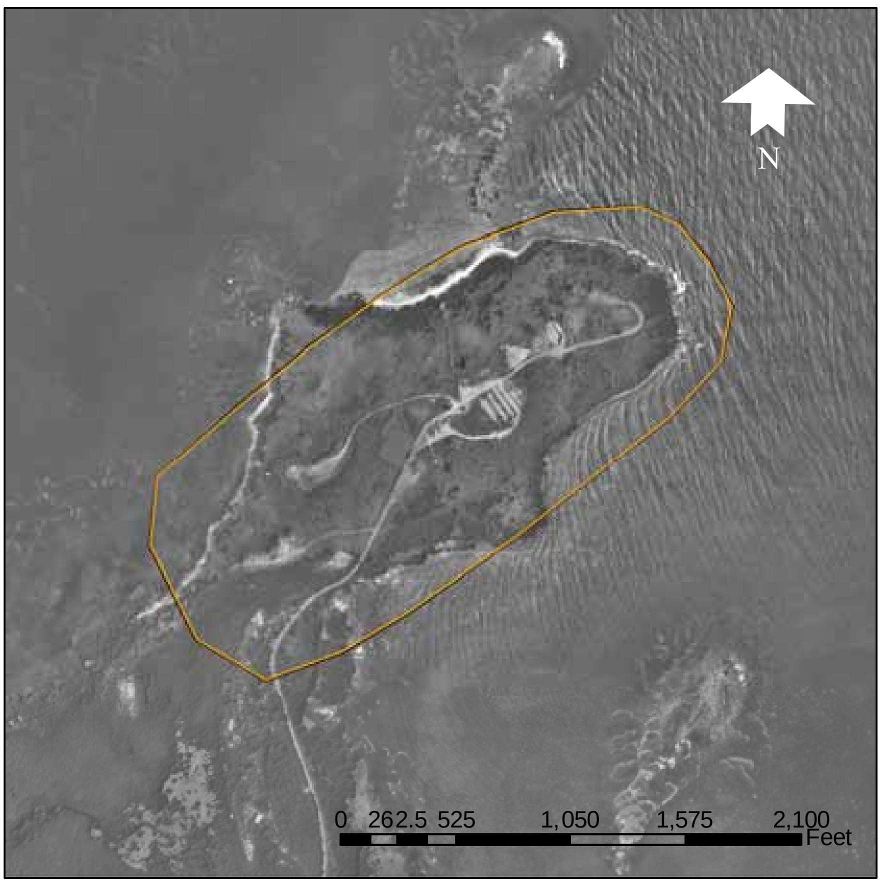
6. Summary and Conclusion

Specifics for the ECP Phase II investigation, to include Quality Assurance/Quality Control (QA/QC) procedures and results, sampling methodology and procedures, and standards use for the risk analysis, are presented in Appendix F.

Figure 5-54. Location of ECP Sites at NSRR

5.4.1 ECP Site 1

This site constitutes the peninsula on Punta Medio Mundo on the northeast side of the station (see Figure 5-55). This peninsula is the location of both active and historic small arms ranges; range locations have moved periodically throughout the peninsula since the station was established. In addition, the 1958 aerial identified three conical pits consistent with use for munitions disposal or detonation. The records review (RR), physical site inspection (PSI), and interviews confirmed use of various portions of the area only as small arms ranges. However, the RR, PSI, and interviews did not confirm or repudiate use of the three observed pits for munitions disposal or detonation. [See photos A-15 through A-17; see also Section 5.11]



*Background aerial photograph from 1958

Figure 5-55. ECP Site 1 - Active Small Arms Range(s)

This site was not investigated under the Phase II ECP because it is being transferred to another federal agency for continued use as an active small arms range.

5.4.2 ECP Site 2

5.4.2.1 Site History and Description

ECP Site 2 is located on the south side of the airfield, just off of the aircraft apron on the northwest side of Hangar 200 (see Figure 5-56). The aerial photography analysis (APA) identified this area as photo identified (PI) Site 2, due to the observation of stains/liquid extending off the edge of the hardstand to a surrounding drainage ditch from 1958-1965. The RR confirmed that Hangar 200 has historically been used for aircraft maintenance. The PSI did not observe any significant stains or stressed vegetation. However, interviews confirmed numerous past spills of petroleum, oils, and lubricant (POL) and hazardous materials (HM) from the 1950s to the 1990s, and former use as an aircraft wash down area is considered likely. [See photos A-61 and A-62]

Figure 5-56. ECP Site 2 - Hangar 200 Apron

The Phase II ECP investigation observed that the surrounding drainage ditch mentioned above is concrete lined and filled with water. [See Photos G-1 through G-3 in Appendix G, which provides photographs that were taken during the Phase II investigation to show site features/conditions.] Also observed during the Phase II investigation was an old floating absorbent sock that would have been utilized to stop potential phase separated hydrocarbons (PSH) from moving further downgradient within the stormwater drainage system. This material was observed immediately east of the drainage tunnels as mentioned above. Fish of approximately four inches in length were observed within this drainage ditch. The majority of the drainage ditch contains thick organic material including long grass and other plant material. There were no signs of any stains or stressed vegetation observed during the Phase II investigation.

5.4.2.2 Field Investigation and Sampling Program

The area located within the concrete-lined drainage ditch located just off the aircraft apron on the northwest side of Hangar 200 was investigated at ECP Site 2.

Surface soil, subsurface soil, and groundwater were originally proposed to be sampled at this site. However, upon arrival at the site, the field crew observed that the drainage ditch was concrete lined with standing water starting at the concrete apron. Therefore, a decision was made to only collect two surface water samples and a sediment sample that was a composite throughout the drainage swale.

The surface water samples were collected near the surface utilizing the direct dip method. The sediment sample was collected utilizing a stainless steel spoon and compositing sediments from the entire length of the drainage swale.

Both surface water sampling locations (2E-SW01 and 2E-SW02) were surveyed in the field using a hand held Global Positioning System (GPS) receiver. The locations of the samples collected are presented on Figure 5-57. The surface water samples were analyzed at the fixed-base analytical laboratory for Appendix IX Volatile Organic Compounds (VOCs), Appendix IX Semivolatile Organic Compounds (SVOCs), total petroleum hydrocarbons (TPH) diesel range organics (DRO) and gasoline range organics (GRO), as well as Appendix IX total metals.

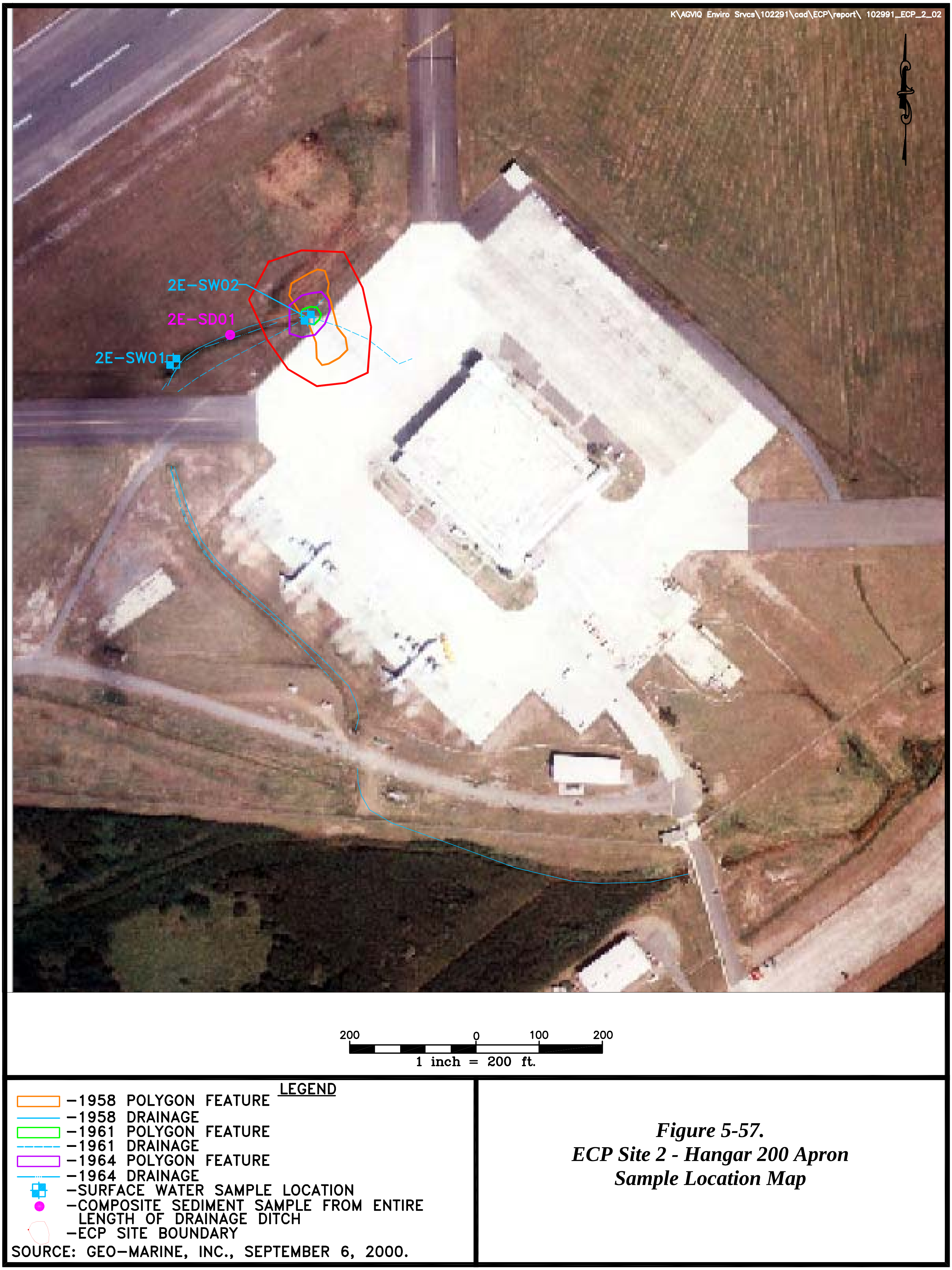


Figure 5-57.
ECP Site 2 - Hangar 200 Apron
Sample Location Map

As mentioned above, the sediment sample was collected from compositing sediment throughout the entire drainage swale starting at the end of the concrete apron and progressing to the culvert underneath the tarmac located off the northeast corner of the concrete apron. The sediment sample was analyzed at the fixed-base analytical laboratory for Appendix IX VOCs, Appendix IX SVOCs, TPH DRO and GRO, as well as Appendix IX metals.

5.4.2.3 Nature and Extent of Contamination

The results of the analytical program for this site are presented in Tables 5-6 through 5-9. In the surface water media, one VOC, three SVOCs, and TPH DRO and GRO were detected at very low, estimated concentrations (see Table 5-6). Five inorganic compounds were quantified in the surface water as well (see Table 5-7). The VOC, toluene, and the TPH GRO and DRO were only found at location 2E-SW02. The SVOCs were quantified in the duplicate sample analysis only, and only at location 2E-SW01. Similar concentrations of inorganics were found at all locations.

Sediment analyses resulted in the detection of four VOCs, four SVOCs, and TPH DRO (see Table 5-8). Thirteen inorganic compounds were also detected in the sample (see Table 5-9).

The contamination at the site is primarily related to heavy metal and fuel contamination. Comparison of the surface water samples to relevant surface water screening criteria indicated slight exceedances of copper and mercury (see Table 5-7). Although not strictly applicable to the sediment collected in the drainage swale, comparison to marine sediment screening values was done with the results of the sediment analyses. This resulted in exceedances of four organic compounds (acetone, chrysene, fluoranthene, and m&p cresol) (Table 5-8). In addition, all inorganic compounds exceeded the marine sediment screening criteria with the exception of beryllium and mercury (Table 5-9).

From the concentrations of organics and inorganics at the site, it appears that past activities have impacted the environment at this location.

5.4.2.4 Qualitative Risk Assessment

COPC Identification

The organic COPCs identified for sediment at Site 2 are acetone, chrysene, fluoranthene, pyrene, and m- and p-cresol because the concentrations of these analytes in the single sample from the water-filled drainage ditch exceed the ecologically-based marine sediment screening criteria.

Table 5-6. Summary of Organic Detections in Surface Water at ECP Site 2 – Hangar 200 Apron

	PR Water Quality Standards	**Surface Water Screening Values**							Number Exceeding PR Water Quality Standards	Range Exceeding PR Water Quality Standards	**Number Exceeding Surface Water Screening Values**	**Range Exceeding Surface Water Screening Values**	Location Maximum Detection
Site ID			2E-SW01		2E-SW01		2E-SW02						
Sample ID			2E-SW01		2E-SW01D		2E-SW02						
Sample Date	(ug/L)	(ug/L)	05/15/04		05/15/04		05/15/04						
Volatile Organic Compounds (ug/L)													
Toluene	NE	37.0	1	U	1	U	1.1		NE		0/3		2E-SW02
Semivolatile Organic Compounds (ug/L)													
Dibenzo(a,h)anthracene	NE	30.0	10	U	1	J	10	U	NE		0/3		2E-SW01D
Indeno(1,2,3-cd)pyrene	NE	30.0	10	U	1	J	10	U	NE		0/3		2E-SW01D
Benzo(g,h,i)perylene	NE	30.0	10	U	1	J	10	U	NE		0/3		2E-SW01D
Total Petroleum Hydrocarbons (mg/L)													
Diesel Range Organics	NE	NE	0.1	U	0.1	U	0.09	J	NE		NE		2E-SW02
Gasoline Range Organics	NE	NE	0.05	U	0.05	U	0.01	J	NE		NE		2E-SW02

Notes:

J - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
ug/L - micrograms per liter.
mg/L - milligrams per liter.
NE - Not Established.

Table 5-7. Summary of Inorganic Detections in Surface Water at ECP Site 2 – Hangar 200 Apron

Site ID / Sample ID / Sample Date	PR Water Quality Standards (mg/L)	**Surface Water Screening Values** (mg/L)	2E-SW01 / 2E-SW01 / 05/15/04		2E-SW01 / 2E-SW01D / 05/15/04		2E-SW02 / 2E-SW02 / 05/15/04		Number Exceeding PR Water Quality Standards	Range Exceeding PR Water Quality Standards	**Number Exceeding Surface Water Screening Values**	**Range Exceeding Surface Water Screening Values**	Location Maximum Detection
Appendix IX (Total) Metals (mg/L)													
Barium	NE	50	0.019		0.019		0.029		NE		0/3		2E-SW02
Copper	0.0031	0.0037	0.02	U	0.02	U	**0.0038**	B	1/3	0.0038B	1/3	0.0038B	2E-SW02
Vanadium	NE	0.120[1]	0.002	B	0.0016	B	8E-04	B	NE		0/3		2E-SW01D
Zinc	NE	0.086	0.002	B	0.0021	B	0.006	B	NE		0/3		2E-SW02
Mercury	0.00005	0.0011	2E-04	U	0.000097	B	2E-04	U	1/3	0.000097B	0/3		2E-SW01D

Notes:

B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.

U - The compound was analyzed for, but was not detected at or above the MDL/PQL.

(1) - This chemical lacks a marine/estuarine surface water screening value. The value shown is a freshwater screening value.

NE - Not Established.

mg/L - milligrams per liter.

Table 5-8. Summary of Organic Detections in Sediment at ECP Site 2 – Hangar 200 Apron

Sample ID Sample Date Sample Depth (ft bgs)	Marine Sediment Screening Values (ug/kg)	2E-SD01 05/15/04 (1)		Number Exceeding Marine Sediment Screening Values	Range Exceeding Marine Sediment Screening Values	Location of Maximum Detection
Volatile Organic Compounds (ug/kg)						
Methylene chloride	434	8.9	J	0/1		2E-SD01
Tetrachloroethene	57.0	22		0/1		2E-SD01
Toluene	187	44		0/1		2E-SD01
Acetone	5.81	41	J	1/1	41J	2E-SD01
Semivolatile Organic Compounds (ug/kg)						
Chrysene	108	190	J	1/1	190J	2E-SD01
Fluoranthene	113	160	J	1/1	160J	2E-SD01
Pyrene	153	120	J	0/1		2E-SD01
Cresol, m & p	100	3,000		1/1	3,000	2E-SD01
Total Petroleum Hydrocarbons (mg/kg)						
Diesel Range Organics	NA	290		NA		2E-SD01

Notes:

J - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.

(1) - This sample was composited from several locations throughout the drainage ditch. The depth of the sample was down to the concrete liner within the drainage ditch.

ft bgs - feet below ground surface.

ug/kg - micrograms per kilogram.

mg/kg - milligrams per kilogram.

Table 5-9. Summary of Inorganic Detections in Sediment at ECP Site 2 – Hangar 200 Apron

	Marine Sediment Screening Values			Number Exceeding Marine Sediment Screening Values	Range Exceeding Marine Sediment Screening Values	Location of Maximum Detection
Sample ID		2E-SD01				
Sample Date		05/15/04				
Sample Depth (ft bgs)	(mg/kg)	(1)				
Appendix IX Metals (mg/kg)						
Silver	0.73	0.77	B	1/1	0.77B	2E-SD01
Barium	48.0	400		1/1	400	2E-SD01
Beryllium	NA	0.36	B	NA		2E-SD01
Cadmium	0.68	15		1/1	15	2E-SD01
Cobalt	10.0	27		1/1	27	2E-SD01
Chromium	52.3	140		1/1	140	2E-SD01
Copper	18.7	130		1/1	130	2E-SD01
Nickel	15.9	26		1/1	26	2E-SD01
Lead	30.2	1,500		1/1	1,500	2E-SD01
Tin	3.40	17	B	1/1	17B	2E-SD01
Vanadium	57.0	110		1/1	110	2E-SD01
Zinc	124	1,200		1/1	1,200	2E-SD01
Mercury	0.13	0.11	S	0/1		2E-SD01

Notes:

B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.

S - The result was determined by Method of Standard Addition.

(1) - This sample was composited from several locations throughout the drainage ditch. The depth of the sample was down to the concrete liner within the drainage ditch.

NA - Not Available.

ft bgs - feet below ground surface.

mg/kg - milligrams per kilogram.

Eleven inorganic COPCs were identified based on exceedance of the marine sediment screening criteria. These are: silver, barium, cadmium, cobalt, chromium, copper, nickel, lead, tin, vanadium, and zinc. Copper and mercury are the only COPCs identified for surface water at Site 2, as the concentration of copper in sample2E-SW02 (0.0038 B mg/L) and mercury in sample 2E-SW01D (0.000097 B mg/L) exceed the Puerto Rico water quality standard.

Potential Risk Discussion

The marine sediment screening criteria developed for ecological receptors at NSRR are not highly relevant for a concrete-lined drainage ditch, however, they were used as screening criteria due to a lack of other potentially more appropriate criteria. The likelihood of significant human exposure to sediment is small; however, the data can be compared to soil risk-based criteria to conservatively assess potential risk to the sediment under the assumption that over the long-term (approximately 30 years) today's sediment can be considered tomorrow's soil. Using this logic, base soil background criteria can also be used for inorganic analytes to assess whether detected concentrations may be natural in origin. The detected organic analytes are present at concentrations far less than the residential RBCs for soil, suggesting that the potential risk to human receptors from exposure to organics in sediment is very low. Similarly, for the inorganic analytes, only lead at 1,500 mg/kg exceeds the screening criteria and the base background level for soil. Exposure to lead at high levels can damage children's ability to learn. Although long-term exposure to lead in sediment by children is unlikely, and a single sample does not reflect the probable exposure point concentration, this high concentration does pose a potential health concern. Although indeterminate, exposure to sediment from the ditch at Site 2 may also pose risks to ecological receptors.

The Puerto Rico water quality standards for copper and mercury are based on the potential effects to ecological receptors. Although extremely unlikely for marine surface water, the most conservative exposure pathway to assess human receptors is direct ingestion. The tap water RBCs presented in the previous tables are based on this pathway and the single estimated concentrations of copper and mercury (less than the reporting limit) are much less than the tap water RBCs, suggesting that even if this water were to be ingested it would pose a very low risk. The potential risk to ecological receptors is indeterminate but is likely low due to the low concentrations of COPCs.

5.4.2.5 Summary of Site Conditions

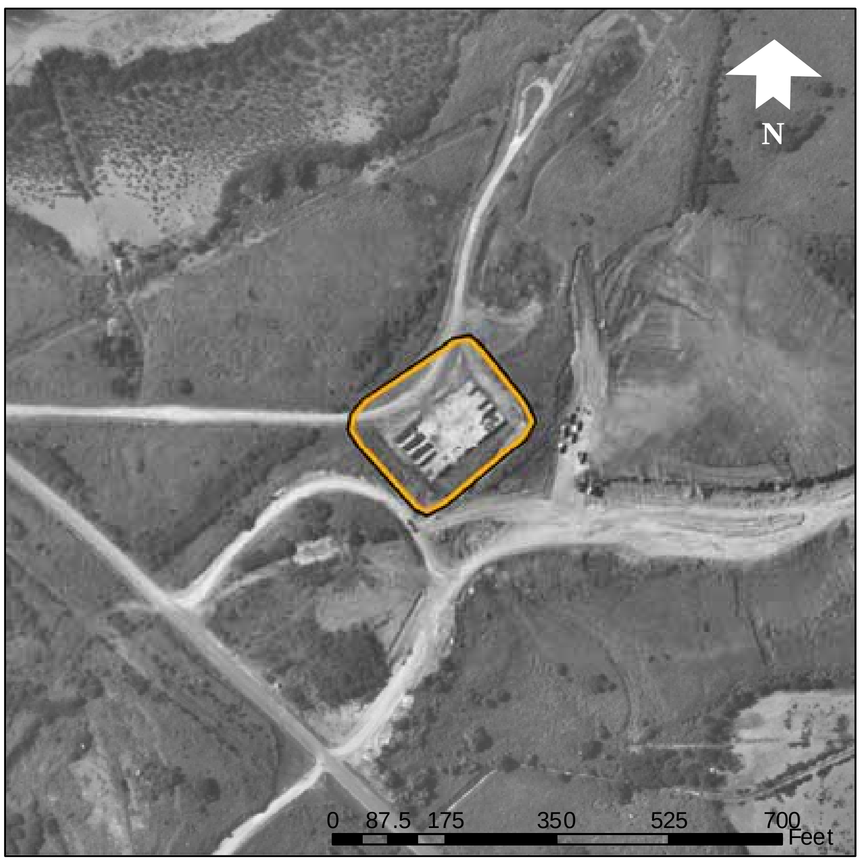
At ECP Site 2 it was determined that past activities have impacted the environment. A qualitative risk assessment indicated that the sediment in the drainage ditch presents a potential human health hazard due to the presence of elevated levels of lead. Other COPCs considered in the sediment at the site included acetone, PAHs, and several other inorganics. None of these other COPCs were determined to pose a significant risk. Surface water is presumed to be transient due to the nature of a drainage ditch and was not considered as a risk to human health and the environment despite the presence of slightly elevated concentrations of copper and mercury.

Further investigation at this site will be conducted under the RCRA Corrective Action/IRP process.

5.4.3 ECP Site 3

5.4.3.1 Site History and Description

This site is located at Facility No. 278, which is a rectangular concrete pad approximately 100' x 160' in size, surrounded by flat lying grass and secondary growth vegetation on the north side of Antietam Road just south of Solid Waste Management Unit (SWMU) 9 Area C (see Figure 5-58).



*Background aerial photograph from 1958

Figure 5-58. ECP Site 3 - Facility No. 278, POL Drum Storage Area

The APA identified this area as PI Site 4, due to the observation of drum storage and staining on a concrete pad and surrounding soil from 1958-1995. The records review confirmed the area as the POL drum storage facility from the 1950s to the 1990s, and the physical site inspections observed staining on the pad but no significant stressed vegetation immediately surrounding the pad. Interviews confirmed that POL and potentially other HM were stored at site, with numerous small spills and releases throughout the usage period.

During the Phase II ECP investigation, some small miscellaneous debris including, small cylinders and equipment, were observed on the concrete pad (see Photos G-4 through G-8 in Appendix G). There were no signs of any stains or stressed vegetation observed during the investigation.

5.4.3.2 Site Hydrogeology

ECP Site 3 is located in the upland area just south of SWMU 9 Area C. ECP Site 3 is underlain by thin residuum, which generally consists of sand, silt, and/or clay. Residuum was observed to range from 0.2-feet (sample 3E-04) to more than 5-feet thick (sample 3E-06). Weathered bedrock (Gabbro) was observed beneath the residuum. Groundwater was not observed in residuum. At ECP Site 3, depth to groundwater was observed approximately 13- to 20-feet bgs. At this depth groundwater would be present in bedrock fractures. A strong fuel odor was evident at temporary well 3E-TW04.

5.4.3.3 Field Investigation and Sampling Program

The area surrounding the concrete slab utilized for POL Drum storage was investigated at ECP Site 3. As presented in the Phase II ECP Work Plan (NAVFAC Atlantic, 2004b), the sample locations at this site were field located with a hand held GPS receiver. As mentioned previously, there were no signs of staining or stressed vegetation observed at this site. Therefore, the originally proposed six locations within the work plan were utilized, with the exception of three locations (3E-01, 3E-04, and 3E-06) because of site access issues including site topography. At these three locations, the borings had to be offset by a few feet to allow for necessary operating clearance for the Geoprobe® rig.

A total of six soil borings were advanced around the perimeter of Facility Number 278 (ECP Site 3) as presented on Figure 5-59. One soil boring was located along each of the northeastern and southwestern edges of the concrete slab, while two soil borings were located along each of the northwestern and southeastern edges of the concrete slab.

LEGEND

- —1958 POLYGON FEATURE
- —1961 POLYGON FEATURE
- —1964 POLYGON FEATURE
- —1976 POLYGON FEATURE
- —1977 POLYGON FEATURE
- —1985 POLYGON FEATURE
- —1995 POLYGON FEATURE
- – SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
- – SURFACE SOIL, SUBSURFACE SOIL, AND GROUNDWATER SAMPLE LOCATION
- – ECP SITE BOUNDARY

SOURCE: GEO-MARINE, INC., SEPTEMBER 6, 2000.

Figure 5-59.
ECP Site 3 - Facility No. 278, POL Drum Storage Area Sample Location Map

Surface soil was collected from each soil boring location utilizing a stainless steel spoon. One surface soil sample was obtained from each of the six sampling locations (3E-01 through 3E-06) from a depth of 0 to 1 foot bgs. Subsurface soil samples were collected from two-foot intervals (i.e., 1 to 3 feet bgs, 3 to 5 feet bgs, etc.). The depth of the soil borings at this site ranged from 5 feet bgs to 33.5 feet bgs (3E-SB02/TW02). A minimum of two subsurface soil samples were obtained from each boring location (3E-01 through 3E-06). All surface and subsurface soil samples were screened in the field utilizing a photo-ionization detector (PID) and a flame-ionization detector (FID) with the results recorded in the field logbook. The screening results were compared against background to indicate if the soil has been impacted by past operations. [See Appendix G for full PID and FID screening results on a per site basis.] A total of four subsurface soil samples were collected from soil boring 3E-04 based on observed FID/PID readings. According to the decision tree for this site, additional subsurface soil samples were to be collected at greater depths until groundwater is encountered, and/or the FID/PID readings are at background levels. However, only one subsurface soil sample from this boring was sent to a fixed-base analytical laboratory based on professional judgment.

A total of six surface soil and six subsurface soil samples were submitted to the fixed-base laboratory, including surface soil samples 3E-SS01 through 3E-SS06, and subsurface soil samples 3E-SB01-01, 3E-SB02-01, 3E-SB03-01, 3E-SB04-01, 3E-SB05-01, and 3E-SB06-01. These samples were analyzed for full Appendix IX analysis.

A groundwater program followed the soil-sampling program, with the installation of two temporary monitor wells based on the field screening results of the subsurface soil. The field screening results indicated that one temporary monitor well was to be installed at soil boring 3E-02, while another temporary monitor well was to be installed at soil boring location 3E-04. Groundwater samples were then collected from each temporary monitor well based on a modified version of the low flow sampling technique, with results submitted to the fixed-base analytical laboratory for full Appendix IX analysis.

5.4.3.4 *Nature and Extent of Contamination*

The results of the analytical program for this site can be seen in Tables 5-10 through 5-15. In the surface soil, there were six VOCs, eleven SVOCs, three pesticides, one PCB, and one chlorinated herbicide detected (Table 5-10). Fifteen inorganic compounds were found in the surface soil as well (Table 5-11). Locations 3E-01 and 3E-03 had the most detections of VOCs, while locations 3E-01 and 3E-06 had the most detections of SVOCs. All SVOC concentrations were estimated.

Table 5-10. Summary of Organic Detections in Surface Soil at ECP Site 3 – Facility No. 278, POL Drum Storage Area

											Number	Range	**Number**	**Range**	
Site ID	EPA Region III	**EPA Region III**	3E-01	3E-01	3E-02	3E-03	3E-04	3E-05	3E-05	3E-06	Exceeding	Exceeding	**Exceeding**	**Exceeding**	Location of
Sample ID	Industrial	**Residential**	3E-SS01	3E-SS01D	3E-SS02	3E-SS03	3E-SS04	3E-SS05	3E-SS05D	3E-SS06	EPA Region III	EPA Region III	**EPA Region III**	**EPA Region III**	Maximum
Sample Date	RBCs	**RBCs**	05/05/04	05/05/04	05/05/04	05/05/04	05/05/04	05/05/04	05/05/04	05/05/04	Industrial	Industrial	**Residential**	**Residential**	Detection
Sample Depth (ft bgs)	(ug/kg)	(ug/kg)	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	RBCs	RBCs	**RBCs**	**RBCs**	
Volatile Organic Compounds (ug/kg)															
Chlorobenzene	2,000,000	160,000	5.9 U	4.3 J	5.5 U	4.5 J	6.5 U	7.2 U	7.3 U	7.3 U	0/8		0/8		3E-SS03
Ethylbenzene	10,000,000	780,000	5.9 U	2.3 J	5.5 U	2.4 J	6.5 U	7.2 U	7.3 U	7.3 U	0/8		0/8		3E-SS03
Carbon tetrachloride	22,000	4,900	4 J	8.8	2.4 J	5.7 J	6.5 U	3 J	7.3 U	7.3 U	0/8		0/8		3E-SS01D
Chloroform	1,000,000	78,000	1.9 J	4.3 J	5.5 U	2.9 J	6.5 U	7.2 U	7.3 U	7.3 U	0/8		0/8		3E-SS01D
Tetrachloroethene	5,300	1,200	5.9 U	5.7 J	5.5 U	6	6.5 U	4.2 J	7.3 U	7.3 U	0/8		0/8		3E-SS03
Xylene	20,000,000	1,600,000	12 U	12 J	11 U	12	13 U	14 U	15 U	15 U	0/8		0/8		3E-SS03
Semivolatile Organic Compounds (ug/kg)															
Benzo(b)fluoranthene	3,900	870	460 U	500 U	390 U	440 U	480 U	480 U	550 U	95 J	0/8		0/8		3E-SS06
Benzo(a)anthracene	3,900	870	460 U	500 U	390 U	440 U	480 U	480 U	550 U	79 J	0/8		0/8		3E-SS06
Benzo(k)fluoranthene	39,000	8,700	460 U	500 U	390 U	440 U	480 U	480 U	550 U	76 J	0/8		0/8		3E-SS06
bis(2-Ethylhexyl)phthalate	200,000	46,000	460 U	500 U	52 J	440 U	480 U	480 U	550 U	130 J	0/8		0/8		3E-SS06
Chrysene	390,000	87,000	460 U	500 U	390 U	440 U	480 U	480 U	550 U	110 J	0/8		0/8		3E-SS06
Benzo(a)pyrene	390	87	460 U	500 U	390 U	440 U	480 U	480 U	550 U	77 J	0/8		0/8		3E-SS06
Fluoranthene	4,100,000	310,000	460 U	500 U	390 U	440 U	480 U	480 U	550 U	120 J	0/8		0/8		3E-SS06
Indeno(1,2,3-cd)pyrene	3,900	870	77 J	500 U	390 U	440 U	480 U	480 U	550 U	51 J	0/8		0/8		3E-SS01
Benzo(g,h,i)perylene	NE	NE	97 J	500 U	390 U	440 U	480 U	480 U	550 U	67 J	NE		NE		3E-SS01
Phenanthrene	NE	NE	460 U	500 U	390 U	440 U	480 U	480 U	550 U	70 J	NE		NE		3E-SS06
Pyrene	3,100,000	230,000	35 J	500 U	390 U	440 U	480 U	480 U	550 U	160 J	0/8		0/8		3E-SS06
Pesticides/PCBs (ug/kg)															
4,4'-DDD	12,000	2,700	4.6 U	5 U	3.9 U	4.4 U	4.8 U	4.8 U	5.5 U	9.4 JP	0/8		0/8		3E-SS06
4,4'-DDE	8,400	1,900	4.6 U	5 U	3.9 U	4.4 U	1.4 J	4.8 U	5.5 U	11	0/8		0/8		3E-SS06
4,4'-DDT	8,400	1,900	4.6 U	5 U	3.9 U	4.4 U	2.3 J	1.1 J	1.1 J	33	0/8		0/8		3E-SS06
Aroclor-1260	1,400	320	46 U	50 U	55	44 U	18 J	48 U	55 U	**330**	0/8		1/8	330	3E-SS06
OP-Pesticides (ug/kg)															
Not Detected															
Chlorinated Herbicides (ug/kg)															
2,4,5-TP	NE	NE	1.5 J	12 U	9.8 U	11 U	12 U	12 U	14 U	14 U	NE		NE		3E-SS01

Notes:
J - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
P - The GC or HPLC confirmation criteria was exceeded. The realtive percent difference is greater than 40% between the two GC columns or HPLC detectors.
NE - Not Established.
ft bgs - feet below ground surface.
ug/kg - micrograms per kilogram.

Table 5-11. Summary of Inorganic Detections in Surface Soil at ECP Site 3 – Facility No. 278, POL Drum Storage Area

Site ID	EPA Region III	**EPA Region III**	2x Average	3E-01	3E-01	3E-02	3E-03	3E-04	3E-05	3E-05	3E-06	Number Exceeding	Range Exceeding	**Number Exceeding**	**Range Exceeding**	Number Exceeding	Range Exceeding	
Sample ID	Industrial	**Residential**	Detected	3E-SS01	3E-SS01D	3E-SS02	3E-SS03	3E-SS04	3E-SS05	3E-SS05D	3E-SS06	EPA Region III	EPA Region III	**EPA Region III**	**EPA Region III**	2x Average	2x Average	Location of
Sample Date	RBCs	**RBCs**	Background	05/05/04	05/05/04	05/05/04	05/05/04	05/05/04	05/05/04	05/05/04	05/05/04	Industrial	Industrial	**Residential**	**Residential**	Detected	Detected	Maximum
Sample Depth (ft bgs)	(mg/kg)	(mg/kg)	(mg/kg)	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	RBCs	RBCs	**RBCs**	**RBCs**	Background	Background	Detection
Appendix IX Inorganics (mg/kg)																		
Arsenic	1.9	0.43	2.4	**1.1** B	**1.2** B	**3.7**	1.2 U	**1.5**	**1.2** B	**3.5**	**3.6**	3/8	3.5 - 3.7	7/8	1.1B - 3.7	3/8	3.5 3.7	3E-SS02
Barium	7,200	550	181	110	70	81	55	83	36	62	74	0/8		0/8		0/8		3E-SS01
Beryllium	200	16	0.45	0.35 B	0.34 B	0.2 B	0.17 B	0.22 B	0.09 B	0.13 B	0.26 B	0/8		0/8		0/8		3E-SS01
Cadmium	100	7.8	0.27	0.8	0.79	1.4	1.4	1.2	0.38 B	0.63 B	2.9	0/8		0/8		8/8	0.38B - 2.9	3E-SS06
Cobalt	2,000	160	44.0	38	26	14	25	24	5.6	10	18	0/8		0/8		0/8		3E-SS01
Chromium	310	23	59.3	**30**	**31**	21	**36**	**34**	8.1	17	**31**	0/8		5/8	30 - 36	0/8		3E-SS03
Copper	4,100	310	234	77 N	84 N	160 N	86 N	97 N	23 N	40 N	100 N	0/8		0/8		0/8		3E-SS02
Nickel	2,000	160	16.6	16	19	13	28	20	5.2	9.6	14	0/8		0/8		3/8	19 - 28	3E-SS03
Lead	400(1)	400(1)	125	20	21	32	2.8	48	16	32	120	0/8		0/8		7/8	16 - 120	3E-SS06
Antimony	41	3.1	2.3	2.6 UN	2.8 UN	2.3 UN	2.4 UN	1 BN	2.5 UN	3.2 UN	3.2 UN	0/8		0/8		0/8		3E-SS04
Tin	61,000	4,700	2.43	2.2 B	2.7 B	3.9 B	3.4 B	3.7 B	3 B	3.3 B	4.1 B	0/8		0/8		7/8	2.7B - 4.1B	3E-SS06
Vanadium	100	7.8	355	**180**	**160**	**86**	**140**	**150**	**35**	**67**	**110**	5/8	110 - 180	8/8	35 - 180	0/8		3E-SS01
Zinc	31,000	2,300	125	87	90	130	70	120	34	63	210	0/8		0/8		2/8	130 - 210	3E-SS06
Cyanide	2,000	160	0.52	0.67 U	0.73 U	0.59 U	0.66 U	0.46 B	0.71 U	0.8 U	0.53 B	0/8		0/8		1/8	0.53B	3E-SS06
Mercury	31(2)	2.3(2)	0.11	0.05 N	0.05 N	0.01 BN	0.01 BSN	0.16 SN	0.15 N	0.05 N	0.05 N	0/8		0/8		2/8	0.15N - 0.16N	3E-SS04

Notes:

B - The reported result is an estimated concentration that is less than the PQL, greater than or equal to the MDL.

N - The matrix spike recovery is not within control limtis.

U - The compound was analyzed for, but was not detected at or above the MDL/PQL.

S - The result was determined by Method of Standard Addition.

(1) - 1996 Soil Screening Guidance.

(2) - Value based on the RBC for Mercuric Chloride.

NE - Not Established.

ft bgs - feet below ground surface.

mg/kg - milligrams per kilogram.

Table 5-12. Summary of Organic Detections in Subsurface Soil at ECP Site 3 – Facility No. 278, POL Drum Storage Area

Site ID Sample ID Sample Date Sample Depth (ft bgs)	EPA Region III Industrial RBCs (ug/kg)	**EPA Region III Residential RBCs** (ug/kg)	3E-01 3E-SB01-01 05/05/04 1.00 - 3.00	3E-02 3E-SB02-01 05/05/04 1.00 - 3.00	3E-03 3E-SB03-01 05/05/04 1.00 - 3.00	3E-04 3E-SB04-01 05/05/04 1.00 - 3.00	3E-05 3E-SB05-01 05/05/04 1.00 - 3.00	3E-06 3E-SB06-01 05/05/04 1.00 - 3.00	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 of Maximum Detection
Volatile Organic Compounds (ug/kg)													
Carbon tetrachloride	22,000	4,900	6.1 U	2.8 J	5.3 U	210 U	5.5 U	9.1 U	0/6		0/6		3E-SB02-01
Semivolatile Organic Compounds (ug/kg)													
Pyrene	3,100,000	230,000	440 U	460 U	390 U	380 U	370 U	28 J	0/6		0/6		3E-SB06-01
Pesticides/PCBs (ug/kg)													
Not Detected													
OP-Pesticides (ug/kg)													
Not Detected													
Chlorinated Herbicides (ug/kg)													
2,4,5-TP	NE	NE	11 U	12 U	9.8 U	4.1 J	9.3 U	15 U	NE		NE		3E-SB04-01

Notes:

J - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.

U - The compound was analyzed for, but was not detected at or above the MDL/PQL.

NE - Not Established.

ft bgs - feet below ground surface.

ug/kg - micrograms per kilogram.

Table 5-13. Summary of Inorganic Detections in Subsurface Soil at ECP Site 3 – Facility No. 278, POL Drum Storage Area

Site ID	EPA Region III Industrial RBCs (mg/kg)	**EPA Region III Residential RBCs** (mg/kg)	2x Average Detected Background (mg/kg)	3E-01	3E-02	3E-03	3E-04	3E-05	3E-06	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**	Number Exceeding 2x Average Detected Background	Range Exceeding 2x Average Detected Background	Location of Maximum Detection
Sample ID				3E-SB01-01	3E-SB02-01	3E-SB03-01	3E-SB04-01	3E-SB05-01	3E-SB06-01							
Sample Date				05/05/04	05/05/04	05/05/04	05/05/04	05/05/04	05/05/04							
Sample Depth (ft bgs)				1.00 - 3.00	1.00 - 3.00	1.00 - 3.00	1.00 - 3.00	1.00 - 3.00	1.00 - 3.00							
Appendix IX Inorganics (mg/kg)																
Silver	510	39	0.46	1.3 U	1.3 U	1 U	0.12 B	1 U	1.8 U	0/6		0/6		0/6		3E-SB04-01
Arsenic	1.9	0.43	2.05	**2**	**1.1** B	1 U	0.98 U	1 U	1.8 U	1/6	2	2/6	1.1B - 2	0/6		3E-SB01-01
Barium	7,200	550	222	120	93	29	25	42	150	0/6		0/6		0/6		3E-SB06-01
Beryllium	200	16	0.74	0.43 B	0.48 B	0.21 B	0.29 B	0.23 B	0.41 B	0/6		0/6		0/6		3E-SB02-01
Cadmium	100	7.8	0.74	0.48 B	0.4 B	0.69	1.9	0.96	0.91 U	0/6		0/6		2/6	0.96 - 1.9	3E-SB04-01
Cobalt	2,000	160	30.0	12	28	32	29	22	33	0/6		0/6		2/6	32 - 33	3E-SB06-01
Chromium	310	23	133	**24**	**29**	**110**	**28**	14	21	0/6		4/6	24 - 110	0/6		3E-SB03-01
Copper	4,100	310	193	94 N	84 N	120 N	120 N	95 N	60 N	0/6		0/6		0/6		3E-SB03-01, 3E-SB04-01
Nickel	2,000	160	31.9	6.9	12	37	25	18	11	0/6		0/6		1/6	37	3E-SB03-01
Lead	400[1]	400[1]	8.68	71	18	1.5	20	7.3	19	0/6		0/6		4/6	18 - 71	3E-SB01-01
Tin	61,000	4,700	2.96	2.2 B	2.8 B	2.7 B	2.1 B	2.9 B	2 B	0/6		0/6		0/6		3E-SB05-01
Vanadium	100	7.8	462	**190**	**220**	**140**	**180**	**140**	**140**	6/6	140 - 220	6/6	140 - 220	0/6		3E-SB02-01
Zinc	31,000	2,300	88.6	78	62	60	150	75	57	0/6		0/6		1/6	150	3E-SB04-01
Mercury	31[2]	2.3[2]	0.093	0.05 SN	0.03 BSN	0.03 SN	0.02 UN	0.02 UN	0.03 UN	0/6		0/6		0/6		3E-SB01-01

Notes:

B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.

N - The matrix spike recovery is not within control limtis.

U - The compound was analyzed for, but was not detected at or above the MDL/PQL.

S - The result was determined by Method of Standard Addition.

(1) - 1996 Soil Screening Guidance.

(2) - Value based on the RBC for Mercuric Chloride.

NE - Not Established.

ft bgs - feet below ground surface.

mg/kg - milligrams per kilogram.

Table 5-14. Summary of Organic Detections in Groundwater at ECP Site 3 – Facility No. 278, POL Drum Storage Area

		EPA Region III	PR Water					Number	Range	Number Exceeding	Range Exceeding	Number	Range	
Site ID	Federal	Tap Water	Quality	3E-04		3E-02		Exceeding	Exceeding	EPA Region III	EPA Region III	Exceeding PR Water	Exceeding PR Water	Location
Sample ID	MCLs	RBCs	Standards	3E-GW01		3E-GW02		Federal	Federal	Tap Water	Tap Water	Quality	Quality	Maximum
Sample Date	(ug/L)	(ug/L)	(ug/L)	05/10/04		05/10/04		MCLs	MCLs	RBCs	RBCs	Standards	Standards	Detection
Volatile Organic Compounds (ug/L)														
2-Butanone	NE	700	NE	2.6	J	1.5	J	NE		0/2		NE		3E-GW01
Iodomethane	NE	NE	NE	0.69	J	0.29	J	NE		NE		NE		3E-GW01
Acetone	NE	550	NE	11	J	12	J	NE		0/2		NE		3E-GW02
Chloromethane	NE	19	NE	0.41	J	1	U	NE		0/2		NE		3E-GW01
Semivolatile Organic Compounds (ug/L)														
Not Detected														
Pesticides/PCBs (ug/L)														
Not Detected														
OP-Pesticides (ug/L)														
Not Detected														
Chlorinated Herbicides (ug/L)														
Not Detected														

Notes:

J - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.

U - The compound was analyzed for, but was not detected at or above the MDL/PQL.

ug/L - micrograms per liter.

NE - Not Established.

Table 5-15. Summary of Inorganic Detections in Groundwater at ECP Site 3 – Facility No. 278, POL Drum Storage Area

		EPA								Number	Range	Number	Range	
		Region III	PR Water					Number	Range	Exceeding	Exceeding	Exceeding	Exceeding	
Site ID	Federal	Tap Water	Quality	3E-04		3E-02		Exceeding	Exceeding	EPA Region III	EPA Region III	PR Water	PR Water	Location
Sample ID	MCLs	RBCs	Standards	3E-GW01		3E-GW02		Federal	Federal	Tap Water	Tap Water	Quality	Quality	Maximum
Sample Date	(mg/L)	(mg/L)	(mg/L)	05/10/04		05/10/04		MCLs	MCLs	RBCs	RBCs	Standards	Standards	Detection
Appendix IX (Dissolved) Inorganics (mg/L)														
Barium	2	0.26	NE	0.018		0.0088	B	0/2		0/2		NE		3E-GW01
Copper	1.3[1]	0.15	1.3	0.0032	B	0.02	U	0/2		0/2		0/2		3E-GW01
Vanadium	NE	0.0037	NE	**0.015**		**0.022**		NE		2/2	0.015 - 0.022	NE		3E-GW02
Zinc	NE	1.1	NE	0.0023	B	0.0039	B	NE		0/2		NE		3E-GW02
Mercury	0.002	0.0011[2]	0.002	0.0004	B	0.0004	B	0/2		0/2		0/2		3E-GW01
Total Cyanide and Sulfide (mg/L)														
Not Detected														

Notes:

B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.

U - The compound was analyzed for, but was not detected at or above the MDL/PQL.

[1] - EPA action level.

[2] - Value based on the Tap Water RBC for Mercuric Chloride.

NE - Not Established.

mg/L - milligrams per liter.

Pesticides and the PCB Aroclor 1260 were found in samples located at 3E-02, 3E-04 through 3E-06, with the highest detections found in 3E-06. The chlorinated herbicide, 2,4,5-TP, was found at an estimated concentration in sample 3E-01. Inorganic detections were similar at all locations.

In the subsurface soil, one VOC, one SVOC, and one chlorinated herbicide were detected at low, estimated concentrations (Table 5-12). Fourteen inorganic compounds were detected (Table 5-13). Location 3E-02 had the VOC carbon tetrachloride in it at a similar concentration to the associated surface soil sample. Location 3E-06 had the SVOC pyrene in it at a lower concentration than in the associated surface soil sample. Chlorinated herbicide 2,4,5-TP was found at 3E-04, and this detection is not coincident with the surface soil detection of this compound.

Groundwater environmental samples indicated that four VOCs (Table 5-14) and five inorganic compounds (Table 5-15) were detected. Most compounds were detected in both samples.

In general, the VOCs and SVOCs detected in the surface and subsurface soil samples were primarily related to fuel contamination, although a few chlorinated compounds were detected in the surface soil, as well as Aroclor 1260. The VOCs detected in the groundwater samples were very low, estimated concentrations; and they were, in general, not related to fuel contamination. It should be noted that during the field investigation, a strong fuel odor was observed in the groundwater at location 3E-04. This observation was not verified by the analytical results. At location 3E-04, high FID and PID readings on the soil were observed as well, but these were not confirmed with any detections in the soil samples.

Comparison to criteria was done with all the results as shown in Tables 5-10 through 5-15. One organic compound, Aroclor 1260 (surface soil), exceeded the EPA Region III Residential RBC. Three inorganic compounds exceeded criteria, including arsenic (soil), chromium (soil), and vanadium (soil and groundwater). Only one of these, arsenic, exceeded twice the average detected background concentration, and only in the surface soil matrix. Arsenic is associated with industrial chemicals as a wood preservative, and in herbicides, insecticides, and poisons. Vanadium is present at high concentrations in the background soils at NSRR. It is likely that the exceedance of this compound in groundwater is a result of leaching from naturally occurring vanadium in the soil.

From the detections of fuel and chlorinated compounds and exceedance of criteria for Aroclor 1260 and arsenic, it is concluded that the soil at this site has been impacted by previous activities. Based on the limited groundwater investigation and observations noted during the field event, it is tentatively concluded that the groundwater has not been impacted by previous activities.

5.4.3.5 Qualitative Risk Assessment

COPC Identification

The only COPCs identified for surface soil at Site 3 are Aroclor-1260 and arsenic. Aroclor-1260 was detected in a single sample out of eight total samples at a concentration that exceeds the residential RBC. Arsenic is the only inorganic analyte that exceeds both the residential RBC and the base background criteria. This occurs in three of the eight samples.

No COPCs were identified in subsurface soil. Arsenic, chromium, and vanadium were detected at concentrations in excess of the residential RBC but less than the base background concentrations.

No organic analytes were identified as COPCs in groundwater and vanadium is the only inorganic COPC.

Potential Risk Discussion

The reasonably anticipated land use for the future at Site 3 can be approximated by the industrial/commercial use. This land use can be qualitatively assessed by comparing data to industrial RBCs. The concentration of Aroclor-1260 in a single surface soil sample is less than the industrial RBC indicating a low potential risk. Furthermore, a single sample does not reflect the probable exposure point concentration of Aroclor-1260. Based on the data, the average concentration of Aroclor-1260 that a receptor could be exposed to over the entire site would be even less. The arsenic concentrations in surface soil exceed the industrial RBCs, however, the low concentrations (3.5 to 3.7 mg/kg) are very near the base background criterion and it is unlikely that these concentrations reflect site-related contamination. These levels of arsenic pose a low potential risk.

Potential exposure to groundwater at NSRR is unlikely. Groundwater is not currently used for potable purposes because drinking water is available from El Yunque which supplies all of NSRR's present needs. The most likely exposure route to groundwater is from inhalation of vapors emitted from volatile organics through the overlying soil, particularly into buildings. Vanadium is not volatile and the RBC used to select it as a COPC is based on a noncarcinogenic toxicity criteria set at one-tenth of the level considered acceptable by EPA to account for potential additive effects of multiple contaminants. As there is only a single noncarcinogenic COPC in groundwater at Site 3, the single contaminant RBC can be used for comparison, which is ten times higher than the tap water RBCs presented in previous tables. The vanadium levels in groundwater are probably a result of leaching from the generally high levels of vanadium in soil at NSRR and are less than the single contaminant RBC (based on the unlikely but assumed exposure via ingestion of groundwater) of 0.037 mg/L. Therefore, the potential risk from exposure to vanadium in groundwater is minimal even if the groundwater were to be used for potable purposes in the future.

5.4.3.6 *Summary of Site Conditions*

PCBs, arsenic, and vanadium were determined to be COPCs at this site based on their exceedance of Residential RBCs. However, none of the COPCs exceeded industrial RBCs in the soil except arsenic, and groundwater was evaluated under an unlikely exposure scenario. Arsenic was assumed to be within background concentrations.

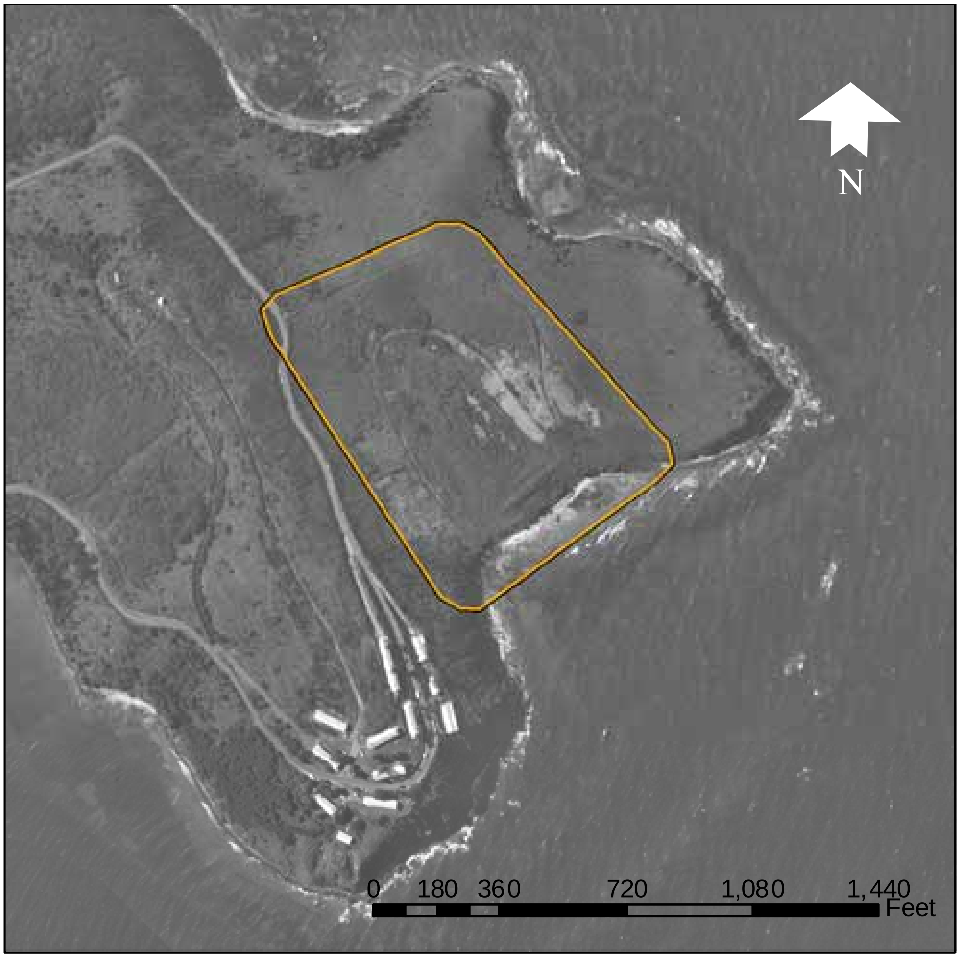
Further investigation at this site will be conducted under the RCRA Corrective Action/IRP process.

5.4.4 ECP Site 4

5.4.4.1 *Site History and Description*

This site is located at Punta Puerca, on the southeast portion of the Site in an upland area covered with secondary growth vegetation (see Figure 5-60). The APA identified this area as PI Site 6, due to the observation of structures and clearing associated with a small arms range in 1958. During the records review of historic maps of the base, this area was identified as a former rifle range. The physical site inspection identified what appeared to be a concrete berm backstop and target placements. Interviews confirmed use of the area as a rifle range in the 1940's. Exact usage dates and frequency of use are unknown.

During the Phase II ECP investigation, the berm backstop was observed. However, it appears that the backstop is made out of fieldstone and mortar, rather than concrete. In addition, a concrete bermed structure that was found southeast of the berm backstop mentioned above. This structure contained galvanized piping protruding from the top of concrete berm. This structure appears to be related to the target placements observed during the physical site inspection. This site is completely covered with very dense, secondary growth vegetation as mentioned above. There were no signs of stains or stressed vegetation observed during the investigation.



*Background aerial photograph from 1958

Figure 5-60. ECP Site 4 - Former Rifle Range at Punta Puerca

5.4.4.2 Field Investigation and Sampling Program

The area in the vicinity of the former rifle range was investigated at ECP Site 4. The sample locations at this site were field located with a hand held GPS receiver. There were no signs of staining or stressed vegetation observed at this site. Therefore, the originally proposed six locations within the Phase II ECP Work Plan (NAVFAC Atlantic, 2004b) were utilized. A total of six surface soil locations were positioned in the field northwest of the berm backstop located in the southeastern portion of the site as presented on Figure 5-61. Two rows of surface soil samples were collected, with the first row of four surface soil samples located just northwest of the back stop, and the second row of two surface soil samples located approximately 80 feet up range of the back stop from the first row.

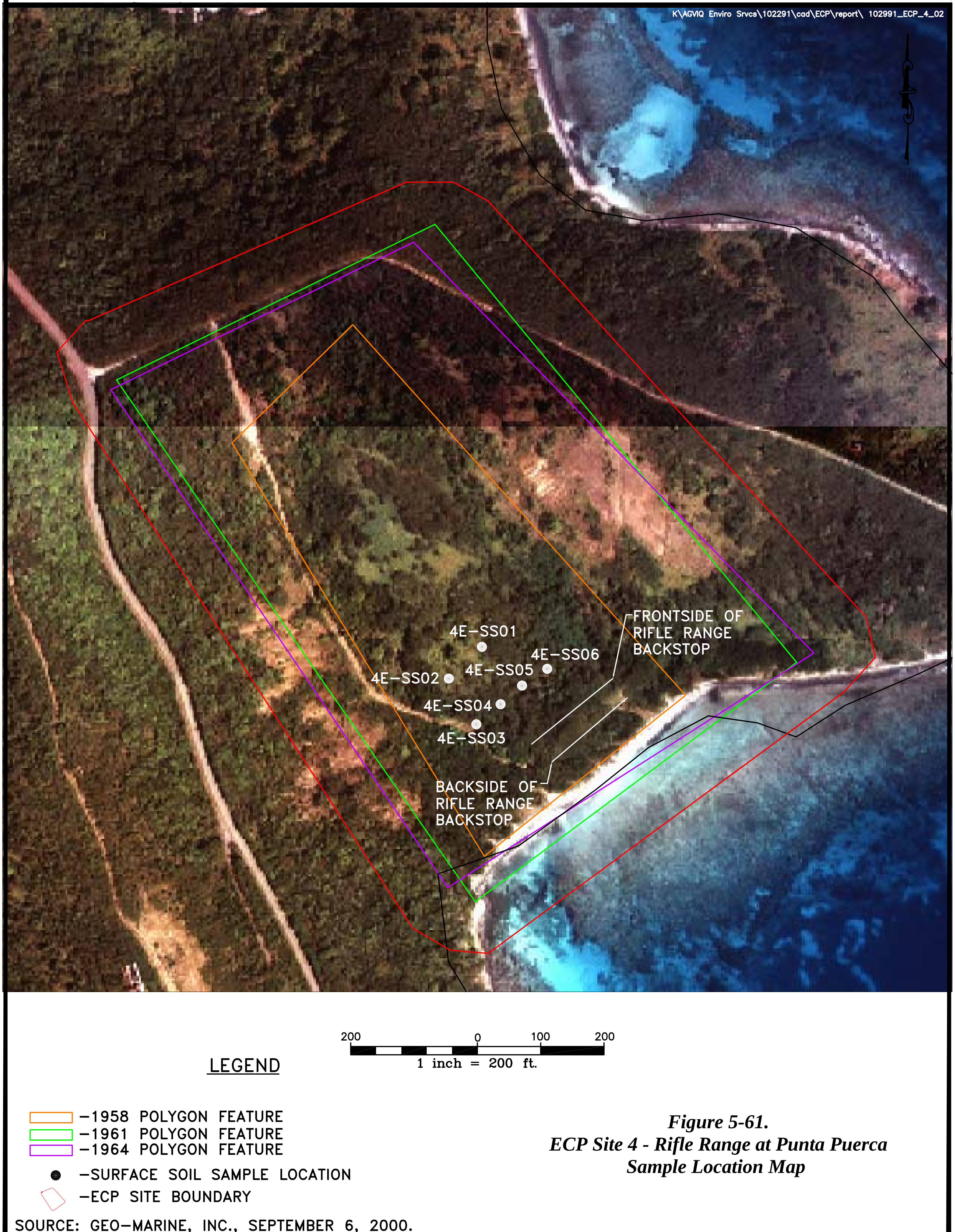


Figure 5-61.
ECP Site 4 - Rifle Range at Punta Puerca
Sample Location Map

Surface soil was collected at each location from a depth of 0 to 1 foot bgs, utilizing a stainless steel spoon. A total of six surface soil samples (4E-SS01 through 4E-SS06) were submitted to a fixed-base analytical laboratory for lead analysis.

5.4.4.3 *Nature and Extent of Contamination*

Six surface soil environmental samples were obtained from locations at the Rifle Range at Punta Puerca as shown on Figure 5-61. These samples were analyzed for lead only and the results are given on Table 5-16. One duplicate environmental sample was obtained from location 4E-SS02. All results were less than background lead concentrations at NSRR, and they were two orders of magnitude lower than the 1996 Soil Screening Guidance of 400 milligrams per kilogram (mg/kg) for lead. As a result, it is concluded that there has been no impact from past activities at this site.

5.4.4.4 *Qualitative Risk Assessment*

COPC Identification

No COPCs were identified at Site 4. All surface soil lead concentrations were less than base background and the soil screening criteria.

Potential Risk Discussion

The potential risk posed by conditions at Site 4 is extremely small due to the lack of COPCs.

5.4.4.5 *Summary of Site Conditions*

Lead was not identified as a COPC. No further action is necessary.

Table 5-16. Summary of Lead Detections in Surface Soil at ECP Site 4 – Rifle Range at Punta Puerca

											Number	Range	**Number**	**Range**	Number	Range	
Site ID	EPA Region III	**EPA Region III**	2x Average	4E-SS01	4E-SS02	4E-SS02	4E-SS03	4E-SS04	4E-SS05	4E-SS06	Exceeding	Exceeding	**Exceeding**	**Exceeding**	Exceeding	Exceeding	
Sample ID	Industrial	**Residential**	Detected	4E-SS01	4E-SS02	4E-SS02D	4E-SS03	4E-SS04	4E-SS05	4E-SS06	EPA Region III	EPA Region III	**EPA Region III**	**EPA Region III**	2x Average	2x Average	Location of
Sample Date	RBCs	**RBCs**	Background	05/05/04	05/05/04	05/05/04	05/05/04	05/05/04	05/05/04	05/05/04	Industrial	Industrial	**Residential**	**Residential**	Detected	Detected	Maximum
Sample Depth (ft bgs)	(mg/kg)	(mg/kg)	(mg/kg)	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	RBCs	RBCs	**RBCs**	**RBCs**	Background	Background	Detection
Lead (mg/kg)																	
Lead	400[1]	400[1]	15.25	6.5	5.3	7.8	6.2	8.7	3.1	3.4	0/7		0/7		0/7		4E-SS04

Note:

[1] - 1996 Soil Screening Guidance.
ft bgs - feet below ground surface.
mg/kg - milligrams per kilogram.

5.4.5 ECP Site 5

5.4.5.1 Site History and Description

This site is located on the east side of Forrestal Drive, and includes existing buildings 377, 2344, and 2345 (See Figure 5-62). The APA identified this area as PI Site 7, due to the observation of drums, vehicle racks, stains, and fuel islands from 1958-1985. The records review (historic maps), physical site inspection, and interviews all confirmed use as former vehicle maintenance and refueling area from the 1940s to the 1980s. Final disposition of suspected USTs at the fuel islands is unknown. Interviewees also confirmed that numerous spills and leaks of POL and HM occurred throughout the usage period. [See photos A-20 and A-21]

The site consists of a level area with the majority of the site paved. The site is surrounded by secondary growth vegetation. There also appears to be some small miscellaneous debris (i.e., 55-gallon drum, boat, etc.) located at this site.

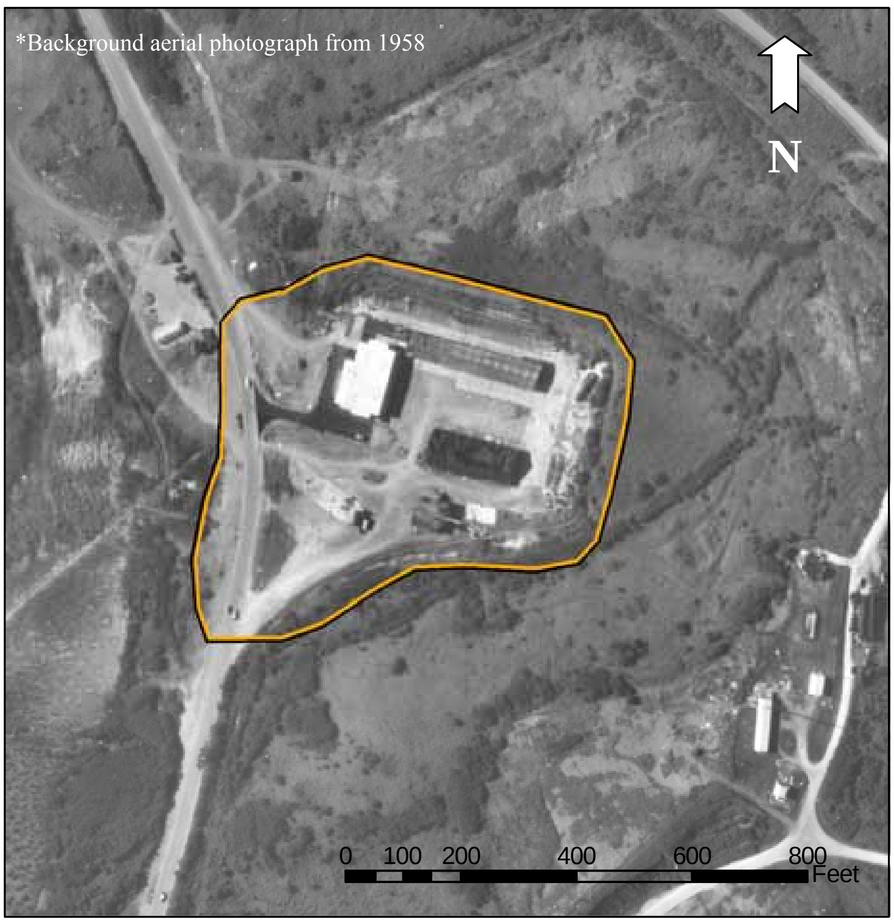


Figure 5-62. ECP Site 5 - Former Vehicle Maintenance and Refueling Area

5.4.5.2 Site Hydrogeology

During the Phase II ECP investigation, a large concrete pad was observed in the southwestern portion of the site, where the suspected USTs were believed to have been located at one point. Four fueling islands were observed within this concrete pad. However, after thoroughly searching the area using the procedures listed in the Phase II ECP Work Plan, no USTs were identified. There were no signs of any stressed vegetation observed during the investigation.

5.4.5.3 Field Investigation and Sampling Program

Two areas were investigated at ECP Site 5, including the former vehicle maintenance area, and the former refueling area.

As presented in the Phase II ECP Work Plan (NAVFAC Atlantic, 2004b), the sample locations at this site were field located with a hand held GPS receiver. There were no signs of staining or stressed vegetation observed at this site. Therefore, the originally proposed sample locations within the work plan were utilized.

The field crew thoroughly searched the former refueling area in an attempt to identify the location of the suspected USTs, as well as to determine if the USTs were still present at the site. Four vent pipes were located protruding from the large concrete pad containing the four former fuel stands. However, after utilizing the various methods listed in the Draft Phase II ECP Work Plan (NAVFAC Atlantic, 2004b), as well as interviewing personnel from TSI Inc. who work in the building located immediately north of the refueling area, the suspected USTs were not identified.

A total of eight soil borings (5E-01 through 5E-08) were advanced at ECP Site 5 as presented on Figure 5-63. Two soil borings (5E-07 and 5E-08) were advanced in the former refueling area, while six additional soil borings were advanced in former vehicle maintenance area.

150 0 75 150

1 inch = 150 ft.

LEGEND

- –1958 POLYGON FEATURE
- –1961 POLYGON FEATURE
- –1964 POLYGON FEATURE
- –1976 POLYGON FEATURE
- –1977 POLYGON FEATURE
- –1985 POLYGON FEATURE
- –1995 POLYGON FEATURE
- –SURFACE AND/OR SUBSURFACE SOIL SAMPLE LOCATION
- –SURFACE SOIL AND/OR SUBSURFACE SOIL, AND GROUNDWATER SAMPLE LOCATION
- –EXISTING MONITOR WELL LOCATION
- –ECP SITE BOUNDARY

SOURCE: GEO-MARINE, INC., SEPTEMBER 6, 2000.

Figure 5-63.
ECP Site 5 - Former Vehicle Maintenance and Refueling Area Sample Location Map

A minimum of two subsurface soil samples was obtained from each boring location (5E-01 through 5E-08). The depth of the soil borings at this site ranged from 10 feet bgs to 25.5 feet bgs. All surface and subsurface soil samples were screened in the field utilizing a PID and FID with the results recorded in the field logbook. The screening results were compared against background to indicate if the soil has been impacted by past operations. [See Appendix G for full PID and FID screening results on a per site basis.] Six surface soil and ten subsurface soil samples were submitted to the fixed-base analytical laboratory for full Appendix IX analysis.

A groundwater program followed the soil-sampling program, with the installation of two temporary monitor wells based on the field screening results of the subsurface soil. One temporary monitor well was installed at soil boring 5E-05, while another temporary monitor well was installed at soil boring location 5E-08. Groundwater samples were then collected from the two temporary monitor wells and the existing permanent monitor well within this area (13MW04) utilizing the low flow sampling technique, and submitted to the fixed-base analytical laboratory for full Appendix IX analysis.

5.4.5.4 Nature and Extent of Contamination

Six surface soil samples, ten subsurface soil samples from eight locations, and three groundwater environmental samples were collected from locations at the Former Vehicle Maintenance and Refueling Area as shown on Figure 5-63. One location (5E-08) for the groundwater samples was determined based on field screening of the soil samples. The other location was installed as indicated by the work plan (NAVFAC Atlantic, 2004b). Duplicate environmental samples were collected from one surface soil location and one groundwater location. The results of the analytical program can be seen in Tables 5-17 through 5-22.

In the surface soil, there were four VOCs, ten SVOCs, four pesticides, and sixteen inorganic compounds detected. Locations 5E-05 and 5E-06 have the most detections of VOCs, while location 5E-04 had the most detections of SVOCs. The pesticides were primarily concentrated at locations 5E-01 through 5E-04, along the northern edge of the site. Inorganic detections were similar throughout the site with the exception of a high lead concentration at location 5E-06 and a fairly high arsenic concentration at 5E-02.

Table 5-17. Summary or Organic Detections in Surface Soil at ECP Site 5 – Former Vehicle Maintenance and Refueling Area

Site ID	EPA Region III Industrial RBCs	EPA Region III Residential RBCs	5E-01		5E-02		5E-03		5E-04		5E-04		5E-05		5E-06		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 of Maximum Detection
Sample ID			5E-SS01		5E-SS02		5E-SS03		5E-SS04		5E-SS04D		5E-SS05		5E-SS06						
Sample Date			05/03/04		05/03/04		05/03/04		05/03/04		05/03/04		05/04/04		05/04/04						
Sample Depth (ft bgs)	(ug/kg)	(ug/kg)	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						
Volatile Organic Compounds (ug/kg)																					
Chloroform	1,000,000	78,000	5.2	U	6.5	U	6.3	U	7.9	U	7.3	U	4.2	J	4.6	J	0/7		0/7		5E-SS06
Tetrachloroethene	5,300	1,200	5.2	U	6.5	U	6.3	U	7.9	U	7.3	U	6.2	U	2.7	J	0/7		0/7		5E-SS06
Carbon tetrachloride	22,000	4,900	5.2	U	2.1	J	4.4	J	7.9	U	7.3	U	4.8	J	14		0/7		0/7		5E-SS06
Chlorobenzene	2,000,000	160,000	5.2	U	6.5	U	6.3	U	7.9	U	7.3	U	6.2	U	2.1	J	0/7		0/7		5E-SS06
Semivolatile Organic Compounds (ug/kg)																					
bis(2-Ethylhexyl)phthalate	200,000	46,000	390	U	440	U	450	U	550	U	550	U	460	U	110	J	0/7		0/7		5E-SS06
Butylbenzylphthalate	20,000,000	16,000,000	390	U	120	J	450	U	550	U	550	U	460	U	510	U	0/7		0/7		5E-SS02
Chrysene	390,000	87,000	390	U	440	U	450	U	60	J	56	J	460	U	510	U	0/7		0/7		5E-SS04
Fluoranthene	4,100,000	310,000	390	U	440	U	450	U	97	J	99	J	460	U	510	U	0/7		0/7		5E-SS04D
Pyrene	3,100,000	230,000	390	U	27	J	32	J	87	J	83	J	21	J	510	U	0/7		0/7		5E-SS04
Benzo(a)pyrene	390	87	390	U	440	U	450	U	69	J	550	U	460	U	510	U	0/7		0/7		5E-SS04
Benzo(b)fluoranthene	3,900	870	390	U	440	U	450	U	67	J	550	U	460	U	510	U	0/7		0/7		5E-SS04
3-Methylcholanthrene	NE	NE	390	U	440	U	450	U	63	J	550	U	460	U	510	U	NE		NE		5E-SS04
Benzo(g,h,i)perylene	NE	NE	390	U	440	U	36	J	66	J	55	J	460	U	52	J	NE		NE		5E-SS04
Benzo(k)fluoranthene	39,000	8,700	390	U	20	J	27	J	76	J	60	J	19	J	28	J	0/7		0/7		5E-SS04
Pesticides/PCBs (ug/kg)																					
Heptachlor	640	140	2	U	2.3	U	46	U	140	U	140	U	3	P	2.6	U	0/7		0/7		5E-SS05
4,4'-DDT	12,000	2,700	1.5	J	6.1		340		460		680		4.6	U	5.1	U	0/7		0/7		5E-SS04D
4,4'-DDE	8,400	1,900	1.9	J	6.5		610		1,400		1,600		4.6	U	1.3	J	0/7		0/7		5E-SS04D
4,4'-DDD	8,400	1,900	3.9	U	4.4	U	60	J	280	U	120	J	4.6	U	5.1	U	0/7		0/7		5E-SS04D
OP-Pesticides (ug/kg)																					
Not Detected																					
Chlorinated Herbicides (ug/kg)																					
Not Detected																					

Notes:

J - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
P - The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two GC columns or HPLC detectors.
NE - Not Established.
ft bgs - feet below ground surface.
ug/kg - micrograms per kilogram.

Table 5-18. Summary or Inorganic Detections in Surface Soil at ECP Site 5 – Former Vehicle Maintenance and Refueling Area

Site ID	EPA Region III Industrial RBCs	**EPA Region III Residential RBCs**	2x Average Detected Background	5E-01		5E-02		5E-03		5E-04		5E-04		5E-05		5E-06		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**	Number Exceeding 2x Average Detected Background	Range Exceeding 2x Average Detected Background	Location of Maximum Detection
Sample ID				5E-SS01		5E-SS02		5E-SS03		5E-SS04		5E-SS04D		5E-SS05		5E-SS06								
Sample Date				05/03/04		05/03/04		05/03/04		05/03/04		05/03/04		05/04/04		05/04/04								
Sample Depth (ft bgs)	(mg/kg)	(mg/kg)	(mg/kg)	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								
Appendix IX Inorganics (mg/kg)																								
Silver	510	39	0.37	1.1	U	1.2	U	0.68	B	0.26	B	0.23	B	1.2	U	1.5	U	0/7		0/7		1/7	0.68B	5E-SS03
Arsenic	1.9	0.43	2.4	**2**		**21**		**2.3**		1.5	U	**1.6**		1.2	U	**2.6**		4/7	2 - 21	5/7	1.6 - 21	2/6	2.6 - 21	5E-SS02
Barium	7,200	550	181	67	N	110	N	210	N	240	N	160	N	110	N	120	N	0/7		0/7		2/7	210N - 240N	5E-SS04
Beryllium	200	16	0.45	0.26	B	0.19	B	0.19	B	0.25	B	0.24	B	0.37	B	0.22	B	0/7		0/7		0/7		5E-SS05
Cadmium	100	7.8	0.27	0.18	B	1.5		2.3		1.2		1.1		0.62	U	0.4	B	0/7		0/7		5/7	0.4B - 2.3	5E-SS03
Cobalt	2,000	160	44.0	21		17		26		31		31		16		28		0/7		0/7		0/7		5E-SS04, 5E-SS04D
Chromium	310	23	59.3	**78**		**52**		**65**		**35**		**40**		**24**		**36**		0/7		7/7	24 - 78	2/7	65 - 78	5E-SS01
Copper	4,100	310	234	100	N	150	N	250	N	110	N	130	N	64	N	110	N	0/7		0/7		1/7	250N	5E-SS03
Nickel	2,000	160	16.6	49		19		31		26		26		8.7		26		0/7		0/7		6/7	19 - 49	5E-SS01
Lead	400(1)	400(1)	125	10		120		280		98		94		3.4		**1,100**		1/7	1,100	1/7	1,100	2/7	280 - 1,100	5E-SS06
Antimony	41	3.1	2.3	2.3	UN	1.1	BN	1.9	BN	2.4	BN	2.2	BN	2.5	UN	3	UN	0/7		0/7		1/7	2.4BN	5E-SS04
Tin	61,000	4,700	2.43	95		5.2	B	28		6.9	B	5.9	B	1.3	B	92		0/7		0/7		6/7	5.2B - 95	5E-SS01
Vanadium	100	7.8	355	**130**	N	**110**	N	**150**	N	**250**	N	**220**	N	**140**	N	**150**	N	7/7	110N - 250N	7/7	110N - 250N	0/7		5E-SS04
Zinc	31,000	2,300	125	78		210		930		280		290		49		160		0/7		0/7		5/7	160 - 930	5E-SS03
Cyanide	2,000	160	0.52	0.58	U	0.65	U	0.67	U	0.83	U	0.8	U	0.68	U	0.52	B	0/7		0/7		0/7		5E-SS06
Mercury	31(2)	2.3(2)	0.11	0.008	BN	0.047	N	0.24	N	0.054	N	0.044	N	0.015	BN	0.037	N	0/7		0/7		1/7	0.24N	5E-SS03

Notes:

B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.

N - The matrix spike recovery is not within control limtis.

U - The compound was analyzed for, but was not detected at or above the MDL/PQL.

(1) - 1996 Soil Screening Guidance.

(2) - Value based on the RBC for Mercuric Chloride.

NE - Not Established.

ft bgs - feet below ground surface.

mg/kg - milligrams per kilogram.

Table 5-19. Summary or Organic Detections in Subsurface Soil at ECP Site 5 – Former Vehicle Maintenance and Refueling Area

	EPA Region III Industrial RBCs (ug/kg)	**EPA Region III Residential RBCs** (ug/kg)	5E-01	5E-02	5E-03	5E-04	5E-05	5E-06	5E-07	5E-07	5E-08	5E-08	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 of Maximum Detection
Site ID			5E-01	5E-02	5E-03	5E-04	5E-05	5E-06	5E-07	5E-07	5E-08	5E-08					
Sample ID			5E-SB01-03	5E-SB02-02	5E-SB03-02	5E-SB04-02	5E-SB05-01	5E-SB06-02	5E-SB07-01	5E-SB07-06	5E-SB08-02	5E-SB08-04					
Sample Date			05/03/04	05/03/04	05/03/04	05/03/04	05/04/04	05/04/04	05/04/04	05/04/04	05/04/04	05/04/04					
Sample Depth (ft bgs)			5.00 - 7.00	3.00 - 5.00	3.00 - 5.00	3.00 - 5.00	1.00 - 3.00	3.00 - 5.00	1.00 - 3.00	11.00 - 13.00	3.00 - 5.00	7.00 - 9.00					
Volatile Organic Compounds (ug/kg)																	
Carbon tetrachloride	22,000	4,900	5.7 U	5.8 U	5.5 U	6.3 U	5.7 U	3.7 J	6.2 U	6.7 U	5.4 U	7 U	0/10		0/10		5E-SB06-02
Acetone	92,000,000	7,000,000	57 U	58 U	55 U	63 U	57 U	54 U	62 U	67 U	84	36 J	0/10		0/10		5E-SB08-02
Semivolatile Organic Compounds (ug/kg)																	
Chrysene	390,000	87,000	390 U	430 U	380 U	420 U	390 U	380 U	460 U	470 U	430 U	44 J	0/10		0/10		5E-SB08-04
Fluoranthene	4,100,000	310,000	390 U	430 U	380 U	420 U	390 U	380 U	460 U	470 U	40 J	98 J	0/10		0/10		5E-SB08-04
Phenanthrene	NE	NE	390 U	430 U	380 U	420 U	390 U	380 U	460 U	470 U	430 U	76 J	NE		NE		5E-SB08-04
Pyrene	3,100,000	230,000	390 U	430 U	380 U	420 U	390 U	380 U	460 U	470 U	30 J	78 J	0/10		0/10		5E-SB08-04
7,12-Dimethylbenz(a)anthracene	NE	NE	390 U	430 U	49 J	420 U	390 U	380 U	460 U	470 U	430 U	460 U	NE		NE		5E-SB03-02
3-Methylcholanthrene	NE	NE	390 U	430 U	64 J	420 U	29 J	380 U	460 U	470 U	430 U	460 U	NE		NE		5E-SB03-02
2-Acetylaminofluorene	NE	NE	390 U	430 U	46 J	420 U	390 U	380 U	460 U	470 U	430 U	460 U	NE		NE		5E-SB03-02
Benzo(k)fluoranthene	39,000	8,700	390 U	430 U	380 U	420 U	390 U	380 U	460 U	470 U	430 U	36 J	0/10		0/10		5E-SB08-04
Pesticides/PCBs (ug/kg)																	
Endosulfan sulfate	NE	NE	3.9 U	4.3 U	3.8 U	4.2 U	3.9 U	3.8 U	4.6 U	0.67 JP	4.3 U	4.6 U	NE		NE		5E-SB07-06
4,4'-DDT	12,000	2,700	3.9 U	4.3 U	4 U	36	3.9 U	3.8 U	4.6 U	4.7 U	4.3 U	4.6 U	0/10		0/10		5E-SB04-02
4,4'-DDE	8,400	1,900	3.9 U	4.3 U	4 U	4.9	3.9 U	3.8 U	4.6 U	4.7 U	4.3 U	4.6 U	0/10		0/10		5E-SB04-02
4,4'-DDD	8,400	1,900	3.9 U	4.3 U	4 U	2 J	3.9 U	3.8 U	4.6 U	4.7 U	1 JP	0.56 JP	0/10		0/10		5E-SB04-02
OP-Pesticides (ug/kg)																	
Not Detected																	
Chlorinated Herbicides (ug/kg)																	
2,4,5-TP	NE	NE	9.9 U	11 U	9.5 U	0.84 J	9.9 U	9.6 U	12 U	12 U	11 U	12 U	NE		NE		5E-SB04-02

Notes:

J - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.

U - The compound was analyzed for, but was not detected at or above the MDL/PQL.

P - The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two GC columns or HPLC detectors.

NE - Not Established.

ft bgs - feet below ground surface.

ug/kg - micrograms per kilogram.

Table 5-20. Summary or Inorganic Detections in Subsurface Soil at ECP Site 5 – Former Vehicle Maintenance and Refueling Area

Site ID / Sample ID / Sample Date / Sample Depth (ft bgs)	EPA Region III Industrial RBCs (mg/kg)	**EPA Region III Residential RBCs** (mg/kg)	2x Average Detected Background (mg/kg)	5E-01 5E-SB01-03 05/03/04 5.00 - 7.00	5E-02 5E-SB02-02 05/03/04 3.00 - 5.00	5E-03 5E-SB03-02 05/03/04 3.00 - 5.00	5E-04 5E-SB04-02 05/03/04 3.00 - 5.00	5E-05 5E-SB05-01 05/04/04 1.00 - 3.00	5E-06 5E-SB06-02 05/04/04 3.00 - 5.00	5E-07 5E-SB07-01 05/04/04 1.00 - 3.00	5E-07 5E-SB07-06 05/04/04 11.00 - 13.00	5E-08 5E-SB08-02 05/04/04 3.00 - 5.00	5E-08 5E-SB08-04 05/04/04 7.00 - 9.00	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**	Number Exceeding 2x Average Detected Background	Range Exceeding 2x Average Detected Background	Location of Maximum Detection
Appendix IX Inorganics (mg/kg)																				
Silver	510	39	0.46	0.18 B	1.2 U	0.16 B	0.16 B	1.1 U	1.1 U	0.17 B	1.3 U	1.2 U	1.3 U	0/10		0/10		0/10		5E-SB01-03
Arsenic	1.9	0.43	2.05	**1.6**	1.2 U	1 U	1.2 U	1.1 U	**1.4**	1.3 U	1.3 U	1.2 U	**1.4**	0/10		3/10	1.4 - 1.6	0/10		5E-SB01-03
Barium	7,200	550	222	210 N	130 N	89 N	190 N	130 N	160 N	110 N	100 N	140 N	54 N	0/10		0/10		0/10		5E-SB01-03
Beryllium	200	16	0.74	0.27 B	0.18 B	0.17 B	0.16 B	0.29 B	0.23 B	0.22 B	0.46 B	0.27 B	0.16 B	0/10		0/10		0/10		5E-SB07-06
Cadmium	100	7.8	0.74	0.35 B	0.6 U	0.67	0.4 B	0.56 U	0.23 B	0.67 U	0.64 U	0.62 U	0.65 U	0/10		0/10		0/10		5E-SB03-02
Cobalt	2,000	160	30.0	27	19	39	36	19	39	5.1	54	23	2.4	0/10		0/10		4/10	36 - 54	5E-SB07-06
Chromium	310	23	133	**77**	**52**	**68**	**55**	**30**	**29**	**41**	**46**	**70**	**56**	0/10		10/10	29 - 77	0/10		5E-SB01-03
Copper	4,100	310	193	21 N	79 N	110 N	55 N	63 N	110 N	99 N	100 N	85 N	85 N	0/10		0/10		0/10		5E-SB03-02, 5E-SB06-02
Nickel	2,000	160	31.9	30	26	28	24	18	14	8.6	19	21	8.1	0/10		0/10		0/10		5E-SB01-03
Lead	400[1]	400[1]	8.68	6.6	3.3	0.87	6.2	0.97	30	36	44	14	21	0/10		0/10		5/10	14 - 44	5E-SB07-06
Tin	61,000	4,700	2.96	1.2 B	1 B	2.4 B	2.5 B	3 B	2.8 B	3.9 B	2.5 B	6.2 U	3.3 B	0/10		0/10		3/10	3B - 3.9B	5E-SB07-01
Vanadium	100	7.8	462	**270** N	**120** N	**220** N	**240** N	**130** N	**210** N	**200** N	**410** N	**160** N	**300** N	10/10	120N - 410N	10/10	120N - 410N	0/10		5E-SB07-06
Zinc	31,000	2,300	88.6	200	80	88	95	59	100	55	140	140	42	0/10		0/10		5/10	95 - 200	5E-SB01-03
Cyanide	2,000	160	0.63	0.58 U	0.63 U	0.55 U	0.62 U	0.57 U	2.1	0.67 U	0.69 U	0.63 U	0.7 U	0/10		0/10		1/10	2.1	5E-SB06-02
Sulfide	NE	NE	32.58	30 U	33 U	29 U	32 U	30 U	29 U	35 B	36 U	33 U	35 U	NE		NE		0/10		5E-SB07-01
Mercury	31[2]	2.3[2]	0.093	0.02 UN	0.02 UN	0.02 UN	0.01 BN	0.01 BN	0.02 UN	0.04 N	0.03 UN	0.02 BN	0.06 N	0/10		0/10		0/10		5E-SB08-04

Notes:

B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.

N - The matrix spike recovery is not within control limtis.

U - The compound was analyzed for, but was not detected at or above the MDL/PQL.

(1) - 1996 Soil Screening Guidance.

(2) - Value based on the RBC for Mercuric Chloride.

NE - Not Established.

ft bgs - feet below ground surface.

mg/kg - milligrams per kilogram.

Table 5-21. Summary or Organic Detections in Groundwater at ECP Site 5 – Former Vehicle Maintenance and Refueling Area

Site ID	Federal MCLs	**EPA Region III Tap Water RBCs**	PR Water Quality Standards	13MW04		13MW04		5E-05		5E-08		Number Exceeding Federal MCLs	Range Exceeding Federal MCLs	**Number Exceeding EPA Region III Tap Water RBCs**	**Range Exceeding EPA Region III Tap Water RBCs**	Number Exceeding PR Water Quality Standards	Range Exceeding PR Water Quality Standards	Location of Maximum Detection
Sample ID				13GW04		13GW04D		5E-GW05		5E-GW08								
Sample Date	(ug/L)	(ug/L)	(ug/L)	05/06/04		05/06/04		05/07/04		05/06/04								
Volatile Organic Compounds (ug/L)																		
2-Butanone	NE	700	NE	10	U	10	U	1.4	J	10	U	NE		0/4		NE		5E-GW05
Iodomethane	NE	NE	NE	1	U	1	U	1	U	0.41	J	NE		NE		NE		5E-GW08
Acetone	NE	550	NE	25	U	25	U	21	J	25	U	NE		0/4		NE		5E-GW05
Carbon disulfide	NE	100	NE	1	U	1	U	1	U	0.69	J	NE		0/4		NE		5E-GW08
Semivolatile Organic Compounds (ug/L)																		
Acenaphthene	NE	37	NE	10	U	10	U	15	U	1.1	J	NE		0/4		NE		5E-GW08
Fluoranthene	NE	150	NE	10	U	10	U	15	U	1.5	J	NE		0/4		NE		5E-GW08
Anthracene	NE	180	NE	10	U	10	U	15	U	0.57	J	NE		0/4		NE		5E-GW08
Phenanthrene	NE	NE	NE	10	U	10	U	15	U	3	J	NE		NE		NE		5E-GW08
Pesticides/PCBs (ug/L)																		
Heptachlor epoxide	0.2	0.0074	NE	0.05	U	0.05	U	**0.02**	JP	0.05	U	0/4		1/4	0.02JP	NE		5E-GW05
OP-Pesticides (ug/L)																		
Not Detected																		
Chlorinated Herbicides (ug/L)																		
Not Detected																		

Notes:

J - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.

U - The compound was analyzed for, but was not detected at or above the MDL/PQL.

P - The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two GC columns or HPLC detectors.

ug/L - micrograms per liter.

NE - Not Established.

Table 5-22. Summary or Inorganic Detections in Groundwater at ECP Site 5 – Former Vehicle Maintenance and Refueling Area

Site ID	Federal MCLs	EPA Region III Tap Water RBCs	PR Water Quality Standards	13MW04		13MW04		5E-05		5E-08		Number Exceeding Federal MCLs	Range Exceeding Federal MCLs	Number Exceeding EPA Region III Tap Water RBCs	Range Exceeding EPA Region III Tap Water RBCs	Number Exceeding PR Water Quality Standards	Range Exceeding PR Water Quality Standards	Location of Maximum Detection
Sample ID				13GW04		13GW04D		5E-GW05		5E-GW08								
Sample Date	(mg/L)	(mg/L)	(mg/L)	05/06/04		05/06/04		05/07/04		05/06/04								
Appendix IX Dissolved Inorganics (mg/L)																		
Barium	2	0.26	NE	0.029		0.027		0.095		**0.27**		0/4		1/4	0.27	NE		5E-GW08
Cobalt	NE	0.073	NE	0.01	U	0.01	U	0.01	U	0.004	B	NE		0/4		NE		5E-GW08
Chromium	0.1	0.011	NE	0.01	U	0.01	U	0.0055	B	0.01	U	0/4		0/4		NE		5E-GW05
Copper	1.3 (1)	0.15	1.3	0.02	U	0.02	U	0.01	B	0.005	B	0/4		0/4		0/4		5E-GW05
Nickel	NE	0.073	NE	0.04	U	0.04	U	0.0028	B	0.004	B	NE		0/4		NE		5E-GW08
Vanadium	NE	0.0037	NE	**0.035**		**0.04**		**0.017**		**0.017**		NE		4/4	0.017 - 0.04	NE		13GW04D
Mercury	0.002	0.0011 (2)	0.002	2E-04	UN	2E-04	UN	0.000084	B	0.002	U	0/4		0/4		0/4		5E-GW05
Appendix IX Total Inorganics (mg/L)																		
Barium	2	0.26	NE	0.026		0.025		NA		NA		0/4		0/4		NE		13GW04
Vanadium	NE	0.0037	NE	**0.043**		**0.042**		NA		NA		NE		2/4	0.042 - 0.043	NE		13GW04

Notes:

B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.

N - The matrix spike recovery is not within control limtis.

U - The compound was analyzed for, but was not detected at or above the MDL/PQL.

(1) - EPA action level.

(2) - Value based on the Tap Water RBC for Mercuric Chloride.

NE - Not Established.

mg/L - milligrams per liter.

NA - Not Analyzed.

In the subsurface soil, there were two VOCs, eight SVOCs, four pesticides and one chlorinated herbicide detected. Sixteen inorganic compounds were detected in the subsurface soil. Location 5E-08 had the highest concentrations of VOCs (acetone) and well as SVOCs. This is not coincident with the surface soil detections as surface soil samples were not taken at 5E-08 due to the presence of a concrete pad. The highest concentrations of pesticides were found at 5E-04 at a depth of 3-5 feet bgs. This is also the location of the highest surface soil concentrations of pesticides. A very low, estimated concentration of 2,4,5-TP was found at location 5E-04. Inorganic concentrations were similar throughout the site.

Groundwater environmental samples detected four VOCs, four SVOCs, and one pesticide. Seven inorganic compounds were also detected. Acetone and 2-butanone were detected in 5E-05, as well as heptachlor epoxide. The remaining organic compounds were detected at 5E-08.

In general, the VOCs detected in the soil are associated with chlorinated compounds. Acetone was also found in the subsurface soil. The SVOCs detected in the soil are primarily polynuclear aromatic hydrocarbons (PAHs) associated with fuel contamination. Pesticides found in the soil at the site are likely a result of the proximity of the site to SWMU 13 and SWMU 53, both of which have documented incidences of pesticide spills (NAVFAC Atlantic, 2004a). During the field investigation, a fuel odor was noted during groundwater sampling at 5E-08, but fuel compounds were not detected. Low dissolved oxygen (less than 1.0 milligrams per liter [mg/L]) was noted in the groundwater at 13MW04, indicating biological activity in the groundwater in this area. However, no detections of compounds were found in this well.

Comparison to criteria was done with all the results as shown in Tables 5-17 through 5-22. Heptachlor epoxide in the groundwater was the only exceedance of an organic compound. This compound exceeded the EPA Region III Tap Water RBC. Inorganic exceedance of RBCs was found for the compounds arsenic (soil), barium (groundwater), chromium (soil), lead (soil), and vanadium (soil and groundwater). Arsenic, chromium, and lead exceeded twice the average detected background concentrations, but only in the surface soil matrix. Vanadium exceeded both the industrial and the residential RBCs, but is naturally present in the soil at NSRR.

From the detections of fuel related compounds, chlorinated compounds, and pesticides at this site, as well as exceedances of criteria for arsenic, lead, and heptachlor epoxide, it is concluded that the soil at this site has been impacted by previous activities. Based on the limited groundwater investigation and observations noted during the field event, it is tentatively concluded that the groundwater may also have been impacted by previous activities.

5.4.5.5 *Qualitative Risk Assessment*

COPC Identification

No organic COPCs were identified in surface soil from Site 5. Arsenic, chromium, and lead were the only inorganic analytes identified as COPCs in surface soil with detected concentrations in excess of the residential RBCs and base background criteria.

No COPCs were identified in subsurface soil.

In groundwater, heptachlor epoxide, barium, and vanadium were identified as COPCs because they exceeded residential tap water RBCs.

Potential Risk Discussion

The reasonably anticipated land use for the future at Site 5 can be approximated by the industrial/commercial use. This land use can be qualitatively assessed by comparing the data to industrial RBCs. The chromium concentrations in surface soil do not exceed the industrial RBC but the arsenic concentrations exceed the industrial RBC and the lead concentration exceeds the lead soil screening criteria. One of the arsenic concentrations (21 mg/kg) is nearly ten times the base background concentration, suggesting that it may represent site-related contamination. However, data collected by the USGS to establish background concentrations in soil for Puerto Rico include a maximum concentration of 22 mg/kg (Baker, 2003). The lead concentration in one sample of 1,100 mg/kg definitely represents site-related contamination. Exposure to lead at high levels can damage children's ability to learn. Although long-term exposure to lead at Site 5 by children is unlikely, and a single sample does not reflect the probable exposure point concentration, this high concentration does pose a potential human health concern.

The potential risk posed by exposure to subsurface soil at Site 5 is extremely small due to the lack of COPCs.

Potential exposure to groundwater at NSRR is unlikely. Groundwater is not currently used for potable purposes because drinking water is available from El Yunque which supplies all of NSRR's present needs. The most likely exposure route to groundwater is from inhalation of vapors emitted from volatile organics through the overlying soil, particularly into buildings. None of the Site 5 groundwater COPCs are volatile. Furthermore, the RBCs used to select barium and vanadium as COPCs are based on noncarcinogenic toxicity criteria set at one-tenth of the level considered acceptable by EPA to account for potential additive effects of multiple contaminants. As there are only two noncarcinogenic COPCs in groundwater at Site 5, the single contaminant RBC can be used for comparison, which is ten times higher than the tap water RBCs presented in Tables 5-17 through 5-22. The sample with elevated barium concentration (0.27 mg/L) is less than the single contaminant tap water RBC (based on the unlikely but assumed exposure via ingestion of groundwater) of 2.6 mg/L, as well as the MCL established for drinking water supplies. The vanadium levels in groundwater are probably a result of leaching from the generally high levels of vanadium in soil at NSRR and only one of four detections (0.04 mg/L) exceeds the single contaminant tap water RBC of 0.037 mg/L. Heptachlor epoxide was detected in only one of four samples at an estimated concentration less than one-half of the reporting limit (0.02 JP µg/L) and is therefore of uncertain concentration (given the P modifier in Table 5-21). This concentration is also less than the MCL established for drinking water supplies. Groundwater at Site 5 does not appear to pose a potential human health concern due to the unlikelihood of exposure and the low concentrations of COPCs even if the groundwater were to be used for potable purposes in the future.

5.4.5.6 Summary of Site Conditions

At ECP Site 5, it was determined that previous activities have impacted the environment. Analytical data from the surface soil indicates that one location (5E-06) poses a potential human health hazard due to an elevated concentration of lead. All other locations had lead concentrations well below the 1996 Soil Screening Guidance. Other COPCs evaluated were arsenic and chromium exposure scenario. At location 5E-04, pesticides were detected in the surface soil at concentrations around 20 percent of the industrial RBCs and 80 percent of the residential RBC, in soil, and pesticides, barium, and vanadium in groundwater. All these compounds exceeded residential RBCs. Arsenic was assumed to be within background concentrations, and chromium was evaluated under an unlikely exposure scenario, therefore, these two constituents were not included in the COPC list.

Further investigation at this site will be conducted under the RCRA Corrective Action/IRP process.

5.4.6 ECP Site 6

5.4.6.1 Site History and Description

This site is located in the immediate area of the base marina (see Figure 5-64). The APA identified this area as PI Site 9, due to the observation of solid waste and scrap metal piles in 1958. The records review (historic maps) and interviews confirmed former use of this area as a landfill from approximately the 1940s to the 1960s. The physical site inspection observed only small quantities of scrap metal in the area, the majority of which is now covered by the marina. The portion of the site not covered by the marina consists of a level area described as estuarine intertidal scrub-shrub broad-leaved evergreen. [See photos A-22 and A-23]

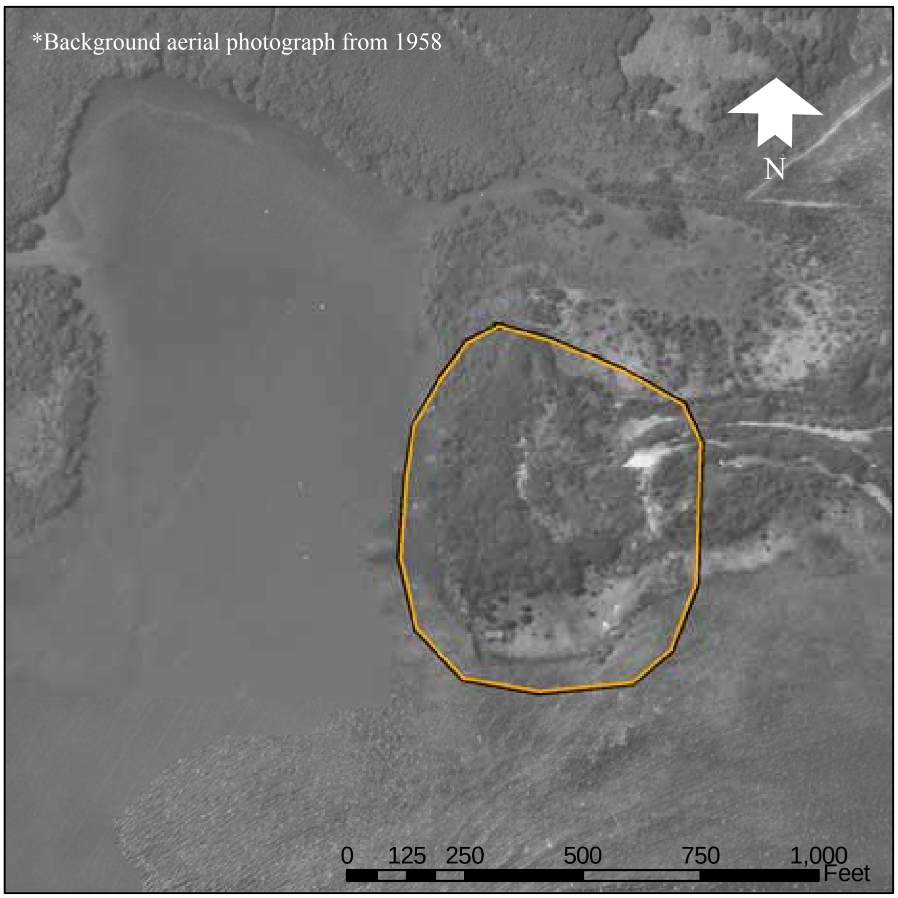


Figure 5-64. ECP Site 6 - Former Landfill at Marina

5.4.6.2 *Site Hydrogeology*

ECP Site 6 is located in near-shore flat lands. Approximately 3- to 4-feet of fill underlies the site. The fill material consists of sand, silt, and/or clay. The fill is underlain by marine sand, silt, and/or clay. Groundwater was generally observed to be shallow (less than 4-feet bgs), except at temporary well 6-TW01 where water was observed at approximately 9-feet bgs. The water table appears to be locally confined due to the presence of silt and clay layers. Bedrock was not encountered at the site.

5.4.6.3 *Field Investigation and Sampling Program*

The area in the vicinity of the former landfill at the marina was investigated at ECP Site 6. The sample locations at this site were field located with a hand held GPS receiver. There were no signs of staining or stressed vegetation observed at this site. Therefore, the originally proposed sample locations within the Phase II ECP Work Plan (NAVFAC Atlantic, 2004b) were utilized.

A total of three soil borings (6E-01, 6E-02, and 6E-03) were advanced at this site as presented on Figure 6-65. A minimum of two subsurface soil samples was obtained from each boring location. The depth of the soil borings at this site ranged from 5 feet bgs to 15 feet bgs. All surface and subsurface soil samples were screened in the field utilizing a PID and FID with the results recorded in the field logbook. The screening results were compared against background to indicate if the soil has been impacted by past operations. [See Appendix G for full PID and FID screening results on a per site basis.]

One surface soil sample (6E-SS03) was collected at soil boring location 6E-03 as mentioned above, while subsurface soil samples (6E-SB01-02, 6E-SB02-01, and 6E-SB03-01) were collected from each soil boring. These samples were submitted to the fixed-base analytical laboratory for full Appendix IX analysis.

A groundwater program followed the soil sampling program, with the installation of two temporary monitor wells (6E-01 and 6E-02) as shown on Figure 5-65. There were no levels of contamination observed based on the readings taken from the FID and PID. Therefore, the proposed locations of the temporary monitor wells within the work plan were used. The groundwater samples were then collected from the two temporary monitor wells utilizing a modified version of the low flow sampling technique, and submitted to the fixed-base analytical laboratory for full Appendix IX analysis.

LEGEND

- 1958 POLYGON FEATURE
- SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
- SURFACE WATER AND SEDIMENT SAMPLE LOCATION
- SUBSURFACE SOIL AND GROUNDWATER SAMPLE LOCATION
- ECP SITE BOUNDARY

SOURCE: GEO-MARINE, INC., SEPTEMBER 6, 2000.

Figure 5-65.
ECP Site 6 - Former Landfill at Marina Sample Location Map

A total of two surface water and sediment sample locations were established off of the southern and western coasts of this site based on the past site practices. One surface water/sediment sample location (6E-SW/SD02) was located immediately south of the site and the eastern polygon, while the other surface water/sediment sample location (6E-SW/SD01) was located west of the site as presented on Figure 5-65. Each sediment sample was collected to a depth of 0.0 to 0.5 feet bgs. All surface water and sediment samples were submitted to the fixed-base analytical laboratory for full Appendix IX analysis.

5.4.6.4 Nature and Extent of Contamination

One surface soil sample, three subsurface soil samples, two groundwater samples, and two surface water and sediment samples were collected from locations at the Former Landfill at the Marina as shown on Figure 5-65. The locations of the groundwater samples were co-located with the subsurface soil samples at 6E-01 and 6E-02 as specified in the work plan (NAVFAC Atlantic, 2004b). The FID results for location 6E-02 indicated a slight elevation in organic vapor above background. The results of the analytical program can be seen in Tables 5-23 through 5-31.

In the surface soil at location 6E-03, there were two VOCs, four SVOCs, and two pesticides detected. Thirteen inorganics were detected in the surface soil as well. All of the VOC, SVOC, and pesticide detections were low and estimated.

The subsurface soil locations indicated that three VOCs, three SVOCs, and three pesticides were present. Fifteen inorganic compounds were also found in the subsurface soil. Toluene and xylene were detected at 6E-03, and carbon disulfide was seen at location 6E-01. SVOCs were primarily present at location 6E-03 and 6E-01. At 6E-03, the concentrations were higher in the subsurface soil than in the surface soil sample from that same location. Pesticides were present at all three locations, again with higher concentrations in the subsurface soil than in the surface soil. The slight elevation in the FID reading in the subsurface soil at location 6E-02 was not confirmed with any volatile detection. Inorganic detections were similar at all locations. With the exception of zinc, lead, arsenic and cadmium, detections in the subsurface soil were lower than in the surface soil.

Groundwater samples indicated that four VOCs, one SVOC, and seven inorganic compounds are present in the groundwater, with the organics detected primarily at location 6E-01. All organic concentrations are low and estimated. Toluene is present at location 6E-01 and is not co-located with the toluene present in the subsurface soil.

Table 5-23. Summary or Organic Detections in Surface Soil at ECP Site 6 – Former Landfill at the Marina

Site ID	EPA Region III	**EPA Region III**	6E-03		6E-03		Number Exceeding	Range Exceeding	**Number Exceeding**	**Range Exceeding**	
Sample ID	Industrial	**Residential**	6E-SS03		6E-SS03D		EPA Region III	EPA Region III	**EPA Region III**	**EPA Region III**	Location of
Sample Date	RBCs	**RBCs**	05/07/04		05/07/04		Industrial	Industrial	**Residential**	**Residential**	Maximum
Sample Depth (ft bgs)	(ug/kg)	(ug/kg)	0.00 - 0.50		0.00 - 0.50		RBCs	RBCs	**RBCs**	**RBCs**	Detection
Volatile Organic Compounds (ug/kg)											
Chlorobenzene	2,000,000	160,000	4.5	U	2.5	J	0/2		0/2		6E-SS03D
Tetrachloroethene	5,300	1,200	4.5	U	2.2	J	0/2		0/2		6E-SS03D
Semivolatile Organic Compounds (ug/kg)											
Fluoranthene	4,100,000	310,000	57	J	42	J	0/2		0/2		6E-SS03
Indeno(1,2,3-cd)pyrene	3,900	870	58	J	370	U	0/2		0/2		6E-SS03
Benzo(g,h,i)perylene	NE	NE	58	J	370	U	NE		NE		6E-SS03
Pyrene	3,100,000	230,000	48	J	43	J	0/2		0/2		6E-SS03
Pesticides/PCBs (ug/kg)											
4,4'-DDE	8,400	1,900	2.8	J	3	J	0/2		0/2		6E-SS03D
4,4'-DDT	8,400	1,900	3.6	U	0.76	JP	0/2		0/2		6E-SS03D
OP-Pesticides (ug/kg)											
Not Detected											
Chlorinated Herbicides (ug/kg)											
Not Detected											

Notes:

J - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.

U - The compound was analyzed for, but was not detected at or above the MDL/PQL.

P - The GC or HPLC confirmation criteria was exceeded. The realtive percent difference is greater than 40% between the two GC columns or HPLC detectors.

NE - Not Established.

ft bgs - feet below ground surface.

ug/kg - micrograms per kilogram.

Table 5-24. Summary or Inorganic Detections in Surface Soil at ECP Site 6 – Former Landfill at the Marina

								Number	Range	**Number**	**Range**			
	EPA	**EPA**						Exceeding	Exceeding	**Exceeding**	**Exceeding**	Number	Range	
Site ID	Region III	**Region III**	2x Average	6E-03		6E-03		EPA	EPA	**EPA**	**EPA**	Exceeding	Exceeding	
Sample ID	Industrial	**Residential**	Detected	6E-SS03		6E-SS03D		Region III	Region III	**Region III**	**Region III**	2x Average	2x Average	Location of
Sample Date	RBCs	**RBCs**	Background	05/07/04		05/07/04		Industrial	Industrial	**Residential**	**Residential**	Detected	Detected	Maximum
Sample Depth (ft bgs)	(mg/kg)	(mg/kg)	(mg/kg)	0.00 - 0.50		0.00 - 0.50		RBCs	RBCs	**RBCs**	**RBCs**	Background	Background	Detection
Appendix IX Inorganics (mg/kg)														
Zinc	31,000	2,300	125	60		63		0/2		0/2		0/2		6E-SS03D
Lead	400(1)	400(1)	125	15		16		0/2		0/2		0/2		6E-SS03D
Arsenic	1.9	0.43	2.4	**2.1**		**2.1**		2/2	2.1 - 2.1	2/2	2.1 - 2.1	0/2		63-SS03, 6E-SS03D
Barium	7,200	550	181	110		89		0/2		0/2		0/2		6E-SS03
Beryllium	200	16	0.45	0.22	B	0.22	B	0/2		0/2		0/2		63-SS03, 6E-SS03D
Cobalt	2,000	160	44.0	18	E	15	E	0/2		0/2		0/2		6E-SS03
Cadmium	100	7.8	0.27	0.085	B	0.076	B	0/2		0/2		0/2		6E-SS03
Chromium	310	23	59.3	18		21		0/2		0/2		0/2		6E-SS03D
Copper	4,100	310	234	91		98		0/2		0/2		0/2		6E-SS03D
Nickel	2,000	160	16.6	8.8		8.7		0/2		0/2		0/2		6E-SS03
Tin	61,000	4,700	2.43	2	B	2.9	B	0/2		0/2		1/2	2.9B	6E-SS03D
Vanadium	100	7.8	355	**120**		**120**		0/2		2/2	120 - 120	0/2		63-SS03, 6E-SS03D
Mercury	31(2)	2.3(2)	0.11	0.02		0.017	B	0/2		0/2		0/2		6E-SS03
Notes:														
B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.														
E - The reported value is an estimated because of the presence of matrix interference.														
(1) - 1996 Soil Screening Guidance.														
(2) - Value based on the RBC for Mercuric Chloride.														
NE - Not Established.														
ft bgs - feet below ground surface.														
mg/kg - milligrams per kilogram.														

Table 5-25. Summary or Organic Detections in Subsurface Soil at ECP Site 6 – Former Landfill at the Marina

									Number	Range	**Number**	**Range**	
	EPA	**EPA**							Exceeding	Exceeding	**Exceeding**	**Exceeding**	
Site ID	Region III	**Region III**	6E-01		6E-02		6E-03		EPA	EPA	**EPA**	**EPA**	
Sample ID	Industrial	**Residential**	6E-SB01-02		6E-SB02-01		6E-SB03-01		Region III	Region III	**Region III**	**Region III**	Location of
Sample Date	RBCs	**RBCs**	05/07/04		05/07/04		05/07/04		Industrial	Industrial	**Residential**	**Residential**	Maximum
Sample Depth (ft bgs)	(ug/kg)	(ug/kg)	3.00 - 5.00		1.00 - 3.00		1.00 - 3.00		RBCs	RBCs	**RBCs**	**RBCs**	Detection
Volatile Organic Compounds (ug/kg)													
Carbon disulfide	10,000,000	780,000	3.5	J	5.8	U	5.4	U	0/3		0/3		6E-SB01-02
Toluene	20,000,000	1,600,000	5.7	U	5.8	U	6.3		0/3		0/3		6E-SB03-01
Xylene	20,000,000	1,600,000	11	U	12	U	4.8	J	0/3		0/3		6E-SB03-01
Semivolatile Organic Compounds (ug/kg)													
Fluoranthene	4,100,000	310,000	390	U	400	U	77	J	0/3		0/3		6E-SB03-01
Benzo(g,h,i)perylene	NE	NE	390	U	400	U	35	J	NE		NE		6E-SB03-01
Pyrene	3,100,000	230,000	42	J	400	U	58	J	0/3		0/3		6E-SB03-01
Pesticides/PCBs (ug/kg)													
4,4'-DDD	12,000	2,700	30		1.5	J	41		0/3		0/3		6E-SB03-01
4,4'-DDE	8,400	1,900	46		14		60		0/3		0/3		6E-SB03-01
4,4'-DDT	8,400	1,900	210	D	0.98	J	1.2	JP	0/3		0/3		6E-SB01-02
OP-Pesticides (ug/kg)													
Not Detected													
Chlorinated Herbicides (ug/kg)													
Not Detected													

Notes:

J - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
P - The GC or HPLC confirmation criteria was exceeded. The realtive percent difference is greater than 40% between the two GC columns or HPLC detectors.
D - The reported result is from a secondary dilution.
NE - Not Established.
ft bgs - feet below ground surface.
ug/kg - micrograms per kilogram.

Table 5-26. Summary or Inorganic Detections in Subsurface Soil at ECP Site 6 – Former Landfill at the Marina

Site ID	EPA Region III Industrial RBCs (mg/kg)	**EPA Region III Residential RBCs** (mg/kg)	2x Average Detected Background (mg/kg)	6E-01	6E-02	6E-03	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**	Number Exceeding 2x Average Detected Background	Range Exceeding 2x Average Detected Background	Location of Maximum Detection
Sample ID				6E-SB01-02	6E-SB02-01	6E-SB03-01							
Sample Date				05/07/04	05/07/04	05/07/04							
Sample Depth (ft bgs)				3.00 - 5.00	1.00 - 3.00	1.00 - 3.00							
Appendix IX Inorganics (mg/kg)													
Zinc	31,000	2,300	88.6	100	94	56	0/3		0/3		2/3	94 - 100	6E-SB01-02
Lead	400(1)	400(1)	8.68	20	63	16	0/3		0/3		3/3	16 - 63	6E-SB02-01
Arsenic	1.9	0.43	2.05	**1.6**	**3.3**	**2.9**	2/3	2.9 - 3.3	3/3	1.6 - 3.3	2/3	2.9 - 3.3	6E-SB02-01
Barium	7,200	550	222	76	62	49	0/3		0/3		0/3		6E-SB01-02
Beryllium	200	16	0.74	0.17 B	0.11 B	0.16 B	0/3		0/3		0/3		6E-SB01-02
Cobalt	2,000	160	30.0	11 E	6.4 E	9.4 E	0/3		0/3		0/3		6E-SB01-02
Cadmium	100	7.8	0.74	0.28 B	0.31 B	0.22 B	0/3		0/3		0/3		6E-SB02-01
Chromium	310	23	133	12	14	16	0/3		0/3		0/3		6E-SB03-01
Copper	4,100	310	193	84	82	65	0/3		0/3		0/3		6E-SB01-02
Nickel	2,000	160	31.9	6.2	4.9	8.3	0/3		0/3		0/3		6E-SB03-01
Antimony	41,000	3,100	2.8	2.3 U	1.4 B	2.3 U	0/3		0/3		0/3		6E-SB02-01
Tin	61,000	4,700	2.96	3.6 B	4 B	2.6 B	0/3		0/3		2/3	3.6B - 4B	6E-SB02-01
Vanadium	100	7.8	462	**94**	**47**	**68**	0/3		3/3	47 - 94	0/3		6E-SB01-02
Mercury	31(2)	2.3(2)	0.093	0.057 S	0.03	0.025	0/3		0/3		0/3		6E-SB01-02
Sulfide	NE	NE	32.58	30 B	30 B	31 U	NE		NE		0/3		6E-SB01-02, 6E-SB02-01

Notes:

B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
E - The reported value is an estimated because of the presence of matrix interference.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
S - The result was determined by Method of Standard Addition.
(1) - 1996 Soil Screening Guidance.
(2) - Value based on the RBC for Mercuric Chloride.
NE - Not Established.
ft bgs - feet below ground surface.
mg/kg - milligrams per kilogram.

Table 5-27. Summary or Organic Detections in Groundwater at ECP Site 6 – Former Landfill at the Marina

Site ID Sample ID Sample Date	Federal MCLs (ug/L)	**EPA Region III Tap Water RBCs** (ug/L)	PR Water Quality Standards (ug/L)	6E-01 6E-GW01 05/09/04		6E-02 6E-GW02 05/09/04		Number Exceeding Federal MCLs	Range Exceeding Federal MCLs	**Number Exceeding EPA Region III Tap Water RBCs**	**Range Exceeding EPA Region III Tap Water RBCs**	Number Exceeding PR Water Quality Standards	Range Exceeding PR Water Quality Standards	Location of Maximum Detection
Volatile Organic Compounds (ug/L)														
Acetone	NE	550	NE	7.8	J	25	U	NE		0/2		NE		6E-GW01
2-Butanone	NE	700	NE	1.8	J	10	U	NE		0/2		NE		6E-GW01
Carbon disulfide	NE	100	NE	0.77	J	1	U	NE		0/2		NE		6E-GW01
Toluene	1,000	75	1,000	0.93	J	0.93	J	0/2		0/2		0/2		6E-GW01, 6E-GW02
Semivolatile Organic Compounds (ug/L)														
Cresol, m & p	NE	NE	NE	5	J	10	U	NE		NE		NE		6E-GW01
Pesticides/PCBs (ug/L)														
Not Detected														
OP-Pesticides (ug/L)														
Not Detected														
Chlorinated Herbicides (ug/L)														
Not Detected														

Notes:

J - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.

U - The compound was analyzed for, but was not detected at or above the MDL/PQL.

ug/L - micrograms per liter.

NE - Not Established.

Table 5-28. Summary or Inorganic Detections in Groundwater at ECP Site 6 – Former Landfill at the Marina

Site ID Sample ID Sample Date	Federal MCLs (mg/L)	**EPA Region III Tap Water RBCs** (mg/L)	PR Water Quality Standards (mg/L)	6E-01 6E-GW01 05/09/04		6E-02 6E-GW02 05/09/04		Number Exceeding Federal MCLs	Range Exceeding Federal MCLs	**Number Exceeding EPA Region III Tap Water RBCs**	**Range Exceeding EPA Region III Tap Water RBCs**	Number Exceeding PR Water Quality Standards	Range Exceeding PR Water Quality Standards	Location of Maximum Detection
Appendix IX Inorganics (mg/L)														
Mercury	0.002	0.0011 (2)	0.002	0.0005	B	0.002	U	0/2		0/2		0/2		6E-GW01
Barium	2	0.26	NE	0.18		**0.33**		0/2		1/2	0.33	NE		6E-GW02
Cobalt	NE	0.073	NE	0.01	U	0.0084	B	NE		0/2		NE		6E-GW02
Chromium	0.1	0.011	NE	0.0016	B	0.01	U	0/2		0/2		NE		6E-GW01
Copper	1.3 (1)	0.15	1.3	0.1	U	0.0075	B	0/2		0/2		0/2		6E-GW02
Nickel	NE	0.073	NE	0.04	U	0.0049	B	NE		0/2		NE		6E-GW02
Vanadium	NE	0.0037	NE	**0.015**	B	0.0024	B	NE		1/2	0.015B	NE		6E-GW01

Notes:

B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.

U - The compound was analyzed for, but was not detected at or above the MDL/PQL.

(1) - EPA action level.

(2) - Value based on the Tap Water RBC for Mercuric Chloride.

NE - Not Established.

mg/L - milligrams per liter.

Table 5-29. Summary or Organic Detections in Sediment at ECP Site 6 – Former Landfill at the Marina

	Marine Sediment Screening Values					Number Exceeding Marine Sediment Screening Values	Range Exceeding Marine Sediment Screening Values	Location of Maximum Detection
Site ID		6E-SW/SD01		6E-SW/SD02				
Sample ID		6E-SD01		6E-SD02				
Sample Date		05/14/04		05/14/04				
Sample Depth (ft bgs)	(ug/kg)	0.00 - 0.50		0.00 - 0.50				
Volatile Organic Compounds (ug/kg)								
Not Detected								
Semivolatile Organic Compounds (ug/kg)								
bis(2-Ethylhexyl)phthalate	182	370	J	770	U	1/2	370J	6E-SD01
Chrysene	108	230	J	770	U	1/2	230J	6E-SD01
Fluoranthene	113	270	J	770	U	1/2	270J	6E-SD01
Indeno(1,2,3-cd)pyrene	600	130	J	770	U	0/2		6E-SD01
Phenanthrene	86.7	72	J	770	U	0/2		6E-SD01
Pyrene	153	300	J	770	U	1/2	300J	6E-SD01
Benzo(a)anthracene	74.8	190	J	770	U	1/2	190J	6E-SD01
Benzo(a)pyrene	88.8	240	J	770	U	1/2	240J	6E-SD01
Benzo(b)fluoranthene	1,800	240	J	770	U	0/2		6E-SD01
Benzo(g,h,i)perylene	670	130	J	770	U	0/2		6E-SD01
Benzo(k)fluoranthene	1,800	250	J	770	U	0/2		6E-SD01
Pesticides/PCBs (ug/kg)								
4,4'-DDE	2.07	12		7.7	U	1/2	12	6E-SD01
OP-Pesticides (ug/kg)								
Not Detected								
Chlorinated Herbicides (ug/kg)								
Not Detected								
Notes:								
J - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.								
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.								
ft bgs - feet below ground surface.								
ug/kg - micrograms per kilogram.								

Table 5-30. Summary or Inorganic Detections in Sediment at ECP Site 6 – Former Landfill at the Marina

	Marine Sediment Screening Values					Number Exceeding Marine Sediment Screening Values	Range Exceeding Marine Sediment Screening Values	
Site ID		6E-SW/SD01		6E-SW/SD02				
Sample ID		6E-SD01		6E-SD02				Location of
Sample Date		05/14/04		05/14/04				Maximum
Sample Depth (ft bgs)	(mg/kg)	0.00 - 0.50		0.00 - 0.50				Detection
Appendix IX Inorganics (mg/kg)								
Arsenic	7.24	7.8		2.1	U	1/2	7.8	6E-SD01
Barium	48.0	18		9.4		0/2		6E-SD01
Beryllium	NA	0.14	B	0.83	U	NA		6E-SD01
Cobalt	10.0	4.6		2	B	0/2		6E-SD01
Chromium	52.3	25		9.9		0/2		6E-SD01
Copper	18.7	98		13		1/2	98	6E-SD01
Nickel	15.9	7.7		2.7	B	0/2		6E-SD01
Lead	30.2	20		5.8		0/2		6E-SD01
Tin	3.40	5.7	B	4.4	B	2/2	4.4B - 5.7B	6E-SD01
Vanadium	57.0	42		19		0/2		6E-SD01
Zinc	124	70		16		0/2		6E-SD01
Sulfide	NA	87		340		NA		6E-SD02
Mercury	0.13	0.15	S	0.043	U	1/2	0.15S	6E-SD01

Notes:

B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
S - The result was determined by Method of Standard Addition.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
NA - Not Available.
ft bgs - feet below ground surface.
mg/kg - milligrams per kilogram.

Table 5-31. Summary or Inorganic Detections in Surface Water at ECP Site 6 – Former Landfill at the Marina

Site ID	PR Water Quality Standards	Surface Water Screening Values	6E-SW/SD01		6E-SW/SD01		6E-SW/SD02		6E-SW/SD02		Number Exceeding PR Water Quality Standards	Range Exceeding PR Water Quality Standards	Number Exceeding Surface Water Screening Values	Range Exceeding Surface Water Screening Values	Location of Maximum Detection
Sample ID			6E-SW01		6E-SW01D		6E-SW02		6E-SW02D						
Sample Date	(mg/L)	(mg/L)	05/14/04		05/14/04		05/14/04		05/14/04						
Appendix IX (Total) Inorganics (mg/L)															
Barium	NE	50	0.007	B	0.007	B	0.007	B	0.007	B	NE		0/4		6E-SW02D
Vanadium	NE	0.120 (1)	0.05	U	0.004	B	0.05	U	0.05	U	NE		0/4		6E-SW01D

Notes:

B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.

U - The compound was analyzed for, but was not detected at or above the MDL/PQL.

(1) - This chemical lacks a marine/estuarine surface water screening value. The value shown is a freshwater screening value.

NE - Not Established.

mg/L - milligrams per liter.

The two sediment samples indicated that eleven SVOCs, one pesticide, and thirteen inorganic compounds are present in the sediment at location 6E-SW/SD01.

Detections of two inorganic compounds were found in the surface water samples.

The VOCs and SVOCs detected in the surface and subsurface soil samples are primarily related to fuel and pesticide contamination, although tetrachloroethene was detected in the surface soil as well. A minimal impact of fuel contamination is noted in the groundwater with the small detections of toluene and m & p cresol. No pesticides were found in the groundwater.

In the sediment samples the contamination is primarily related to the presence of fuel compounds. Location 6E-SW/SD01 indicated several SVOCs present at estimated concentrations, and one pesticide. Location 6E-SW/SD01 is present among several docks that have been used for boat parking/refueling. A sail boat recently burned near this location while it was docked.

Comparison to criteria was done with all the results as shown in Tables 5-21 through 5-29. The only organic detections that exceeded screening values were found in sediment sample 6E-SD01. Seven compounds, including six SVOCs and one pesticide, exceeded the marine sediment screening values. Three inorganic compounds exceeded EPA Region III Residential RBCs, including arsenic (soil), vanadium (soil and groundwater), and barium (groundwater). Arsenic also exceeded twice the average background concentration established at NSRR, but only in the subsurface soil matrix. Four inorganic compounds in sediment exceeded the marine sediment screening values including arsenic, copper, tin, and mercury.

From the detections and exceedance of criteria of fuel and inorganic compounds in the sediment, it is concluded that the sediment at location 6E-SW/SD01 has been impacted by previous site activities associated with the marina and not the former landfill at the marina. The other sediment location (6E-SW/SD02), which was not located in the marina, did not detect any of the PAHs from 6E-SW/SD01, and the inorganic detections were also much lower. However, the detections and exceedances of fuel could be related to a boat that caught on fire in the marina a few months before the investigation in the vicinity of this sampling location. Significant detections of pesticides and exceedance of criteria of inorganic compounds in the soil provide evidence that the subsurface soil has also been impacted by previous activities. Although groundwater data is limited, it does not appear that the site groundwater has been impacted by previous site activities.

5.4.6.5 *Qualitative Risk Assessment*

COPC Identification

No COPCs were identified for surface soil.

Arsenic was the only COPC identified for subsurface soil with the concentrations in two samples in excess of both the residential RBC and the base background criterion.

The organic analytes identified as COPCs for sediment at Site 6, based on their detection at concentrations in excess of the ecological receptor-based marine sediment screening criteria are: bis(2-ethylhexyl)phthalate, five PAHs (chrysene, fluoranthene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene), and 4,4'-DDE. Arsenic, copper, mercury, and tin are the inorganic analytes identified as COPCs based on concentrations in excess of the marine sediment screening criteria.

No COPCs were identified for surface water.
Barium and vanadium were the only analytes identified as COPCs for groundwater.

Potential Risk Discussion

The potential risk posed by exposure to surface soil at Site 6 is extremely small due to the lack of COPCs.

Significant exposure to subsurface soil is less likely than to surface soil, especially given the reasonably anticipated land use of industrial/commercial. Furthermore, the two arsenic detections in excess of the industrial RBC (2.9 and 3.3 mg/kg) are likely representative of background, as data collected by the United States Geologic Society to establish background concentrations in soil for Puerto Rico, include a maximum concentration of 22 mg/kg (Baker, 2003).

The sediment COPCs were selected using ecologically-based marine sediment screening criteria. Significant human exposure to marine sediments is highly unlikely and if exposure occurred it would be expected to be of significantly shorter duration than for exposure to soil. However, in order to assess the potential risks to human health the sediment concentrations can conservatively be compared to soil RBCs to evaluate the possibility of exposure to these sediments if they were brought to the surface such as by dredging. This evaluation shows that only benzo(a)pyrene is present at a concentration (240 µg/kg) that exceeds the residential RBC and this concentration is less than the industrial RBC, which is more indicative of potential exposure. This same comparison of RBCs to the inorganic COPC data shows that copper, mercury, and tin concentrations are less than residential RBCs, while a single low concentration of arsenic exceeds the industrial RBC. Given the unlikelihood of human exposure to marine sediments, the few potential risk drivers (i.e., benzo(a)pyrene and arsenic), and low concentrations, the potential risk to human health from sediment exposure is considered low. However, based on the exceedance of the marine sediment criteria, the sediment associated with Site 6 poses moderate potential ecological risk.

The potential risk posed by exposure to surface water at Site 6 is extremely small due to the lack of COPCs.

Potential exposure to groundwater at NSRR is unlikely. Groundwater is not currently used for potable purposes because drinking water is available from El Yunque which supplies all of NSRR's present needs. The most likely exposure route to groundwater is from inhalation of vapors emitted from volatile organics through the overlying soil, particularly into buildings. Neither of the Site 6 groundwater COPCs is volatile. Furthermore, the RBCs used to select barium and vanadium as COPCs are based on noncarcinogenic toxicity criteria set at one-tenth of the level considered acceptable by EPA to account for potential additive effects of multiple contaminants. As there are only two noncarcinogenic COPCs in groundwater at Site 6, the single contaminant RBC can be used for comparison, which is ten times higher than the tap water RBCs presented in Section 5.0 tables. The sample with elevated barium concentration (0.33 mg/L) is less than the single contaminant tap water RBC (based on the unlikely but assumed exposure via ingestion of groundwater) of 2.6 mg/L, as well as the MCL established for drinking water supplies. The detected vanadium levels in groundwater are less than the reporting limit and the only detection that exceeded the screening criterion (0.015 mg/L) is less than the single contaminant tap water RBC of 0.037 mg/L. Groundwater at Site 5 does not appear to pose a potential human health concern due to the unlikelihood of exposure and the low concentrations of the COPCs. The potential risk from groundwater exposure is very low even if the groundwater were to be used for potable purposes in the future.

5.4.6.6 Summary of Site Conditions

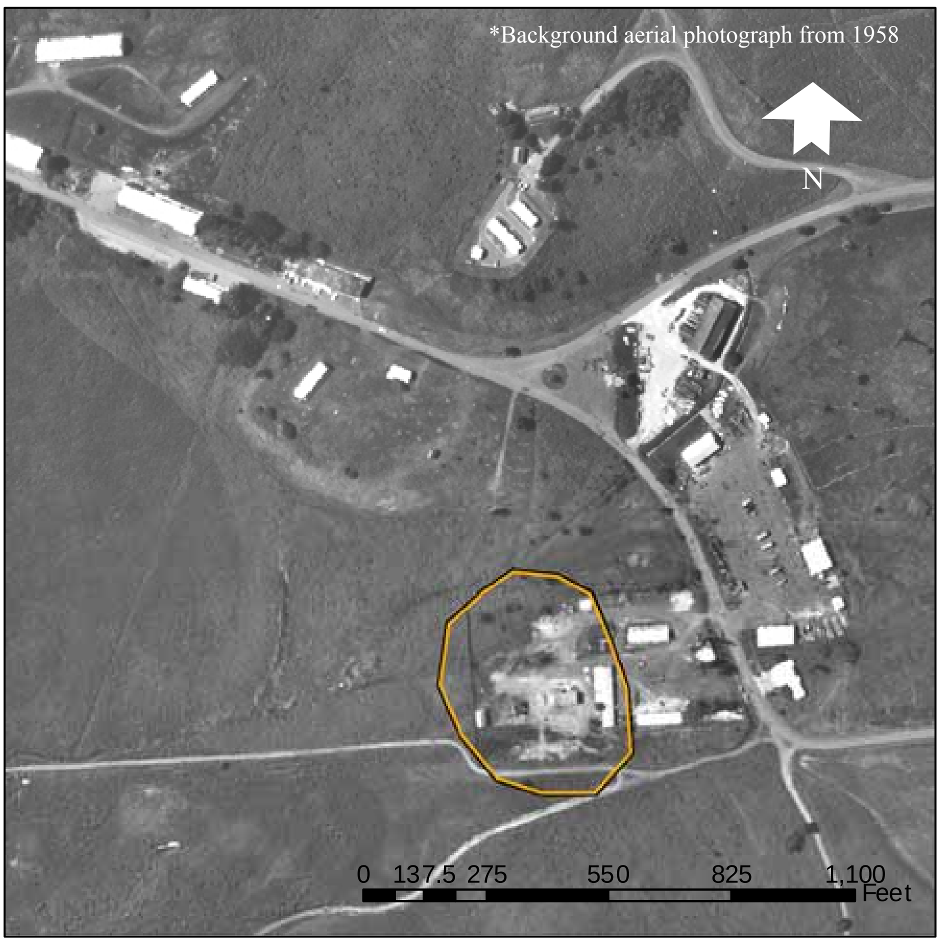
Past activities have likely impacted the environment at ECP Site 6. There were no COPCs identified in the surface soil. Arsenic was identified as a COPC in the subsurface soil, but is believed to be representative of background concentrations. Barium and vanadium were identified as COPCs in the groundwater, but an unlikely exposure scenario was used for the qualitative risk assessment in groundwater. PAHs, pesticides and inorganics were identified as COPCs in the sediment. These do not present any human health risk, but may present an ecological risk. Further investigation at this site will be conducted under the RCRA Corrective Action/IRP process.

5.4.7 ECP Site 7

5.4.7.1 Site History and Description

This site is located southwest of Building 1686 in the Bundy area of the base (see Figure 5-66). The APA identified this area as PI Site 11, due to the observation of two areas of disturbed ground, two horizontal storage tanks, drums, and staining in what appears to be a large open storage/maintenance area in 1958. Interviews confirmed historic use of the area for Bundy area facility and vehicle maintenance activities from the 1940s to the 1960s. There were no signs of any stressed vegetation observed at this site during the Phase II ECP investigation. A majority of this site is located in a wooded area where runoff appears to collect after a rain event. [See photos A-24 and A-25]

Figure 5-66. ECP Site 7 - Former Bundy Area Maintenance Facilities



5.4.7.2 Site Hydrogeology

ECP Site 7 is located in the upland area of the Bundy area. Approximately 2- to 4-feet of gravel, sand, and silt fill material overlay residual clay. Although the soil borings were advanced to a depth that ranged from 5 to 10 feet bgs, groundwater was not encountered in any of the borings advanced at the site.

5.4.7.3 Field Investigation and Sampling Program

The area in the vicinity of Building 1686 in the Bundy area was investigated as Site 7. The sample locations at this site were field located with a hand held GPS receiver. There were no signs of staining or stressed vegetation observed at this site. Therefore, the originally proposed sample locations within the Phase II ECP Work Plan (NAVFAC Atlantic, 2004b) were utilized.

Three soil borings (7E-01 through 7E-03) were advanced in areas within the Former Bundy Maintenance Area as presented on Figure 5-67. A minimum of two subsurface soil samples were collected from each boring location. The depth of the soil borings at this site ranged from 5 feet bgs to 10 feet bgs. All surface and subsurface soil samples were screened in the field utilizing a PID and FID with the results recorded in the field logbook. The screening results were compared against background to indicate if the soil has been impacted by past operations. [See Appendix G for full PID and FID screening results on a per site basis.]

Three surface soil samples (7E-SS01, 7E-SS02, and 7E-SS03) and three subsurface soil samples (7E-SB01-01, 7E-SB02-02, and 7E-SB03-02) were submitted to a fixed-base laboratory for full Appendix IX analysis.

A groundwater program was not required for this site based on professional judgment after reviewing the FID/PID levels. The levels did not indicate any potential impact to groundwater. Therefore based on this information, the decision tree presented in the work plan stated that temporary monitor wells would not be installed.

LEGEND
- —1958 POLYGON FEATURE
- —SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
- —ECP SITE BOUNDARY

SOURCE: GEO-MARINE, INC., SEPTEMBER 6, 2000.

Figure 5-67.
ECP Site 7 - Former Bundy Area Maintenance Facilities Sample Location Map

NAVAL ACTIVITY PUERTO RICO

5.4.7.4 *Nature and Extent of Contamination*

Three surface soil and three subsurface soil environmental samples were collected from three locations at the former Bundy Area Maintenance Facilities as discussed in the previous section. Groundwater samples were not taken based on professional judgment of the results of the FID/PID screening. Although a slightly elevated reading was noted with the FID at location 7E-01 at depth 1-2 feet, screening from deeper soils at that location did not indicate concentrations above background. In addition, groundwater was not encountered during this investigation because drilling had ceased prior to the occurrence of groundwater based on the decision tree for this site. No duplicate environmental samples were taken at this site. The results of the analytical program can be seen in Tables 5-32 through 5-35.

In the surface soil, five VOCs, thirteen SVOCs, and three pesticides were detected. Sixteen inorganic compounds were also detected. The location of the VOC compounds was primarily 7E-01, while the location of the SVOC compounds was primarily 7E-03. The highest concentration of pesticides was seen at location 7E-01. The highest inorganic concentrations were seen at location 7E-01 and 7E-02.

In the subsurface soil, two VOCs and eighteen SVOCs were detected at estimated concentrations. Eleven inorganic compounds were also detected. Location 7E-01 and 7E-02 both had VOC compounds, but only at very low estimated concentrations. Location 7E-01 was contaminated primarily with all the SVOCs. It is noted that the SVOC contamination in the subsurface soil is not co-located with the SVOC contamination in the surface soil. The inorganic concentrations were slightly higher in locations 7E-02 and 7E-03.

In general the VOC contamination in the soil is composed of both chlorinated compounds (tetrachloroethene and chlorobenzene) and fuel-related compounds (ethylbenzene, toluene, and xylene). The SVOC contamination is all fuel related with significant concentrations of several polynuclear aromatic hydrocarbons (PAHs) present in the surface soil at 7E-03. Lower concentrations of the PAH compounds are found at location 7E-01 in the subsurface soil. All of these compounds may have been related to past site activities associated with a maintenance facility.

Table 5-32. Summary of Organic Detections in Surface Soils at ECP Site 7 – Former Bundy Area Maintenance Facilities

Site ID Sample ID Sample Date Sample Depth (ft bgs)	EPA Region III Industrial RBCs (ug/kg)	**EPA Region III Residential RBCs** (ug/kg)	7E-01 7E-SS01 05/09/04 0.00 - 1.00	7E-02 7E-SS02 05/09/04 0.00 - 1.00	7E-03 7E-SS03 05/09/04 0.00 - 1.00	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 of Maximum Detection
Volatile Organic Compounds (ug/kg)										
Ethylbenzene	10,000,000	780,000	3.1 J	6.2 U	6 U	0/3		0/3		7E-SS01
Tetrachloroethene	5,300	1,200	25	2.6 J	6 U	0/3		0/3		7E-SS01
Toluene	20,000,000	1,600,000	2.4 J	6.2 U	6 U	0/3		0/3		7E-SS01
Chlorobenzene	2,000,000	160,000	18	6.2 U	6 U	0/3		0/3		7E-SS01
Xylene	20,000,000	1,600,000	13 J	12 U	12 U	0/3		0/3		7E-SS01
Semivolatile Organic Compounds (ug/kg)										
Chrysene	390,000	87,000	460 U	430 U	1,200	0/3		0/3		7E-SS03
Dibenzo(a,h)anthracene	390	87	460 U	430 U	**260** J	0/3		1/3	260J	7E-SS03
Acenaphthene	6,100,000	470,000	460 U	430 U	220 J	0/3		0/3		7E-SS03
Fluoranthene	4,100,000	310,000	460 U	430 U	1,700	0/3		0/3		7E-SS03
Fluorene	4,100,000	310,000	460 U	430 U	90 J	0/3		0/3		7E-SS03
Anthracene	31,000,000	2,300,000	460 U	430 U	300 J	0/3		0/3		7E-SS03
Phenanthrene	NE	NE	460 U	430 U	1,200	NE		NE		7E-SS03
Pyrene	3,100,000	230,000	26 J	430 U	1,800	0/3		0/3		7E-SS03
Benzo(a)anthracene	3,900	870	460 U	430 U	**1,000**	0/3		1/3	1,000	7E-SS03
Benzo(a)pyrene	390	87	460 U	430 U	**1,300**	1/3	1,300	1/3	1,300	7E-SS03
Benzo(b)fluoranthene	3,900	870	460 U	430 U	**1,000**	0/3		1/3	1,000	7E-SS03
Benzo(k)fluoranthene	39,000	8,700	460 U	430 U	1,000	0/3		0/3		7E-SS03
Dibenzofuran	200,000	16,000	460 U	430 U	69 J	0/3		0/3		7E-SS03
Pesticides/PCBs (ug/kg)										
4,4'-DDT	8,400	1,900	68	0.67 J	2.7 J	0/3		0/3		7E-SS01
4,4'-DDE	8,400	1,900	100	0.9 JP	1.6 J	0/3		0/3		7E-SS01
4,4'-DDD	12,000	2,700	17	4.3 U	4.1 U	0/3		0/3		7E-SS01

OP-Pesticides (ug/kg)
Not Detected

Chlorinated Herbicides (ug/kg)
Not Detected

Notes:
J - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
P - The GC or HPLC confirmation criteria was exceeded. The realtive percent difference is greater than 40% between the two GC columns or HPLC detectors.
NE - Not Established.
ft bgs - feet below ground surface.
ug/kg - micrograms per kilogram.

Table 5-33. Summary of Inorganic Detections in Surface Soils at ECP Site 7 – Former Bundy Area Maintenance Facilities

Site ID	EPA Region III Industrial RBCs	**EPA Region III Residential RBCs**	2x Average Detected Background	7E-01	7E-02	7E-03	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**	Number Exceeding 2x Average Detected Background	Range Exceeding 2x Average Detected Background	Location of Maximum Detection
Sample ID				7E-SS01	7E-SS02	7E-SS03							
Sample Date				05/09/04	05/09/04	05/09/04							
Sample Depth (ft bgs)	(mg/kg)	(mg/kg)	(mg/kg)	0.00 - 1.00	0.00 - 1.00	0.00 - 1.00							
Appendix IX Inorganics (mg/kg)													
Arsenic	1.9	0.43	2.4	**1.2** B	1.1 U	1.1 U	0/3		1/3	1.2B	0/3		7E-SS01
Barium	7,200	550	181	85	430	86	0/3		0/3		1/3	430	7E-SS02
Beryllium	200	16	0.45	0.17 B	0.84	0.22 B	0/3		0/3		1/3	0.84	7E-SS02
Cadmium	100	7.8	0.27	0.21 B	2.8 U	0.56 U	0/3		0/3		0/3		7E-SS01
Cobalt	2,000	160	44.0	11	25	10	0/3		0/3		0/3		7E-SS02
Chromium	310	23	59.3	**27**	**61**	23	0/3		2/3	27 - 61	1/3	61	7E-SS02
Copper	4,100	310	234	84	100	57	0/3		0/3		0/3		7E-SS02
Nickel	2,000	160	16.6	13	12	7.7	0/3		0/3		0/3		7E-SS01
Lead	400[1]	400[1]	125	110	3.7	27	0/3		0/3		0/3		7E-SS01
Antimony	41	3.1	2.3	1.3 B	2.3 U	2.2 U	0/3		0/3		0/3		7E-SS01
Tin	61,000	4,700	2.43	5.3 B	2.5 B	2.7 B	0/3		0/3		3/3	2.5B - 5.3B	7E-SS01
Vanadium	100	7.8	355	**72**	**180**	**81**	1/3	180	3/3	72 - 180	0/3		7E-SS02
Zinc	31,000	2,300	125	130	34	49	0/3		0/3		1/3	130	7E-SS01
Cyanide	2,000	160	0.52	0.67 U	0.64 U	0.32 B	0/3		0/3		0/3		7E-SS03
Sulfide	NE	NE	28.5	35 B	32 U	31 U	NE		NE		0/3		7E-SS01
Mercury	31[2]	2.3[2]	0.11	0.024 B	0.029	0.031	0/3		0/3		0/3		7E-SS03

Notes:

B - The reported result is an estimated concentration that is less than the PQL, greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
[1] - 1996 Soil Screening Guidance.
[2] - Value based on the RBC for Mercuric Chloride.
NE - Not Established.
ft bgs - feet below ground surface.
mg/kg - milligrams per kilogram.

Table 5-34. Summary of Organic Detections in Subsurface Soil at ECP Site 7 – Former Bundy Area Maintenance Facilities

Site ID Sample ID Sample Date Sample Depth (ft bgs)	EPA Region III Industrial RBCs (ug/kg)	**EPA Region III Residential RBCs** (ug/kg)	7E-01 7E-SB01-01 05/13/04 1.00 - 3.00	7E-02 7E-SB02-02 05/13/04 3.00 - 5.00	7E-03 7E-SB03-02 05/13/04 3.00 - 5.00	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 of Maximum Detection
Volatile Organic Compounds (ug/kg)										
Tetrachloroethene	5,300	1,200	4 J	4.6 J	5.7 U	0/3		0/3		7E-SB02-02
Chlorobenzene	2,000,000	160,000	3 J	2.8 J	5.7 U	0/3		0/3		7E-SB01-01
Semivolatile Organic Compounds (ug/kg)										
bis(2-Ethylhexyl)phthalate	200,000	46,000	68 J	450 U	440 U	0/3		0/3		7E-SB01-01
4-Bromophenylphenyl ether	NE	NE	45 J	450 U	440 U	NE		NE		7E-SB01-01
Butylbenzylphthalate	20,000,000	1,600,000	72 J	450 U	440 U	0/3		0/3		7E-SB01-01
Chrysene	390,000	87,000	99 J	450 U	440 U	0/3		0/3		7E-SB01-01
Dibenzo(a,h)anthracene	390	87	**100** J	450 U	440 U	0/3		1/3	100J	7E-SB01-01
Fluoranthene	4,100,000	310,000	110 J	450 U	440 U	0/3		0/3		7E-SB01-01
Fluorene	4,100,000	310,000	38 J	450 U	440 U	0/3		0/3		7E-SB01-01
Hexachlorobenzene	1,800	400	76 J	450 U	440 U	0/3		0/3		7E-SB01-01
Indeno(1,2,3-cd)pyrene	3,900	870	92 J	450 U	440 U	0/3		0/3		7E-SB01-01
Anthracene	31,000,000	2,300,000	88 J	450 U	440 U	0/3		0/3		7E-SB01-01
Phenanthrene	NE	NE	90 J	450 U	440 U	NE		NE		7E-SB01-01
Pyrene	3,100,000	230,000	130 J	25 J	440 U	0/3		0/3		7E-SB01-01
Benzo(a)anthracene	3,900	870	83 J	450 U	440 U	0/3		0/3		7E-SB01-01
Benzo(a)pyrene	390	87	65 J	450 U	440 U	0/3		0/3		7E-SB01-01
Benzo(b)fluoranthene	3,900	870	61 J	450 U	440 U	0/3		0/3		7E-SB01-01
Benzo(g,h,i)perylene	NE	NE	120 J	450 U	440 U	NE		NE		7E-SB01-01
Benzo(k)fluoranthene	39,000	8,700	75 J	450 U	440 U	0/3		0/3		7E-SB01-01
Di-n-butylphthalate	NE	NE	85 J	450 U	440 U	NE		NE		7E-SB01-01
Pesticides/PCBs (ug/kg)										
Not Detected										
OP-Pesticides (ug/kg)										
Not Detected										
Chlorinated Herbicides (ug/kg)										
Not Detected										

Notes:

J - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
NE - Not Established.
ft bgs - feet below ground surface.
ug/kg - micrograms per kilogram.

Table 5-35. Summary of Inorganic Detections in Subsurface Soil at ECP Site 7 – Former Bundy Area Maintenance Facilities

Site ID Sample ID Sample Date Sample Depth (ft bgs)	EPA Region III Industrial RBCs (mg/kg)	**EPA Region III Residential RBCs** (mg/kg)	2x Average Detected Background (mg/kg)	7E-01 7E-SB01-01 05/13/04 1.00 - 3.00	7E-02 7E-SB02-02 05/13/04 3.00 - 5.00	7E-03 7E-SB03-02 05/13/04 3.00 - 5.00	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**	Number Exceeding 2x Average Detected Background	Range Exceeding 2x Average Detected Background	Location of Maximum Detection
Appendix IX Inorganics (mg/kg)													
Barium	7,200	550	222	73	190	310	0/3		0/3		1/3	310	7E-SB03-02
Beryllium	200	16	0.74	0.42 B	0.69	0.55	0/3		0/3		0/3		7E-SB02-02
Cobalt	2,000	160	30.0	22	24	24	0/3		0/3		0/3		7E-SB02-02, 7E-SB03-02
Chromium	310	23	133	**26**	**33**	17	0/3		2/3	26 - 33	0/3		7E-SB02-02
Copper	4,100	310	193	29	120	160	0/3		0/3		0/3		7E-SB03-02
Nickel	2,000	160	31.9	4.5	12	11	0/3		0/3		0/3		7E-SB02-02
Lead	400[1]	400[1]	8.68	2.8	4.8	1.2	0/3		0/3		0/3		7E-SB02-02
Tin	61,000	4,700	2.96	2.5 B	3.5 B	2.7 B	0/3		0/3		1/3	3.5B	7E-SB02-02
Vanadium	100	7.8	462	**110**	**140**	**150**	1/3	110 - 150	1/3	110 - 150	0/3		7E-SB03-02
Zinc	31,000	2,300	88.6	14 E	41 E	33 E	0/3		0/3		0/3		7E-SB02-02
Mercury	31[2]	2.3[2]	0.093	0.028	0.023 B	0.033	0/3		0/3		0/3		7E-SB03-02

Notes:

B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
E - The reported value is an estimated because of the presence of matrix interference.
[1] - 1996 Soil Screening Guidance.
[2] - Value based on the RBC for Mercuric Chloride.
NE - Not Established.
ft bgs - feet below ground surface.
mg/kg - milligrams per kilogram.

Comparison to criteria was done with all the results and is shown in Tables 5-32 through 5-35. Four organic compounds and three inorganic compounds exceeded EPA Region III Residential RBCs. The organic compounds exceeding criteria in the surface soil only were benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene. Dibenzo(a,h)anthracene was found in both surface and subsurface soil, but at different locations. Arsenic, chromium, and vanadium exceeded EPA Region III Residential RBCs. However, only chromium exceeded the established background criteria at NSRR, and only in the surface soil at location 7E-02. The concentration of chromium was only slightly higher than background, and it is likely to be naturally occurring.

From the detections of fuel and chlorinated compounds and exceedance of criteria for selected SVOCs, it can be concluded that the soil at this site has been impacted by previous activities consistent with those performed at a maintenance facility.

5.4.7.5 Qualitative Risk Assessment

A discussion on the COPCs and potential risks associated with the surface soil at this site, is provided below.

COPC Identification

The COPCs in surface soil at Site 7 are four PAHs: dibenzo(a,h)anthracene, benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene. One sample contained concentrations of these analytes in excess of the residential RBC. Chromium was the only inorganic analyte identified as a COPC in surface soil with the concentration from one sample exceeding both the residential RBC and base background.

The PAH, dibenzo(a,h)anthracene, is the only COPC identified in subsurface soil.

Potential Risk Discussion

Of the surface soil COPCs, only benzo(a)pyrene (at 1,300 μg/kg) exceeds the industrial RBC, which is more indicative of the reasonably anticipated land use at Site 7. Only one of three surface soil samples had detectable concentrations of benzo(a)pyrene, so the site as a whole is expected to pose a moderate potential risk.

Significant exposure to subsurface soil is less likely than to surface soil, especially given the reasonably anticipated land use of industrial/commercial. The dibenzo(a,h)anthracene concentration (100 J μg/kg) is less than the industrial

RBC, indicating a low potential for significant risk from exposure to subsurface soil.

5.4.7.6 Summary of Site Conditions

ECP Site 7 has been impacted by previous activities. A moderate risk to human health was found at ECP Site 7 in the surface soil due to the presence of PAHs. COPCs in the subsurface soil consisted of PAHs, but these were below industrial RBCs (above residential RBCs) and considered a low risk to human health. Only one location at ECP Site 7, 7E-03, had levels presenting an industrial risk, and it will be assumed that this location will be the only one remediated. Other COPCs at the site included chromium in the surface soil and low levels of PAHs at location 7E-01 in the subsurface soil, but all these concentrations were below the industrial RBC (above the residential RBC).

Further investigation at this site will be conducted under the RCRA Corrective Action/IRP process.

5.4.8 ECP Site 8

5.4.8.1 Site History and Description

This site is located at the southeast end of the base in the Bundy area (see Figure 5-68). The APA identified this area as PI site 12, due to the observation of a disposal or fill area with multi-toned, mounded materials from 1958-1961. Interviews did not confirm or repudiate the area as a disposal area. However, the Phase I ECP Report indicated that the PSI observed numerous piles of mounded gravel and charcoal, metal and building debris, and two empty 55-gallon drums. During the Phase II ECP investigation, the field crew observed the same type of site features as described in the above paragraph. There were no signs of any stressed vegetation observed during the Phase II ECP investigation. [See photos A-26 and A-27]

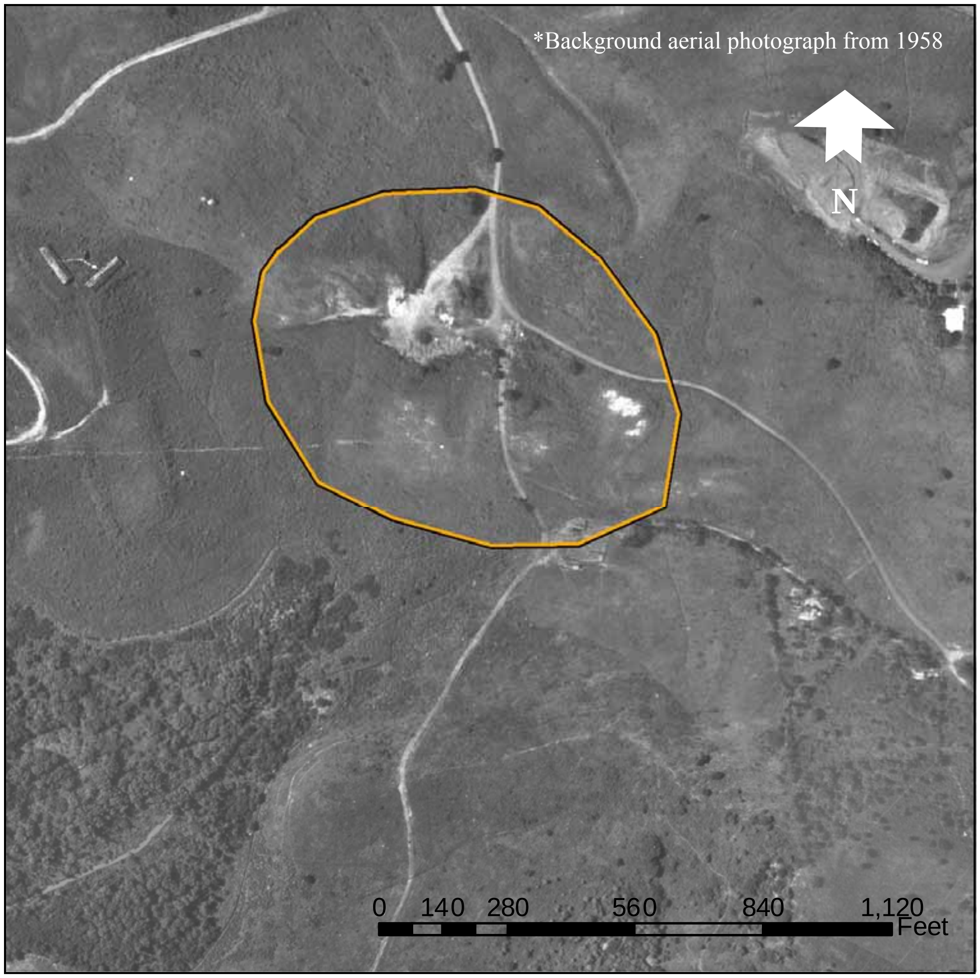


Figure 5-68. ECP Site 8 - Former Bundy Disposal Area

5.4.8.2 Site Hydrogeology

ECP Site 8 is located in the upland area of the Bundy area. Due to topography and subsurface conditions, borings at the Site were advanced to no more than 5-feet bgs. A thin residual sand and silt was observed to overlay weathered bedrock (Gabbro). Groundwater was not encountered in any of the borings advanced at the site.

5.4.8.3 Field Investigation and Sampling Program

The former Bundy Disposal Area was investigated at ECP Site 8. The sample locations at this site were field located with a hand held GPS receiver. There were no signs of staining or stressed vegetation observed at this site. Therefore, the originally proposed sample locations within the Draft Phase II ECP Work Plan (NAVFAC Atlantic, 2004b) were utilized, with the exception of two soil boring locations (8E-02 and 8E-03). These two locations had to be offset due to site access issues as well as site topography.

Three soil borings (8E-01, 8E-02, and 8E-03) were advanced in the former Bundy Disposal Area. Subsurface soil samples were collected from two-foot intervals through the use of an auger bucket. All surface and subsurface soil samples were screened in the field utilizing a PID and FID with the results recorded in the field logbook. The screening results were compared against background to indicate if the soil has been impacted by past operations. [See Appendix G for full PID and FID screening results on a per site basis.]

Three surface soil samples (8E-SS01, 8E-SS02, and 8E-SS03) and two subsurface soil samples (8E-SB01-01 and 8E-SB03-01) were submitted to a fixed-base laboratory for full Appendix IX analysis.

A groundwater program was not required for this site based on the FID/PID levels. The levels did not indicate any potential impact to groundwater.

5.4.8.4 Nature and Extent of Contamination

At ECP Site 8, three surface soil and two subsurface soil environmental samples were collected from locations shown on Figure 5-69. Groundwater sampling did not occur because the FID/PID screening did not result in any detection of organic soil vapors. One duplicate environmental sample was collected from the surface soil media. The results of the analytical program can be seen in Tables 5-36 through 5-38.

In the surface soil, two VOCs and two pesticides were detected. Thirteen inorganic compounds were also quantified in this matrix. All locations had small quantities of VOCs, with the highest concentration of the VOC tetrachloroethene found at location 8E-01. Pesticides were only detected at location 8E-01. Locations 8E-01 and 8E-03 had the highest concentrations of inorganic compounds.

Organic compounds were not detected in the subsurface soil matrix, and ten inorganic compounds were detected in the subsurface. The inorganic detections were similar between the two locations and in the same order of magnitude as those found in the surface soil matrix.

150 0
1 inch = 150 ft.

LEGEND

- –1958 POLYGON FEATURE
- –1961 POLYGON FEATURE
- –SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
- –SURFACE SOIL SAMPLE LOCATION
- –ECP SITE BOUNDARY

SOURCE: GEO–MARINE, INC., SEPTEMBER 6, 2000.

Figure 5-69.
ECP Site 8 - Former Bundy Disposal Area
Sample Location Map

Table 5-36. Summary of Organic Detections in Surface Soil at ECP Site 8 – Former Bundy Disposal Area

Site ID Sample ID Sample Date Sample Depth (ft bgs)	EPA Region III Industrial RBCs (ug/kg)	**EPA Region III Residential RBCs** (ug/kg)	8E-01 8E-SS01 05/14/04 0.00 - 1.00	8E-02 8E-SS02 05/14/04 0.00 - 1.00	8E-02 8E-SS02D 05/14/04 0.00 - 1.00	8E-03 8E-SS03 05/14/04 0.00 - 1.00	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 of Maximum Detection
Volatile Organic Compounds (ug/kg)											
Tetrachloroethene	5,300	1,200	11	1.8 J	3.6 J	2.7 J	0/4		0/4		8E-SS01
Chlorobenzene	2,000,000	160,000	3.9 J	5.2 U	2.2 J	5.8 U	0/4		0/4		8E-SS01
Semivolatile Organic Compounds (ug/kg)											
Not Detected											
Pesticides/PCBs (ug/kg)											
4,4'-DDT	8,400	1,900	0.64 J	3.7 U	3.6 U	4 U	0/4		0/4		8E-SS01
4,4'-DDE	8,400	1,900	1.5 J	3.7 U	3.6 U	4 U	0/4		0/4		8E-SS01
OP-Pesticides (ug/kg)											
Not Detected											
Chlorinated Herbicides (ug/kg)											
Not Detected											

Notes:

J - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
ft bgs - feet below ground surface.
ug/kg - micrograms per kilogram.

Table 5-37. Summary of Inorganic Detections in Surface Soil at ECP Site 8 – Former Bundy Disposal Area

Site ID Sample ID Sample Date Sample Depth (ft bgs)	EPA Region III Industrial RBCs (mg/kg)	**EPA Region III Residential RBCs** (mg/kg)	2x Average Detected Background (mg/kg)	8E-01 8E-SS01 05/14/04 0.00 - 1.00	8E-02 8E-SS02 05/14/04 0.00 - 1.00	8E-02 8E-SS02D 05/14/04 0.00 - 1.00	8E-03 8E-SS03 05/14/04 0.00 - 1.00	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**	Number Exceeding 2x Average Detected Background	Range Exceeding 2x Average Detected Background	Location of Maximum Detection
Appendix IX Inorganics (mg/kg)														
Arsenic	1.9	0.43	2.4	**1.3**	1.1 U	**0.91** B	1 U	0/4		2/4	0.91B - 1.3	0/4		8E-SS01
Barium	7,200	550	181	220 N	90 N	120 N	190 N	0/4		0/4		2/4	190N - 220N	8E-SS01
Beryllium	200	16	0.45	0.37 B	0.26 B	0.21 B	0.58	0/4		0/4		1/4	0.58	8E-SS03
Cobalt	2,000	160	44.0	12	1.9	2	11	0/4		0/4		0/4		8E-SS01
Chromium	310	23	59.3	12	2.8	2.4	12	0/4		0/4		0/4		8E-SS01, 8E-SS03
Copper	4,100	310	234	130 N	60 N	58 N	13 N	0/4		0/4		0/4		8E-SS01
Nickel	2,000	160	16.6	6.4	1.1 B	1 B	3.4 B	0/4		0/4		0/4		8E-SS01
Lead	400(1)	400(1)	125	18	1.3	0.91	2	0/4		0/4		0/4		8E-SS01
Tin	61,000	4,700	2.43	3.2 B	3.5 B	3 B	1.9 B	0/4		0/4		3/4	3B - 3.5B	8E-SS02
Vanadium	100	7.8	355	**82**	**34**	**36**	**35**	0/4		4/4	34 - 82	0/4		8E-SS01
Zinc	31,000	2,300	125	45 E	11 E	13 E	6.2 E	0/4		0/4		0/4		8E-SS01
Sulfide	NE	NE	27.1	32 U	28 U	27 B	30 U	NE		NE		0/4		8E-SS02D
Mercury	31(2)	2.3(2)	0.11	0.039	0.02 U	0.021 U	0.038	0/4		0/4		0/4		8E-SS01

Notes:

B - The reported result is an estimated concentration that is less than the PQL, greater than or equal to the MDL.
N - The matrix spike recovery is not within control limtis.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
E- The reported value is an estimated because of the presence of matrix interference.
(1) - 1996 Soil Screening Guidance.
(2) - Value based on the RBC for Mercuric Chloride.
NE - Not Established.
ft bgs - feet below ground surface.
mg/kg - milligrams per kilogram.

Table 5-38. Summary of Inorganic Detections in Subsurface Soil at ECP Site 8 – Former Bundy Disposal Area

Site ID Sample ID Sample Date Sample Depth (ft bgs)	EPA Region III Industrial RBCs (mg/kg)	**EPA Region III Residential RBCs** (mg/kg)	2x Average Detected Background (mg/kg)	8E-01 8E-SB01-01 05/14/04 1.00 - 3.00	8E-03 8E-SB03-01 05/14/04 1.00 - 3.00	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**	Number Exceeding 2x Average Detected Background	Range Exceeding 2x Average Detected Background	Location of Maximum Detection
Appendix IX Inorganics (mg/kg)												
Barium	7,200	550	222	180 N	**590** N	0/2		1/2	590N	1/2	590N	8E-SB03-01
Beryllium	200	16	0.74	0.77	0.56	0/2		0/2		1/2	0.77	8E-SB01-01
Cobalt	2,000	160	30.0	11	5.4	0/2		0/2		0/2		8E-SB01-01
Chromium	310	23	133	2.7	8.2	0/2		0/2		0/2		8E-SB03-01
Copper	4,100	310	193	22 N	14 N	0/2		0/2		0/2		8E-SB01-01
Nickel	2,000	160	31.9	1.6 B	2.8 B	0/2		0/2		0/2		8E-SB03-01
Lead	400(1)	400(1)	8.68	0.93	0.91	0/2		0/2		0/2		8E-SB01-01
Tin	61,000	4,700	2.96	2.4 B	2.3 B	0/2		0/2		0/2		8E-SB01-01
Vanadium	100	7.8	462	**24**	**34**	0/2		2/2	24 - 34	0/2		8E-SB03-01
Zinc	31,000	2,300	88.6	14 E	11 E	0/2		0/2		0/2		8E-SB01-01

Notes:

B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
N - The matrix spike recovery is not within control limtis.
E- The reported value is an estimated because of the presence of matrix interference.
(1) - 1996 Soil Screening Guidance.
ft bgs - feet below ground surface.
mg/kg - milligrams per kilogram.

The organic compounds found in the surface soil matrix are primarily chlorinated compounds and pesticides, with most quantities being low and estimated. Inorganic detections are representative of background concentrations of these compounds found at NSRR with the exception of barium in the subsurface soil matrix.

Comparison to criteria was done with all the results as shown in Table 5-36 through 5-38. No organic compounds exceeded criteria at this site. Three inorganic compounds exceeded the EPA Region III Residential RBCs, including arsenic and vanadium in the surface soil and barium and vanadium in the subsurface soil. At 8E-03 the barium concentration in the subsurface soil also exceeded twice the average detected background concentration, indicating possible contamination. It should be noted that barium also exceeded the background screening value in two of the three surface soil samples, although it did not exceed the RBCs. The concentrations of arsenic and vanadium in the soil did not exceed the background concentrations established at NSRR.

Based on the occurrence of barium in the soil in excess of background and exceedance of criteria, it is tentatively concluded that site contamination has occurred from previous activities. Barium is associated with ignition equipment and acid batteries, and is a component of gray and ductile irons. These items could have been disposed of at the site as indicated by the past use of the site and as shown by a feature in the 1958 aerial photograph (NAVFAC Atlantic, 2004a), where 8E-03 was located (see Figure 5-68).

5.4.8.5 Qualitative Risk Assessment

A discussion on the COPCs and potential risks associated with the surface soil at this site is provided below.

COPC Identification

No COPCs were identified for surface soil at Site 8

Barium is the only COPC identified for subsurface soil with one detected concentration that exceeds both the residential RBC and base background concentrations.

Potential Risk Discussion

The potential risk posed by exposure to surface soil at Site 8 is extremely small due to the lack of COPCs.

Significant exposure to subsurface soil is less likely than to surface soil, especially given the reasonably anticipated land use of industrial/commercial. The barium concentration (590 mg/kg) is less than the industrial RBC, indicating a low potential risk from exposure to subsurface soil.

5.4.8.6 Summary of Site Conditions

At ECP Site 8, a low risk to human health was found due to the presence of barium in the subsurface soil in excess of residential RBCs but below industrial RBCs. No other COPCs were found at this site. It is likely that this site has been impacted by previous activities.

Further investigation at this site will be conducted under the RCRA Corrective Action/IRP process.

5.4.9 ECP Site 9

5.4.9.1 Site History and Description

This site is located west of Langley Drive and north of the Commissary, at the site of the newly constructed bachelor's enlisted quarters (BEQ) (see Figure 5-70). The APA identified this area as PI Site 13, due to the observation of a cleared rectangular area that appeared to be unused, with ground scarring consistent with a small arms range in 1958. The records review (historic maps) identified this area as a former pistol range. Interviews did not confirm or repudiate use of the area as a pistol range. The physical site inspection could not detect evidence of a former pistol range, since the area has been disturbed/ covered by the new BEQ. [See photo A-28]

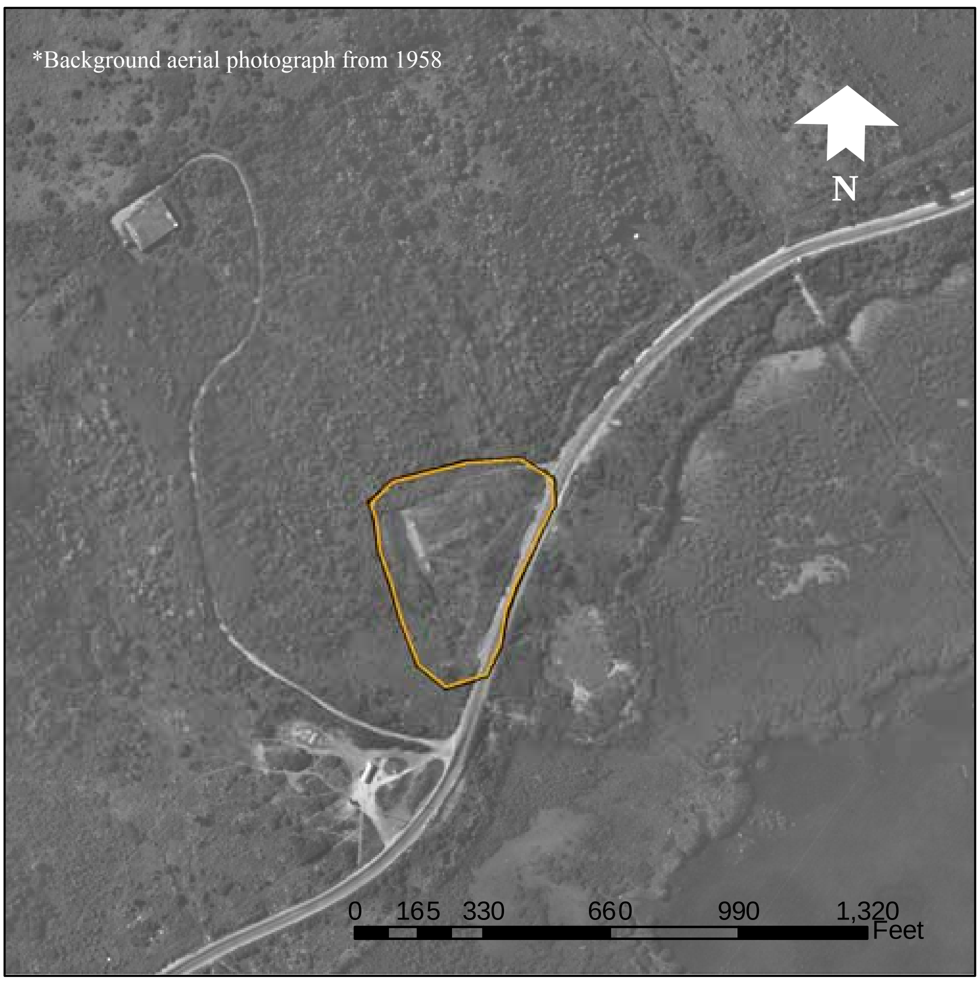


Figure 5-70. ECP Site 9 - Former Pistol Range at New BEQ

During the Phase II ECP investigation, a total of eleven structures were observed making up the new BEQ. The majority of the area at this site is covered in new vegetation.

5.4.9.2 Field Investigation and Sampling Program

As discussed previously, eleven new housing structures have been constructed at the location of the former pistol range. The recent construction of this area has involved earthwork throughout the entire construction site. Therefore, due to the amount of soil that was excavated, it was determined that surface soil samples were to be collected from the surface soil that remains, to determine if high levels of lead are present in the surface soil that may cause a risk to human health receptors living in these quarters.

A total of six surface soil locations were positioned around the newly constructed buildings to ascertain if past pistol range activity may have a residual impact to the newly graded surface soils. The locations of the six surface soil samples were collected from areas adjacent to the newly constructed buildings. The samples were scattered from across the entire constructed site to ensure wide coverage as presented on Figure 5-71.

One surface soil sample was collected from each location from a depth of 0 to 1 foot bgs. Soil samples submitted to the fixed-base laboratory included six surface soil samples (9E-SS01 through 9E-SS06), and were analyzed for lead.

NOTE:
THE SITE LAYOUT OF THE NEW BEQ HOUSING WAS PROVIDED BY NAPR. THIS OVERLAY IS NOT TO SCALE AND IS ONLY FOR VISUAL REPRESENTATION OF THE SITE AND THE CORRESPONDING SAMPLE LOCATIONS. SAMPLE LOCATIONS ARE APPROXIMATE AND SHOWN IN REFERENCE TO WERE THEY WERE COLLECTED WITH RESPECT TO THE STRUCTURES SHOWN.

200 0 100 200
1 inch = 200 ft.

LEGEND

- 1958 POLYGON FEATURE
- 1961 POLYGON FEATURE
- SURFACE SOIL SAMPLE LOCATION
- ECP SITE BOUNDARY
- 2689 - BEQ BUILDING

SOURCE: GEO-MARINE, INC., SEPTEMBER 6, 2000.

Figure 5-71.
ECP Site 9 - Former Pistol Range at New BEQ Sample Location Map

5.4.9.3 *Nature and Extent of Contamination*

Six surface soil environmental samples were obtained from locations at the former Pistol Range at the new Bachelors' Enlisted Quarters as shown on Figure 5-71. These samples were analyzed for lead only and the results are given on Table 5-39. One duplicate environmental sample was obtained from location 9E-SS05. Two results exceeded background lead concentrations at NSRR, but they were one order of magnitude lower than the 1996 Soil Screening Guidance of 400 mg/kg for lead. As a result, it is concluded that there has been no impact from past activities at this site.

5.4.9.4 *Qualitative Risk Assessment*

A discussion on the COPCs and potential risks associated with the surface soil at this site is provided below.

COPC Identification

No COPCs were identified at Site 9. All surface soil lead concentrations were less than the soil screening criteria and only two detected concentrations were greater than base background out of a total of seven samples.

Potential Risk Discussion

The potential risk posed by conditions at Site 9 is extremely small due to the lack of COPCs.

5.4.9.5 *Summary of Site Conditions*

Lead was not identified as a COPC. No further action is necessary.

Table 5-39. Summary of Lead Detections in Surface Soil at ECP Site 9 – Former Pistol Range at BEQ

											Number	Range	**Number**	**Range**	Number	Range	
Site ID	EPA Region III	**EPA Region III**	2x Average	9E-SS01	9E-SS02	9E-SS03	9E-SS04	9E-SS05	9E-SS05	9E-SS06	Exceeding	Exceeding	**Exceeding**	**Exceeding**	Exceeding	Exceeding	
Sample ID	Industrial	**Residential**	Detected	9E-SS01	9E-SS02	9E-SS03	9E-SS04	9E-SS05	9E-SS05D	9E-SS06	EPA Region III	EPA Region III	**EPA Region III**	**EPA Region III**	2x Average	2x Average	Location of
Sample Date	RBCs	**RBCs**	Background	05/05/04	05/05/04	05/05/04	05/05/04	05/05/04	05/05/04	05/05/04	Industrial	Industrial	**Residential**	**Residential**	Detected	Detected	Maximum
Sample Depth (ft bgs)	(mg/kg)	(mg/kg)	(mg/kg)	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	RBCs	RBCs	**RBCs**	**RBCs**	Background	Background	Detection
Lead (mg/kg)																	
Lead	400[1]	400[1]	15.25	75	2	33	2.8	3.5	4	6.1	0/7		0/7		2/7	33 - 75	9E-SS01

Notes:

[1] - 1996 Soil Screening Guidance.
ft bgs - feet below ground surface.
mg/kg - milligrams per kilogram.

5.4.10 ECP Site 10

5.4.10.1 Site History and Description

This site is located in an open level grass area along Ofstie Airfield (see Figure 5-72). The APA identified this area as PI Site 15, due to the observation of two small structures consistent with a skeet range in 1958. The records review (historic maps) identified a skeet range in this location. The physical site inspection did not observe any evidence of former skeet range; however, interviews confirmed use of area as a skeet range in the 1940s. Exact usage dates and frequency of use are unknown. [See photos A-29 and A-30]

Figure 5-72. ECP Site 10 - Former Skeet Range at Ofstie Airfield

5.4.10.2 Field Investigation and Sampling Program

The area in the vicinity of the former skeet range was investigated at ECP Site 10. The sample locations at this site were field located with a hand held GPS receiver. As mentioned previously, there were no signs of staining or stressed vegetation observed at this site. Therefore, the originally proposed sample locations within Draft Phase II ECP Work Plan (NAVFAC Atlantic, 2004b) were utilized.

A total of five surface soil locations were positioned in the area of the suspected skeet range area identified in the Phase I ECP Report (NAVFAC Atlantic, 2004a), as presented on Figure 5-73. One surface soil samples was obtained from each location from a depth of 0 to 1 foot bgs. Soil samples submitted to a fixed-base laboratory included five surface soil samples (10E-SS01 through 10E-SS05). These samples were submitted to the fixed-base analytical laboratory for lead analysis.

5.4.10.3 Nature and Extent of Contamination

Five surface soil environmental samples were obtained from locations at the former Skeet Range at Ofstie Airfield as previously discussed. These samples were analyzed for lead only and the results are given on Table 5-40. No duplicate samples were analyzed. All results were less than the established background lead concentrations at NSRR, and they were two orders of magnitude lower than the 1996 Soil Screening Guidance of 400 mg/kg for lead. As a result, it is concluded that there has been no impact from past activities at this site.

5.4.10.4 Qualitative Risk Assessment

A discussion on the COPCs and potential risks associated with the surface soil at this site is provided below.

COPC Identification

No COPCs were identified at Site 10. All surface soil lead concentrations were less than base background and the soil screening.

Potential Risk Discussion

The potential risk posed by conditions at Site 10 is extremely small due to the lack of COPCs.

5.4.10.5 Summary of Site Conditions

Lead was not identified as a COPC. No further action is necessary.

LEGEND

- 1958 POLYGON FEATURE
- SURFACE SOIL SAMPLE LOCATION
- ECP SITE BOUNDARY

SOURCE: GEO-MARINE, INC., SEPTEMBER 6, 2000.

Figure 5-73.
ECP Site 10 - Former Skeet Range
at Ofstie Airfield
Sample Location Map

Table 5-40. Summary of Lead Detections in Surface Soil at ECP Site 10 – Former Skeet Range at Ofstie Airfield

Site ID Sample ID Sample Date Sample Depth (ft bgs)	EPA Region III Industrial RBCs (mg/kg)	**EPA Region III Residential RBCs** (mg/kg)	2x Average Detected Background (mg/kg)	10E-SS01 10E-SS01 05/08/04 0.00 - 1.00	10E-SS02 10E-SS02 05/08/04 0.00 - 1.00	10E-SS03 10E-SS03 05/08/04 0.00 - 1.00	10E-SS04 10E-SS04 05/08/04 0.00 - 1.00	10E-SS05 10E-SS05 05/08/04 0.00 - 1.00	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**	Number Exceeding 2x Average Detected Background	Range Exceeding 2x Average Detected Background	Location of Maximum Detection
Lead (mg/kg)															
Lead	400[1]	400[1]	15.25	3.8	4.5	2.7	8.6	2.2	0/5		0/5		0/5		10E-SS04

Note:
[1] - 1996 Soil Screening Guidance.
ft bgs - feet below ground surface.
mg/kg - milligrams per kilogram.

5.4.11 ECP Site 11

5.4.11.1 Site History and Description

This site is located southwest of Hangar 200 in a level open grassy field (see Figure 5-74). The APA identified this area as PI Site 16, due to the observation of a depression/disturbed ground consistent with an existing or former UST location in 1958. The records review (historic maps) identified this area as the former location of UST No. 208. No records were available as to the final disposition of this UST. The physical site inspection observed no evidence of a UST, and interviews did not confirm or repudiate use or removal of a UST in the area.

Figure 5-74. ECP Site 11 - Former UST No. 208

During the Phase II ECP investigation, a slight depression was observed in the photo identified area presented in the Phase II ECP work plan (NAVFAC Atlantic, 2004b). However, as mentioned previously, after thoroughly searching the area, the UST was not identified. The vegetation at this site is shown in all five site photographs (see phots G-24 through G-28 in Appendix G) taken during the Phase II ECP investigation. Also shown is the vegetation in the areas immediately surrounding the former UST area. There were no signs of any stressed vegetation observed during the investigation. Photograph G-28 also presents the location where soil boring 11E-SB01 was installed.

5.4.11.2 Site Hydrogeology

ECP Site 11 is located in the inland flat lands, in the airfield area. Minor amounts of fill material (0.5-feet of sand and rock fragments) were observed at boring 11E-SB02. Otherwise, residual clay was observed in both borings. A few weathered fractures were observed in the clay. A low groundwater-yielding fracture was observed at approximately 11.5 feet at boring 11E-SB02. Two moderately yielding fractures were observed at boring 11E-SB01 between approximately 8.5- and 9.0-feet bgs. Bedrock was not encountered at the site.

5.4.11.3 Field Investigation and Sampling Program

The area within a depression/disturbed ground consistent with an existing or former UST location as described in the Phase I ECP Report (NAVFAC Atlantic, 2004a) was investigated at ECP Site 11.

The field crew thoroughly searched the depression/disturbed area in an attempt to determine if the UST was still present at this site. After a thorough search for the UST in the entire 1958 polygon feature as presented on Figure 5-75, it was determined that the UST was not currently present.

Based on the above findings, as well as the decision tree for this site located within the work plan, one soil boring was positioned within the former UST location (center of depression), and one was located along the perimeter of the former UST area. The sample locations were then field located with a hand held GPS receiver. As mentioned previously, there were no signs of stressed vegetation observed at this site.

–1958 POLYGON FEATURE
–SUBSURFACE SOIL SAMPLE LOCATION
–ECP SITE BOUNDARY

SOURCE: GEO–MARINE, INC., SEPTEMBER 6, 2000.

Figure 5-75.
ECP Site 11 - Former UST No. 208
Sample Location Map

A total of two soil borings were advanced within the depression/disturbed ground area as mentioned above. Subsurface soil was collected from two-foot intervals down to groundwater. The depth of the soil borings at this site ranged from 10 feet bgs to 14 feet bgs. All subsurface soil samples were screened in the field utilizing a FID with the results recorded in the field logbook. The screening results were compared against background to indicate if the soil has been impacted by past operations. [See Appendix G for full PID and FID screening results on a per site basis.]

Two subsurface soil samples (11E-SB01-03 and 11E-SB02-04) were submitted to a fixed-base laboratory for analysis of Appendix IX VOCs, SVOCs, and metals, and TPH DRO and GRO.

A groundwater program was not required for this site based on the FID levels. The levels did not indicate any potential impact to groundwater.

5.4.11.4 *Nature and Extent of Contamination*

Two subsurface soil environmental samples were collected from two locations at ECP Site 11 as discussed previously. Groundwater samples were not collected based on the results of the PID/FID screening performed on the soil collected from the borings at depths terminating at 10 to 14 feet bgs. Although a slightly elevated reading was noted with the FID at location 11E-SB02 at a depth of 9-10 feet, screening from deeper soils at that location did not indicate concentrations above background. No duplicate environmental samples were obtained from this site. The results of the analytical program can be seen in Tables 5-41 and 5-42.

The analytical program resulted in small estimated concentrations of two VOCs and a small amount of DRO, also estimated. Twelve inorganic compounds were also quantified in the subsurface soil matrix. Location 11E-SB01 had the highest concentration of the organic compounds, while location 11E-SB02 had the highest inorganic concentrations. The organic compounds are, in general, associated with fuel contamination. Tetrachloroethene was detected as well. The inorganic compounds are all naturally occurring at NSRR.

Comparison to criteria was done with all the results as shown in Tables 5-41 and 5-42. No organic compounds exceeded any criteria. Three inorganic compound concentrations, arsenic, chromium, and vanadium, exceeded the EPA Region III Residential RBCs, all at location 11E-SB02-04. However, the background concentrations were not exceeded for these three compounds. The copper concentration at 11E-SB02-04 exceeded the background concentration for this compound at NSRR, but not the RBCs.

Table 5-41. Summary of Organic Detections in Suburface Soil at ECP Site 11 – Former UST No. 208

Site ID Sample ID Sample Date Sample Depth (ft bgs)	EPA Region III Industrial RBCs (ug/kg)	**EPA Region III Residential RBCs** (ug/kg)	11E-SB01 11E-SB01-03 05/09/04 5.0 - 7.00	11E-SB02 11E-SB02-04 05/09/04 7.00 - 9.00	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 of Maximum Detection
Volatile Organic Compounds (ug/kg)									
Tetrachloroethene	5,300	1,200	2.2 J	5.6 U	0/2		0/2		11E-SB01-03
Chlorobenzene	2,000,000	160,000	3.4 J	5.6 U	0/2		0/2		11E-SB01-03
Semivolatile Organic Compounds (ug/kg)									
Not Detected									
Total Petroleum Hydrocarbons (mg/kg)									
Diesel Range Organics	NE	NE	3.9 J	2.4 J	NE		NE		11E-SB01-03

Notes:

J - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
NE - Not Established.
ft bgs - feet below ground surface.
ug/kg - micrograms per kilogram.
mg/kg - milligrams per kilogram.

Table 5-42. Summary of Inorganic Detections in Suburface Soil at ECP Site 11 – Former UST No. 208

Site ID Sample ID Sample Date Sample Depth (ft bgs)	EPA Region III Industrial RBCs (mg/kg)	**EPA Region III Residential RBCs** (mg/kg)	2x Average Detected Background (mg/kg)	11E-SB01 11E-SB01-03 05/09/04 5.0 - 7.00	11E-SB02 11E-SB02-04 05/09/04 7.00 - 9.00	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**	Number Exceeding 2x Average Detected Background	Range Exceeding 2x Average Detected Background	Location of Maximum Detection
Appendix IX Inorganics (mg/kg)												
Arsenic	1.9	0.43	2.05	1.2 U	**1.6**	0/2		1/2	1.6	0/2		11E-SB02-04
Barium	7,200	550	222	21	3.6	0/2		0/2		0/2		11E-SB01-03
Beryllium	200	16	0.74	0.052 B	0.3 B	0/2		0/2		0/2		11E-SB02-04
Cobalt	2,000	160	30.0	1.2 U	5	0/2		0/2		0/2		11E-SB02-04
Chromium	310	23	133	18	**65**	0/2		1/2	65	0/2		11E-SB02-04
Copper	4,100	310	193	18	210	0/2		0/2		1/2	210	11E-SB02-04
Nickel	2,000	160	31.9	1.7 B	6.3	0/2		0/2		0/2		11E-SB02-04
Lead	400[(1)]	400[(1)]	8.68	2	3.6	0/2		0/2		0/2		11E-SB02-04
Tin	61,000	4,700	2.96	2.9 B	2.1 B	0/2		0/2		0/2		11E-SB01-03
Vanadium	100	7.8	462	**25**	**410**	1/2	410	2/2	25 - 410	0/2		11E-SB02-04
Zinc	31,000	2,300	88.6	3.9	24	0/2		0/2		0/2		11E-SB02-04
Mercury	31[(2)]	2.3[(2)]	0.093	0.013 B	0.023 U	0/2		0/2		0/2		11E-SB01-03

Notes:

B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
(1) - 1996 Soil Screening Guidance.
(2) - Value based on the RBC for Mercuric Chloride.
ft bgs - feet below ground surface.
mg/kg - milligrams per kilogram.
NE - Not Established.

Based on the limited subsurface soil investigation and results at this site, it can be concluded that past activities have not impacted the environmental conditions at ECP Site 11.

5.4.11.5 Qualitative Risk Assessment

A discussion on the COPCs and potential risks associated with the subsurface soil at this site is provided below.

COPC Identification

No organic COPCs were identified for subsurface soil at Site 11. No inorganic COPCs were identified either. Residential RBC concentrations were exceeded in several samples for arsenic, chromium, and vanadium but none of these concentrations exceed the base background criteria.

Potential Risk Discussion

The potential risk posed by conditions at Site 11 is extremely small due to the lack of COPCs.

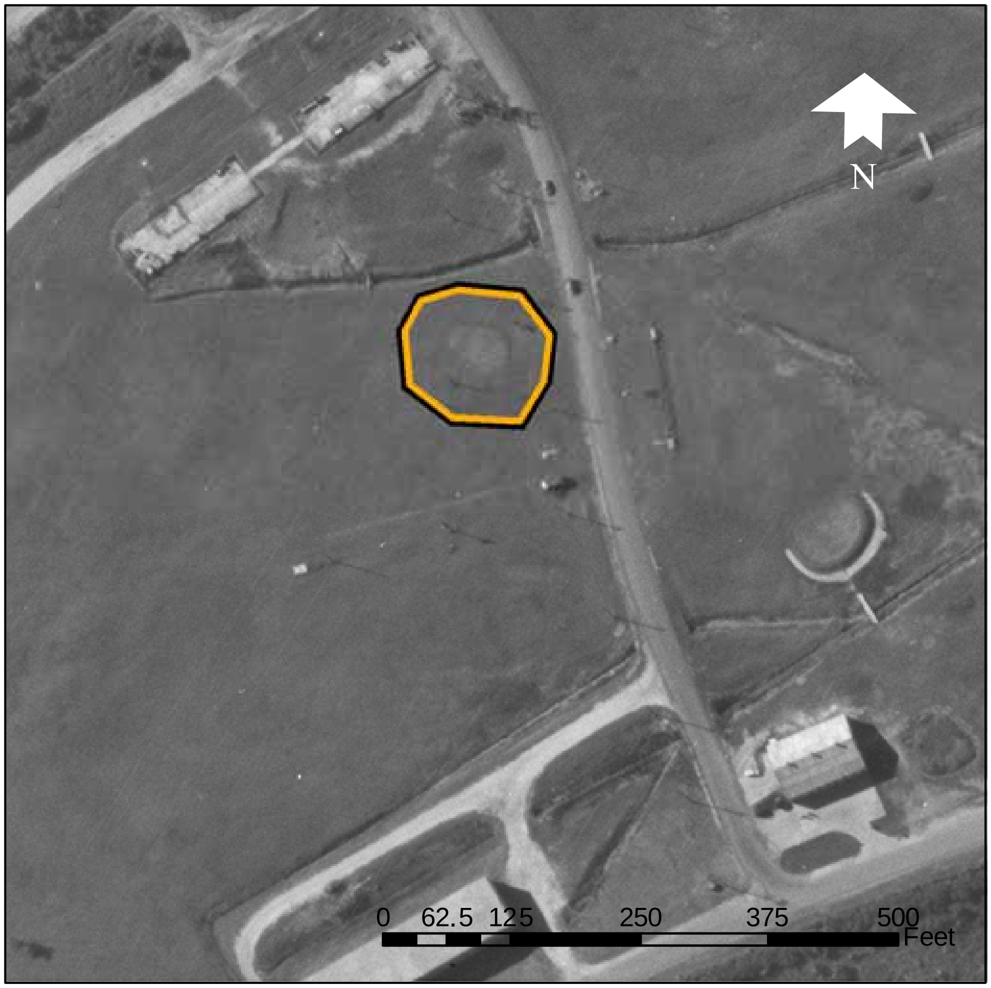
5.4.11.6 Summary of Site Conditions

No COPCs were identified at this site, resulting in an extremely small risk to human health. Based on the results of the ECP Phase II Investigation, it is unlikely that this site has been impacted by previous activities. No further action is necessary.

5.4.12 ECP Site 12

5.4.12.1 Site History and Description

This site is located southwest of Hangar 200 in a small open level area surrounded by secondary growth vegetation (see Figure 5-76). The APA identified this area as PI Site 17, due to the observation of a depression/disturbed ground consistent with an existing or former UST location in 1958. The records review (historic maps) identified this area as the former location of UST No. 209. No records were available as to the final disposition of this UST. The physical site inspection observed no evidence of a UST, and interviews did not confirm or repudiate use or removal of a UST in the area. [See photo A-31]



*Background aerial photograph from 1958

Figure 5-76. ECP Site 12 - Former UST No. 209

A relatively open area within the heavy secondary growth vegetation was observed in the photo identified area presented in the Phase II ECP work plan (Baker Environmental Inc. [Baker], 2004), during the Phase II ECP investigation. However, after thoroughly searching the area, the UST was not identified. There were no signs of any stressed vegetation observed during the Phase II ECP investigation (see photos G-29 and G-30).

5.4.12.2 Site Hydrogeology

ECP Site 12 is located in the inland flat lands, near the airfield. Minor amounts of fill material were observed at the site (1-foot of silt and gravel) at boring 12E-SB02. Otherwise, residual clay was observed in both borings. A few weathered fractures were observed in the clay. Evidence of low groundwater-yielding fractures was observed at approximately 10-feet bgs at both borings. A wet zone at 4-feet bgs was also observed at boring 11E-SB01. Bedrock was not encountered at the site.

5.4.12.3 *Field Investigation and Sampling Program*

The area within a depression/disturbed ground consistent with an existing or former UST location as described in the Phase I ECP Report (NAVFAC Atlantic, 2004a) was investigated at ECP Site 12.

The field crew thoroughly searched the depression/disturbed ground in an attempt to determine if the UST was still present at this site. After a thorough search of the entire 1958 polygon feature presented on Figure 5-77 for the UST, it was determined that the UST was not currently present.

Based on the above findings, one soil boring was positioned within the former UST location (center of depression), and one was located along the perimeter of the former UST area. Subsurface soil was collected from two-foot intervals down to groundwater at a depth of approximately 10 feet bgs. The depth of the soil borings at this site ranged from 15 feet bgs to 20 feet bgs. All subsurface soil samples were screened in the field utilizing a FID with the results recorded in the field logbook. The screening results were compared against background to indicate if the soil has been impacted by past operations. [See Appendix G for full PID and FID screening results on a per site basis.]

Two subsurface soil samples (12E-SB01-02 and 12E-SB02-04) were submitted to a fixed-base laboratory for analysis of Appendix IX VOCs, SVOCs, and metals, and TPH DRO and GRO.

A groundwater program was not required for this site based on the FID levels. The levels did not indicate any potential impact to groundwater.

5.4.12.4 *Nature and Extent of Contamination*

Two environmental samples were collected from subsurface soil at two locations at the former UST No. 209 as shown on Figure 5-77. Groundwater samples were not collected based on the results of the PID/FID screening performed on soil collected from borings 15 to 20 feet bgs in depth. No duplicate environmental samples were obtained from this site. The results of the analytical program can be seen in Tables 5-43 and 5-44.

LEGEND

–1958 POLYGON FEATURE

–SUBSURFACE SOIL SAMPLE LOCATION

–ECP SITE BOUNDARY

SOURCE: GEO–MARINE, INC., SEPTEMBER 6, 2000.

Figure 5-77.
ECP Site 12 - Former UST No. 209
Sample Location Map

Table 5-43. Summary of Organic Detections in Suburface Soil at ECP Site 12 – Former UST No. 209

Site ID Sample ID Sample Date Sample Depth (ft bgs)	EPA Region III Industrial RBCs (ug/kg)	**EPA Region III Residential RBCs** (ug/kg)	12E-SB01 12E-SB01-02 05/09/04 3.00 - 5.00	12E-SB02 12E-SB02-04 05/09/04 7.00 - 9.00	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 of Maximum Detection
Volatile Organic Compounds (ug/kg)									
Not Detected									
Semivolatile Organic Compounds (ug/kg)									
4-Bromophenylphenyl ether	NE	NE	94 J	460 U	NE		NE		12E-SB01-02
Pyrene	3,100,000	230,000	22 J	460 U	0/2		0/2		12E-SB01-02
Total Petroleum Hydrocarbons (mg/kg)									
Diesel Range Organics	NE	NE	4.3 U	3.3 J	NE		NE		12E-SB02-04

Notes:

J - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
NE - Not Established.
ft bgs - feet below ground surface.
ug/kg - micrograms per kilogram.
mg/kg - milligrams per kilogram.

Table 5-44. Summary of Inorganic Detections in Suburface Soil at ECP Site 12 – Former UST No. 209

Site ID Sample ID Sample Date Sample Depth (ft bgs)	EPA Region III Industrial RBCs (mg/kg)	**EPA Region III Residential RBCs** (mg/kg)	2x Average Detected Background (mg/kg)	12E-SB01 12E-SB01-02 05/09/04 3.00 - 5.00	12E-SB02 12E-SB02-04 05/09/04 7.00 - 9.00	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**	Number Exceeding 2x Average Detected Background	Range Exceeding 2x Average Detected Background	Location of Maximum Detection
Appendix IX Inorganics (mg/kg)												
Silver	510	39	0.46	0.16 B	1.3 U	0/2		0/2		0/2		12E-SB01-02
Barium	7,200	550	222	42	11	0/2		0/2		0/2		12E-SB01-02
Beryllium	200	16	0.74	0.14 B	0.093 B	0/2		0/2		0/2		12E-SB01-02
Cobalt	2,000	160	30.0	5.4	0.83 B	0/2		0/2		0/2		12E-SB01-02
Chromium	310	23	132.6	18	19	0/2		0/2		0/2		12E-SB02-04
Copper	4,100	310	193.1	57	53	0/2		0/2		0/2		12E-SB01-02
Nickel	2,000	160	31.9	4.3 B	2.2 B	0/2		0/2		0/2		12E-SB01-02
Lead	400(1)	400(1)	8.68	1.5	1.3	0/2		0/2		0/2		12E-SB01-02
Tin	61,000	4,700	2.96	1.8 B	2.5 B	0/2		0/2		0/2		12E-SB02-04
Vanadium	100	7.8	462.2	**120**	**180**	2/2	120 - 180	2/2	120 - 180	0/2		12E-SB02-04
Zinc	31,000	2,300	88.6	19	7.5	0/2		0/2		0/2		12E-SB01-02
Mercury	31(2)	2.3(2)	0.093	0.097	0.028	0/2		0/2		0/2		12E-SB01-02

Notes:

B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or abovethe MDL/PQL.
NE - Not Established.
(1) - 1996 Soil Screening Guidance.
(2) - Value based on the RBC for Mercuric Chloride.
ft bgs - feet below ground surface.
mg/kg - milligrams per kilogram.

There were two SVOCs detected in the sample obtained from location 12E-SB01 at a depth of 3-5 feet bgs. DRO was detected in a small estimated concentration at the other location, 12E-SB02, at a depth of 7-9 feet bgs. Twelve inorganic compounds were quantified at similar concentrations at both locations.

The SVOCs quantified with estimated concentrations at 12E-SB01 were pyrene and 4-Bromophenyl phenyl ether. Pyrene is a PAH and is typically associated with fuel contamination. The other compound, 4-bromophenyl phenyl ether, is used as a research chemical and as a flame retardant additive in polymers. It is possible that it may be formed during chlorination treatment of sewage and drinking water, but in this case would only be found in aqueous phase media. Inorganic compounds at this site are typically found in the soil at NSRR.

Organic compounds did not exceed any RBC criteria established at the site (see Tables 5-43 and 5-44). However, criteria have not been established for 4-bromophenyl phenyl ether. Inorganic concentrations did not exceed any criteria with the exception of vanadium, which is found naturally in high concentrations at NSRR. The vanadium concentration did not exceed the established background value for subsurface soil at NSRR.

It is tentatively concluded that no impact to the environment has occurred at ECP Site 12. This conclusion is based on the low concentrations of organics found at the site. (The occurrence of the compound 4-bromophenyl phenyl ether is anomalous, and the source is unknown. However, the low concentration found in the soil is not likely to cause concern.)

5.4.12.5 Qualitative Risk Assessment

A discussion on the COPCs and potential risks associated with the subsurface soil at this site is provided below.

COPC Identification

No organic COPCs were identified for subsurface soil at Site 12. No inorganic COPCs were identified either. Residential RBC concentrations were exceeded in two samples for vanadium but these concentrations do not exceed the base background criteria.

Potential Risk Discussion

The potential risk posed by conditions at Site 12 is extremely small due to the lack of COPCs.

5.4.12.6 Summary of Site Conditions

It is unlikely that this site has been impacted by the presence of former UST No. 209. No COPCs were identified at ECP Site 12. No further action is necessary.

5.4.13 ECP Site 13

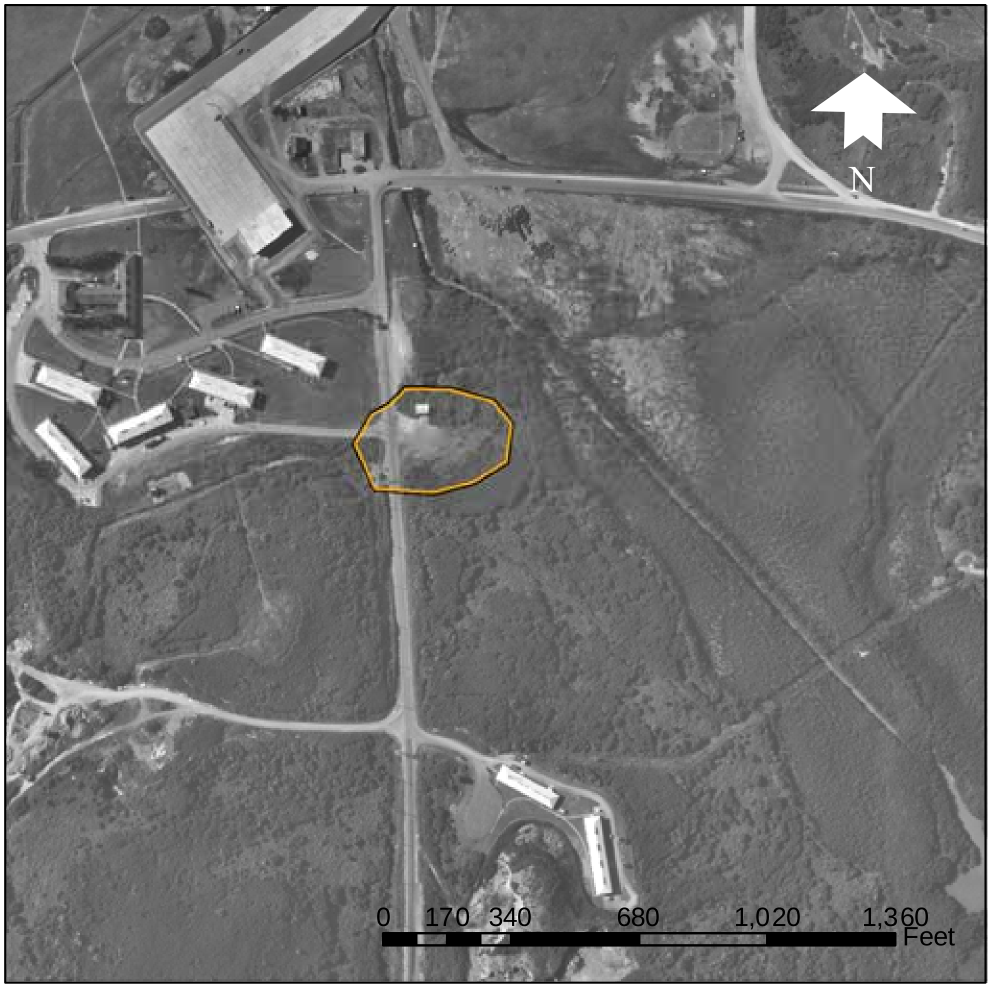
5.4.13.1 Site History and Description

This site is located on the east side of Langley Drive north of the tennis courts in a level area covered with secondary growth vegetation (see Figure 5-78). The APA identified this area as PI Site 18, due to the observation of a small building that could potentially be consistent with a gas station in 1958. The records review (historic maps) identified the structure as a gas station; however, no records were available as to final disposition of fuel storage tanks. Interviews confirmed former use as a gas station; however, final disposition of fuel storage tanks was unknown. The physical site inspection observed a building foundation, but no evidence of USTs.

During the Phase II ECP investigation, a concrete pad as well as a building foundation mentioned above, were observed north of the tennis courts within the woods. This building foundation contained an area were suspected previous vehicle maintenance was performed. The suspected vehicle maintenance was performed in a service bay accessed by a ladder. After thoroughly searching the area for the suspected UST associated with this former gas station, the UST was not identified. There were no signs of any stressed vegetation observed during the investigation. A downgradient storm water drainage swale was observed north of the building structure. See Appendix G for photos G-31 and G 32 taken of this site during the field investigation.

5.4.13.2 Site Hydrogeology

ECP Site 13 is located in the upland area, on the border of the inland flat lands. Surficial material at the site consisted of approximately 3- to 5.5-feet of fill material (mainly gravel, silt, or clay). Residual clay was observed beneath the fill, ranging from 4.3-feet thick at boring 13E-SB01 to 10.6-feet thick at boring 13E-SB03. Bedrock (Gabbro) was observed beneath the residual clay. The bedrock exhibited heavy weathering. A groundwater zone was observed in the bedrock at approximately 16-feet bgs at temporary well 13E-TW03. Groundwater was also observed in a fracture 12-feet bgs at boring 13E-SB01. A slight fuel odor was observed in the residual clay at temporary well 13E-TW03 at a depth of 8- to 14-feet bgs. Green staining was observed in the bedrock at boring 13E-SB01, but there was no observed odor or readings on the photoionization detector (PID) or flame ionization detector (FID).



*Background aerial photograph from 1958

Figure 5-78. ECP Site 13 - Former Gas Station

5.4.13.3 Field Investigation and Sampling Program

The area located just off the north side of the tennis courts on Langley Drive was investigated at ECP Site 13. The field crew thoroughly searched this site in an attempt to determine the location of suspected UST area, as well as to determine if the UST was still present at the site. Based on site layout in historical aerial photographs, it was assumed that the former UST was located south of building foundation mentioned within the Phase I ECP Report (NAVFAC Atlantic, 2004a). As mentioned previously, a concrete pad as well as a building foundation mentioned above, was observed north of the tennis courts within the secondary growth vegetation area. This building foundation contained a service bay for vehicle maintenance. However, the suspected UST was not identified, and there were no signs of any stressed vegetation observed during the investigation. As mentioned previously, a downgradient storm water drainage swale was observed north of the building structure.

Based on the above findings, as well as the decision tree for this site, the field crew relocated one soil boring (13E-SB02) from its original location presented within the work plan, to a downgradient area north of the existing building structure. This soil boring, in conjunction with the other two soil borings at this site (13E-SB01 and 13E-SB03), would have provided coverage to the north, west, and south of the building structure. However, after multiple attempts at installing soil boring (13E-SB02) within this downgradient area north of the building structure, the result was auger refusal. The decision was then made to install 13E-SB02 in the originally proposed location south of the building structure and west of soil boring 13E-SB03 as presented in the work plan.

A total of three soil borings were advanced at this site as presented on Figure 5-79. Subsurface soil samples were collected from two-foot intervals down to groundwater and ranged in depth from 15 feet bgs to 20 feet bgs. All subsurface soil samples were screened in the field utilizing a FID with the results recorded in the field logbook. The screening results were compared against background to indicate if the soil has been impacted by past operations. [See Appendix G for full PID and FID screening results on a per site basis.]

Three subsurface soil samples were submitted to the fixed-base analytical laboratory including (13E-SB01-04, 13E-SB02-05, and 13E-SB03-05) for analysis of Appendix IX VOCs, SVOCs, and metals and TPH DRO and GRO.

A groundwater program followed the soil sampling program, with two temporary monitor wells installed at soil boring locations 13E-SB02 and 13E-SB03. Although the PID/FID levels did not indicate any real impact to groundwater, the decision was made to install the two temporary wells at the above locations based on the fuel odor observed, as well as the greenish staining observed in the subsurface soils. The temporary monitor wells were installed at the site and the groundwater samples were then collected utilizing a modified version of the low flow sampling technique, and submitted to the fixed-base analytical laboratory for analysis of Appendix IX VOCs, SVOCs, inorganics, as well as TPH DRO and GRO. The inorganic analysis requested was for dissolved metals only.

LEGEND
- 1958 POLYGON FEATURE
- 1958 DRAINAGE
- SUBSURFACE SOIL SAMPLE LOCATION
- SUBSURFACE SOIL AND GROUNDWATER SAMPLE LOCATION
- ECP SITE BOUNDARY

SOURCE: GEO-MARINE, INC., SEPTEMBER 6, 2000.

Figure 5-79.
ECP Site 14 - Former Southern Fire Training Area

5.4.13.4 Nature and Extent of Contamination

Three subsurface soil samples and two groundwater samples were collected from the area of a former gas station at ECP Site 13 at locations shown on Figure 5-79. The locations of the groundwater samples were determined based on field screening of the soil samples by the FID and PID instruments No duplicate environmental samples were collected at this site. The results of the analytical program can be seen in Table 5-45 through 5-48.

In the subsurface soil, three VOCs, three SVOCs and TPH DRO were detected and quantified at estimated concentrations. Twelve inorganic compounds were also quantified in the subsurface soil. Location 13E-SB03 contained the highest concentrations of VOCs and DRO compounds, with the exception of acetone, which was found at a slightly higher concentration at location 13E-SB02. Location 13E-SB01 contained the highest concentrations of SVOCs. Some SVOCs were also found at location 13E-SB02. Inorganic concentrations were varied for the different compounds. No location exhibited higher overall concentrations of inorganic concentrations than another.

Groundwater environmental samples indicated that two VOCs and both TPH DRO and GRO were present in fairly low quantities. Six inorganic compounds were also quantified. Similar concentrations of most compounds were found at both locations. The fuel odor observed during sampling at 12E-GW03 and the slightly elevated FID screening levels found in 13E-SB03 were verified by the presence of DRO at this location. The DRO concentration was similar at 13E-GW02, but was not detected by the FID/PID screening.

In general, the organic compounds detected at ECP Site 13 are typical of those associated with fuel and solvent use. The inorganic compounds found in soil are associated with background levels at NSRR. Some dissolution of these compounds from the soil matrix is expected to result in the concentrations found in the groundwater.

Comparison to criteria was performed and is shown in Tables 5-45 through 5-48. Dibenzo(a,h)anthracene (soil) was found at a concentration exceeding the EPA Region III Residential RBC at location 13E-SB01-04. Arsenic (soil), chromium (soil), mercury (groundwater) and vanadium (soil and groundwater) exceeded their EPA Region III Residential RBCs. However, none of the soil compounds was found in excess of twice the average detected background concentrations established for soil at NSRR. High naturally occurring vanadium in soil has likely contributed to the elevated vanadium concentration in groundwater. Barium (soil), cobalt (soil), and zinc (soil) were quantified at concentrations slightly higher than background concentrations, but were below the RBCs.

Table 5-45. Summary of Organic Detections in Suburface Soil at ECP Site 13 – Former Gas Station

Site ID Sample ID Sample Date Sample Depth (ft bgs)	EPA Region III Industrial RBCs (ug/kg)	**EPA Region III Residential RBCs** (ug/kg)	13E-SB01 13E-SB01-04 05/08/04 7.00 - 9.00	13E-SB02-05 13E-SB02-05 05/08/04 9.00 - 11.00	13E-SB03 13E-SB03-05 05/08/04 9.00 - 11.00	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 of Maximum Detection
Volatile Organic Compounds (ug/kg)										
Tetrachloroethene	5,300	1,200	6.2 U	5.9 U	2.4 J	0/3		0/3		13E-SB03-05
Chlorobenzene	2,000,000	160,000	6.2 U	5.9 U	2.9 J	0/3		0/3		13E-SB03-05
Acetone	92,000,000	7,000,000	62 U	44 J	43 J	0/3		0/3		13E-SB02-05
Semivolatile Organic Compounds (ug/kg)										
Dibenzo(a,h)anthracene	390	87	**110** J	63 J	480 U	0/3		1/3	110J	13E-SB01-04
Indeno(1,2,3-cd)pyrene	3,900	870	110 J	60 J	480 U	0/3		0/3		13E-SB01-04
Benzo(g,h,i)perylene	NE	NE	120 J	75 J	480 U	NE		NE		13E-SB01-04
Total Petroleum Hydrocarbons (mg/kg)										
Diesel Range Organics	NE	NE	2.7 J	2.6 J	3.2 J	NE		NE		13E-SB03-05

Notes:

J - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
NE - Not Established.
ft bgs - feet below ground surface.
ug/kg - micrograms per kilogram.
mg/kg - milligrams per kilogram.

Table 5-46. Summary of Inorganic Detections in Suburface Soil at ECP Site 13 – Former Gas Station

Site ID Sample ID Sample Date Sample Depth (ft bgs)	EPA Region III Industrial RBCs (mg/kg)	**EPA Region III Residential RBCs** (mg/kg)	2x Average Detected Background (mg/kg)	13E-SB01 13E-SB01-04 05/08/04 7.00 - 9.00	13E-SB02 13E-SB02-05 05/08/04 9.00 - 11.00	13E-SB03 13E-SB03-05 05/08/04 9.00 - 11.00	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**	Number Exceeding 2x Average Detected Background	Range Exceeding 2x Average Detected Background	Location of Maximum Detection
Appendix IX Metals (mg/kg)													
Arsenic	1.9	0.43	2.05	1.2 U	**0.85** B	1.3 U	0/3		1/3	0.85B	0/3		13E-SB02-05
Barium	7,200	550	222	250	190	140	0/3		0/3		1/3	250	13E-SB01-04
Beryllium	200	16	0.74	0.21 B	0.32 B	0.33 B	0/3		0/3		0/3		13E-SB03-05
Cobalt	2,000	160	30.0	10	23	36	0/3		0/3		1/3	36	13E-SB03-05
Chromium	310	23	133	10	9	**40**	0/3		1/3	40	0/3		13E-SB03-05
Copper	4,100	310	193	36	18	120	0/3		0/3		0/3		13E-SB03-05
Nickel	2,000	160	31.9	4.9	5.4	18	0/3		0/3		0/3		13E-SB03-05
Lead	400(1)	400(1)	8.68	1.9	0.83	1.9	0/3		0/3		0/3		13E-SB01-04, 13E-SB03-05
Tin	61,000	4,700	2.96	2 B	1.6 B	2.1 B	0/3		0/3		0/3		13E-SB03-05
Vanadium	100	7.8	462	**240**	**210**	**200**	3/3	200 - 240	3/3	200 - 240	0/3		13E-SB01-04
Zinc	31,000	2,300	88.6	52	210	67	0/3		0/3		1/3	210	13E-SB02-05
Mercury	31(2)	2.3(2)	0.093	0.019 B	0.023 U	0.019 B	0/3		0/3		0/3		13E-SB01-04, 13E-SB03-05

Notes:

B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
NE - Not Established.
(1) - 1996 Soil Screening Guidance.
(2) - Value based on the RBC for Mercuric Chloride.
ft bgs - feet below ground surface.
mg/kg - milligrams per kilogram.

Table 5-47. Summary of Organic Detections in Groundwater at ECP Site 13 – Former Gas Station

Site ID Sample ID Sample Date	Federal MCLs (ug/L)	**EPA Region III Tap Water RBCs** (ug/L)	PR Water Quality Standards (ug/L)	13E-SB02 13E-GW02 5/10/2004	13E-SB03 13E-GW03 5/10/2004	Number Exceeding Federal MCLs	Range Exceeding Federal MCLs	**Number Exceeding EPA Region III Tap Water RBCs**	**Range Exceeding EPA Region III Tap Water RBCs**	Number Exceeding PR Water Quality Standards	Range Exceeding PR Water Quality Standards	Location of Maximum Detection
Volatile Organic Compounds (ug/L)												
Acetone	NE	550	NE	8 J	7 J	NE		0/2		NE		13E-GW02
Carbon disulfide	NE	100	NE	1 U	1.1	NE		0/2		NE		13E-GW03
Semivolatile Organic Compounds (ug/L)												
Not Detected												
Total Petroleum Hydrocarbons (mg/L)												
Diesel Range Organics	NE	NE	NE	0.81	0.71	NE		NE		NE		13E-GW02
Gasoline Range Organics	NE	NE	NE	0.014 J	0.05 U	NE		NE		NE		13E-GW02

Notes:
J - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
ug/L - micrograms per liter.
mg/L - milligrams per liter.
NE - Not Established.

Table 5-48. Summary of Inorganic Detections in Groundwater at ECP Site 13 – Former Gas Station

Site ID Sample ID Sample Date	Federal MCLs (mg/L)	**EPA Region III Tap Water RBCs** (mg/L)	PR Water Quality Standards (mg/L)	13E-SB02 13E-GW02 5/10/2004	13E-SB03 13E-GW03 5/10/2004	Number Exceeding Federal MCLs	Range Exceeding Federal MCLs	**Number Exceeding EPA Region III Tap Water RBCs**	**Range Exceeding EPA Region III Tap Water RBCs**	Number Exceeding PR Water Quality Standards	Range Exceeding PR Water Quality Standards	Location of Maximum Detection
Appendix IX (Dissolved) Metals (mg/L)												
Barium	2	0.26	NE	0.0061 B	0.043	0/2		0/2		NE		13E-GW03
Cobalt	NE	0.073	NE	0.01 U	0.0014 B	NE		0/2		NE		13E-GW03
Copper	1.3[1]	0.15	1.3	0.02 U	0.0032 B	0/2		0/2		NE		13E-GW03
Nickel	NE	0.073	NE	0.0023 B	0.004 B	NE		0/2		NE		13E-GW03
Vanadium	NE	0.0037	NE	**0.067**	**0.038**	NE		2/2	0.038 - 0.067	NE		13E-GW02
Mercury	0.002	0.0011[1]	0.002	**0.0012** B	0.004 U	0/2		1/2	0.0012B	0/2		13E-GW02

Total Cyanide and Sulfide (mg/L)

Not Detected

Notes:

B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
NE - Not Established.
[1] - Value based on the Tap Water RBC for Mercuric Chloride.
mg/L - milligrams per liter.

Based on the detections of dibenzo(a,h)anthracene in soil, TPH DRO in soil and groundwater, and GRO in groundwater, and exceedance of criteria for dibenzo(a,h)anthracene, it is concluded that this site has been impacted by previous activities at NSRR.

5.4.13.5 Qualitative Risk Assessment

A discussion on the COPCs and potential risks associated with the subsurface soil and groundwater at this site, is provided below.

COPC Identification

Dibenzo(a,h)anthracene is the only organic analyte identified as a COPC in subsurface soil at Site 13, with a concentration in one sample in excess of the residential RBC. No inorganic analytes were identified as COPCs. Arsenic, chromium, and vanadium were present in at least one sample at a concentration that exceeds the residential RBCs but none of these concentrations exceeded the base background criteria.

No organic COPCs were identifed for groundwater at Site 13. Mercury and vanadium were the only inorganic COPCs identified in groundwater.

Potential Risk Discussion

Significant exposure to subsurface soil is less likely than to surface soil, especially given the reasonably anticipated land use of industrial/commercial. The dibenzo(a,h)anthracene concentration (110 µg/kg) is less than the industrial RBC, indicating a low potential for significant risk from exposure to subsurface soil.

Potential exposure to groundwater at NSRR is unlikely. Groundwater is not currently used for potable purposes because drinking water is available from El Yunque which supplies all of NSRR's present needs. The most likely exposure route to groundwater is from inhalation of vapors emitted from volatile organics through the overlying soil, particularly into buildings. Mercury and vanadium are not considered volatile in groundwater. The RBCs used to select mercury and vanadium as COPCs are based on noncarcinogenic toxicity criteria set at one-tenth of the level considered acceptable by EPA to account for potential additive effects of multiple contaminants. As there are only two noncarcinogenic COPCs in groundwater at Site 13, the single contaminant RBC can be used for comparison, which is ten times higher than the tap water RBCs. The mercury concentration (0.0012 B mg/L) is an estimated value less than the reporting limit and is less than the single contaminant tap water RBC of 0.011 mg/L (based on the unlikely but assumed exposure via ingestion of groundwater). The vanadium levels in groundwater are probably a result of leaching from the generally high levels of vanadium in soil at NSRR, however, both samples from the two monitoring wells contain levels that exceed the single contaminant tap water RBC of 0.037 mg/L. Groundwater at Site 13 from mercury and vanadium exposure does not appear to pose a significant potential human health concern due to the unlikelihood of exposure and low concentrations of the COPCs. The potential risk from groundwater exposure is very low even if the groundwater were to be used for potable purposes in the future.

5.4.13.6 Summary of Site Conditions

Activities conducted at the former gas station at ECP Site 13 have likely impacted the environment. A single PAH was found in the subsurface soil below industrial RBC (above residential RBC), resulting in a low risk. Vanadium and mercury were identified as COPCs in the groundwater because they were above the RBCs, but an unlikely exposure scenario was used to determine that no risk to human health is expected from groundwater exposure. Further investigation at this site will be conducted under the RCRA Corrective Action/IRP process.

5.4.14 ECP Site 14

5.4.14.1 Site History and Description

This site is located at the southwest end of the Ofstie Airfield within a flat lying open area surrounded by secondary growth vegetation (see Figure 5-80). The APA identified this area as PI Site 19, due to the observation of a circular, graded area with an aircraft fuselage and two stained areas consistent with a fire training area from 1961-1964. The records review did not identify a fire training area at this location. Interviews confirmed former use as a fire training area; dates of usage and fuel used unknown but were suspected to be in the 1950s and 1960s. The physical site inspection observed a disturbed circular area consistent with that of a fire training area, but no stressed vegetation or stained soils. [See photos A-32 and A-33]

The Phase II ECP investigation noted several depressed areas at this site containing different types of vegetation then the remaining portions of the site. The depressed areas contained vegetation that appeared in vines, rather then the remaining areas that contained mostly dense tall grass. Also noted within the area were trees around the perimeter of the site (see photographs G-33 through G-35 taken during the Phase II ECP investigation). During the investigation, an unidentified metal object was observed in the vicinity of 14E-03 as presented in Photograph G-35.

*Background aerial photograph from 1961

Figure 5-80. ECP Site 14 - Former Southern Fire Training Area

5.4.14.2 Site Hydrogeology

ECP Site 14 is located in the inland flat lands, near the airfield. Fill material was observed to a depth of 4-feet at boring 14E-SB01 and to a depth of 9.7-feet at boring 14E-SB02. Residual clay was observed below the fill, and from the surface at boring 14E-SB02. A gravelly zone was observed at approximately 10-feet bgs boring 14E-SB01. Fracturing was not as evident as it was in other sites in the inland flat lands. Groundwater was observed between 10- and 12-feet bgs within the residual clay. Bedrock was not encountered at the site.

5.4.14.3 Field Investigation and Sampling Program

As mentioned previously in this report, there were no signs of staining or stressed vegetation observed at this site. Therefore, the originally proposed sample locations within the work plan were utilized.

A total of three soil borings (14E-01 through 14E-03) were advanced in three separate areas of the former fire training area as presented on Figure 5-81. One soil boring was located in the center of each of the two stained areas identified within the Phase I ECP Report (NAVFAC Atlantic, 2004a), while one soil boring was located in the area of the historical identification of an aircraft fuselage.

Subsurface soil samples were collected from two-foot intervals down to groundwater. All three soil borings at this site were drilled to a depth of 15 feet bgs. All surface and subsurface soil samples were screened in the field utilizing a FID and PID with the results recorded in the field logbook. The screening results were compared against background to indicate if the soil has been impacted by past operations. [See Appendix G for full PID and FID screening results on a per site basis.]

Three surface soil samples (14E-SS01 through 14E-SS03) and three subsurface soil samples (14E-SB01-04, 14E-SB02-02, and 14E-SB03-02) were submitted to the fixed-base analytical laboratory for analysis of Appendix IX VOCs, SVOCs, and metals and TPH DRO and GRO analysis. The QA/QC samples collected at this site included one duplicate sample (14E-SS03D) and one MS/MSD (14E-SS03MS/MSD) within the surface soil samples.

A groundwater program was not required for this site based on the FID/PID levels. The levels did not indicate any potential impact to groundwater.

5.4.14.4 *Nature and Extent of Contamination*

A total of three surface soil and three subsurface soil samples were collected from three locations at the former Southern Fire Training Area, ECP Site 14, shown on Figure 4-13. Groundwater samples were not collected due to the fact that the FID/PID screening did not result in any readings above background. One duplicate environmental sample was collected from the surface soil media. The results of the analytical program can be seen in Tables 5-49 through 5-52.

In the surface soil there were two VOCs, and TPH DRO detected. Fifteen inorganic compounds were quantified as well. All locations had similar levels of the organic compounds. Inorganic concentrations were more spatially varied. In the subsurface soil only DRO was detected at concentrations roughly half of those seen in the surface soil at each location. Eleven inorganic compounds were detected.

In general, the organic contamination in the soil is primarily related to fuel contamination, and inorganics consistent with the use of a fire training facility. The VOCs quantified were very low and estimated concentrations. The inorganic concentrations exhibited more variability.

LEGEND

- 1961 POLYGON FEATURE
- 1961 DRAINAGE
- 1964 POLYGON FEATURE
- SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
- ECP SITE BOUNDARY

SOURCE: GEO-MARINE, INC., SEPTEMBER 6, 2000.

Figure 5-81.
ECP Site 14 - Former Southern Fire Training Area Sample Location Map

Table 5-49. Summary of Organic Detections in Surface Soil at ECP Site 14 – Former Southern Fire Training Area

Site ID Sample ID Sample Date Sample Depth (ft bgs)	EPA Region III Industrial RBCs (ug/kg)	**EPA Region III Residential RBCs** (ug/kg)	14E-01 14E-SS01 05/08/04 0.00 - 1.00	14E-02 14E-SS02 05/08/04 0.00 - 1.00	14E-03 14E-SS03 05/08/04 0.00 - 1.00	14E-03 14E-SS03D 05/08/04 0.00 - 1.00	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 of Maximum Detection
Volatile Organic Compounds (ug/kg)											
Tetrachloroethene	5,300	1,200	3.6 J	2.2 J	3.2 J	4.7 J	0/4		0/4		14E-SS03D
Chlorobenzene	2,000,000	160,000	2.5 J	1.8 J	3.5 J	5 J	0/4		0/4		14E-SS03D
Semivolatile Organic Compounds (ug/kg)											
Not Detected											
Total Petroleum Hydrocarbons (mg/kg)											
Diesel Range Organics	NE	NE	6.2	4 J	4.9	4.5	NE		NE		14E-SS01

Notes:

J - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
NE - Not Established.
ft bgs - feet below ground surface.
ug/kg - micrograms per kilogram.
mg/kg - milligrams per kilogram

Table 5-50. Summary of Inorganic Detections in Surface Soil at ECP Site 14 – Former Southern Fire Training Area

Site ID Sample ID Sample Date Sample Depth (ft bgs)	EPA Region III Industrial RBCs (mg/kg)	**EPA Region III Residential RBCs** (mg/kg)	2x Average Detected Background (mg/kg)	14E-01 14E-SS01 05/08/04 0.00 - 1.00	14E-02 14E-SS02 05/08/04 0.00 - 1.00	14E-03 14E-SS03 05/08/04 0.00 - 1.00	14E-03 14E-SS03D 05/08/04 0.00 - 1.00	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**	Number Exceeding 2x Average Detected Background	Range Exceeding 2x Average Detected Background	Location of Maximum Detection
Appendix IX Inorganics (mg/kg)														
Silver	510	39	0.37	1.2 U	1.2 U	0.23 B	0.16 B	0/4		0/4		0/4		14E-SS03
Arsenic	1.9	0.43	2.4	**1.5**	**1.6**	**1.6**	1.3 U	0/4		3/4	1.5 - 1.6	0/4		14E-SS02, 14E-SS03
Barium	7,200	550	181	120	56	54	52	0/4		0/4		0/4		14E-SS01
Beryllium	200	16	0.45	0.2 B	0.18 B	0.19 B	0.18 B	0/4		0/4		0/4		14E-SS01
Cadmium	100	7.8	0.27	2.6	0.58 U	5.2	4.9	0/4		0/4		3/4	2.6 - 5.2	14E-SS03
Cobalt	2,000	160	44.0	13	10	8.6	8.2	0/4		0/4		0/4		14E-SS01
Chromium	310	23	59.3	**25**	17	23	21	0/4		1/4	25	0/4		14E-SS01
Copper	4,100	310	234.2	100 *	28 *	250 *	200 *	0/4		0/4		1/4	250*	14E-SS03
Nickel	2,000	160	16.55	6.5	6.2	9.6	8.9	0/4		0/4		0/4		14E-SS03
Lead	400[(1)]	400[(1)]	15.25	230	17	150	140	0/4		0/4		4/4	17 - 230	14E-SS01
Antimony	41	3.1	2.3	1.2 BN	2.3 UN	1.4 BN	1.1 BN	0/4		0/4		0/4		14E-SS03
Tin	61,000	4,700	2.43	3.7 B	3.4 B	4.6 B	4.5 B	0/4		0/4		4/4	3.4B - 4.6B	14E-SS03
Vanadium	100	7.8	354.5	**74**	**77**	**65**	**61**	0/4		4/4	61 - 77	0/4		14E-SS02
Zinc	31,000	2,300	125.2	130	48	120	120	0/4		0/4		1/4	130	14E-SS01
Mercury	31[(2)]	2.3[(2)]	0.11	0.042	0.046	0.056	0.053	0/4		0/4		0/4		14E-SS03

Notes:

B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
N - The matrix spike recovery is not within control limtis.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
* - Duplicate analysis is not within control limits.
(1) - 1996 Soil Screening Guidance.
(2) - Value based on the RBC for Mercuric Chloride.
NE - Not Established.
ft bgs - feet below ground surface.
mg/kg - milligrams per kilogram.

Table 5-51. Summary of Organic Detections in Subsurface Soil at ECP Site 14 – Former Southern Fire Training Area

Site ID Sample ID Sample Date Sample Depth (ft bgs)	EPA Region III Industrial RBCs (ug/kg)	**EPA Region III Residential RBCs** (ug/kg)	14E-01 14E-SB01-04 05/08/04 7.00 - 9.00	14E-02 14E-SB02-02 05/08/04 3.00 - 5.00	14E-03 14E-SB03-02 05/08/04 3.00 - 5.00	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 of Maximum Detection
Volatile Organic Compounds (ug/kg)										
Not Detected										
Semivolatile Organic Compounds (ug/kg)										
Not Detected										
Total Petroleum Hydrocarbons (mg/kg)										
Diesel Range Organics	NE	NE	2.6 J	2.2 J	2.6 J	NE		NE		14E-SB01-04, 14E-

Notes:
J - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
NE - Not Established.
ft bgs - feet below ground surface.
ug/kg - micrograms per kilogram.
mg/kg - milligrams per kilogram

Table 5-52. Summary of Inorganic Detections in Subsurface Soil at ECP Site 14 – Former Southern Fire Training Area

Site ID Sample ID Sample Date Sample Depth (ft bgs)	EPA Region III Industrial RBCs (mg/kg)	**EPA Region III Residential RBCs** (mg/kg)	2x Average Detected Background (mg/kg)	14E-01 14E-SB01-04 05/08/04 7.00 - 9.00	14E-02 14E-SB02-02 05/08/04 3.00 - 5.00	14E-03 14E-SB03-02 05/08/04 3.00 - 5.00	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**	Number Exceeding 2x Average Detected Background	Range Exceeding 2x Average Detected Background	Location of Maximum Detection
Appendix IX Inorganics (mg/kg)													
Barium	7,200	550	222	170	51	40	0/3		0/3		0/3		14E-SB01-04
Beryllium	200	16	0.74	0.36 B	0.29 B	0.26 B	0/3		0/3		0/3		14E-SB01-04
Cobalt	2,000	160	30.0	38	7.3	6.6	0/3		0/3		1/3	38	14E-SB01-04
Chromium	310	23	133	16	**28**	19	0/3		1/3	28	0/3		14E-SB02-02
Copper	4,100	310	193	26 *	48 *	33 *	0/3		0/3		0/3		14E-SB02-02
Nickel	2,000	160	31.9	13	11	6.8	0/3		0/3		0/3		14E-SB01-04
Lead	400(1)	400(1)	8.68	2.1	1.7	1.9	0/3		0/3		0/3		14E-SB01-04
Tin	61,000	4,700	2.96	1.7 B	2 B	2.7 B	0/3		0/3		0/3		14E-SB03-02
Vanadium	100	7.8	462	**78**	**140**	**120**	2/3	120 - 140	3/3	78 - 140	0/3		14E-SB02-02
Zinc	31,000	2,300	88.6	61	54	38	0/3		0/3		0/3		14E-SB01-04
Mercury	31(2)	2.3(2)	0.093	0.022	0.029	0.033	0/3		0/3		0/3		14E-SB03-02

Notes:

B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
* - Duplicate analysis is not within control limits.
(1) - 1996 Soil Screening Guidance.
(2) - Value based on the RBC for Mercuric Chloride.
NE - Not Established.
ft bgs - feet below ground surface.
mg/kg - milligrams per kilogram.

Comparison to criteria was done with the concentrations found at ECP Site 14 and is shown in the corresponding summary tables mentioned above. Organic compounds did not exceed any RBC criteria established at NSRR, although no RBCs are available for DRO. Arsenic (surface soil), chromium (surface and subsurface soil), and vanadium (surface and subsurface soil) all exceeded the EPA Region III Residential RBCs. Vanadium (subsurface soil) also exceeded the EPA Region III Industrial RBC in two of the three samples. They did not, however, exceed twice the average detected background concentrations for those compounds at NSRR. Cadmium, cobalt, copper, lead, tin, and zinc all exceeded established background concentrations for these compounds. The highest concentrations of these compounds were at locations 14E-01 and 14E-03, both located at areas that have exhibited staining in past aerial photographs (NAVFAC Atlantic, 2004a). Only the surface soil had the higher concentrations of these compounds with the exception of cobalt. This compound was higher in concentration in the subsurface soil, but not excessively above the background concentration.

Based on the exceedances of background of several inorganic compounds at locations previously noted as stained in aerial photographs, and the presence of DRO at the site, it is concluded that this site has been impacted by previous operations. However, because the concentrations in the soil do not exceed any RBCs, with the exception of compounds having naturally occurring background concentrations, it can be determined that no action is necessary to address the contamination at the site. DRO concentrations are low enough, that again, no action would be necessary to address this contamination.

5.4.14.5 Qualitative Risk Assessment

A discussion on the COPCs and potential risks associated with the surface soil and subsurface soil at this site is provided below.

COPC Identification

No organic COPCs were identified for surface soil at Site 14. No inorganic analytes were identified as COPCs. Arsenic, chromium, and vanadium were present in at least one sample at a concentration that exceeds the residential RBCs but none of these concentrations exceeded the base background criteria.

Similarly, no COPCs were identified for subsurface soil at Site 14. Chromium and vanadium were present in at least one sample at a concentration that exceeds the residential RBCs but none of these concentrations exceeded the base background criteria.

Potential Risk Discussion

The potential risk posed by conditions at Site 14 is extremely small due to the lack of COPCs.

5.4.14.6 Summary of Site Conditions

This site has locations with higher than background metals concentrations, consistent with a fire training area and a small amount of DRO. As such, it can be concluded that activities have impacted the environment.

Further investigation at this site will be conducted under the RCRA Corrective Action/IRP process.

5.4.15 ECP Site 15

5.4.15.1 Site History and Description

This site is located on the western end of the Ofstie Airfield on the northern aircraft parking apron (see Figure 5-82). The APA identified this area as PI Site 21, due to the observation of extensive stains on and just off of the apron from 1977-1985. Three above ground storage tanks (ASTs) were also observed in this area. The records review identified the area as part of the aircraft apron, where numerous aircraft were parked throughout its usage period. The physical site inspection observed that most of the area is now covered by an expanded aircraft apron; no stains or stressed vegetation were observed at the edges of the expanded concrete apron. A drainage ditch parallels the apron going from west to east. Interviews identified the area as an aircraft apron, and stated that numerous past spills of POL and HM occurred at the site, and that light aircraft maintenance was also conducted in this area.

During the Phase II ECP investigation, there was visual evidence of staining along the southern portion of the expanded aircraft apron (Photograph G-36). However, there were no signs of stressed vegetation in any areas of this site. In addition, five groundwater monitor wells were observed south of the extended aircraft apron, in the southwestern portion of the site (Photograph G-37). Two of the five monitor wells contained well tags indicating 794-MW2 and 794-MW3. These wells are associated with UST 794, and were investigated as part of the UST groundwater monitoring program on base, as presented in the Site Characterization Site 794 Report (BB&L, 1994). Photograph G-38 and G-38 present other views of this site.

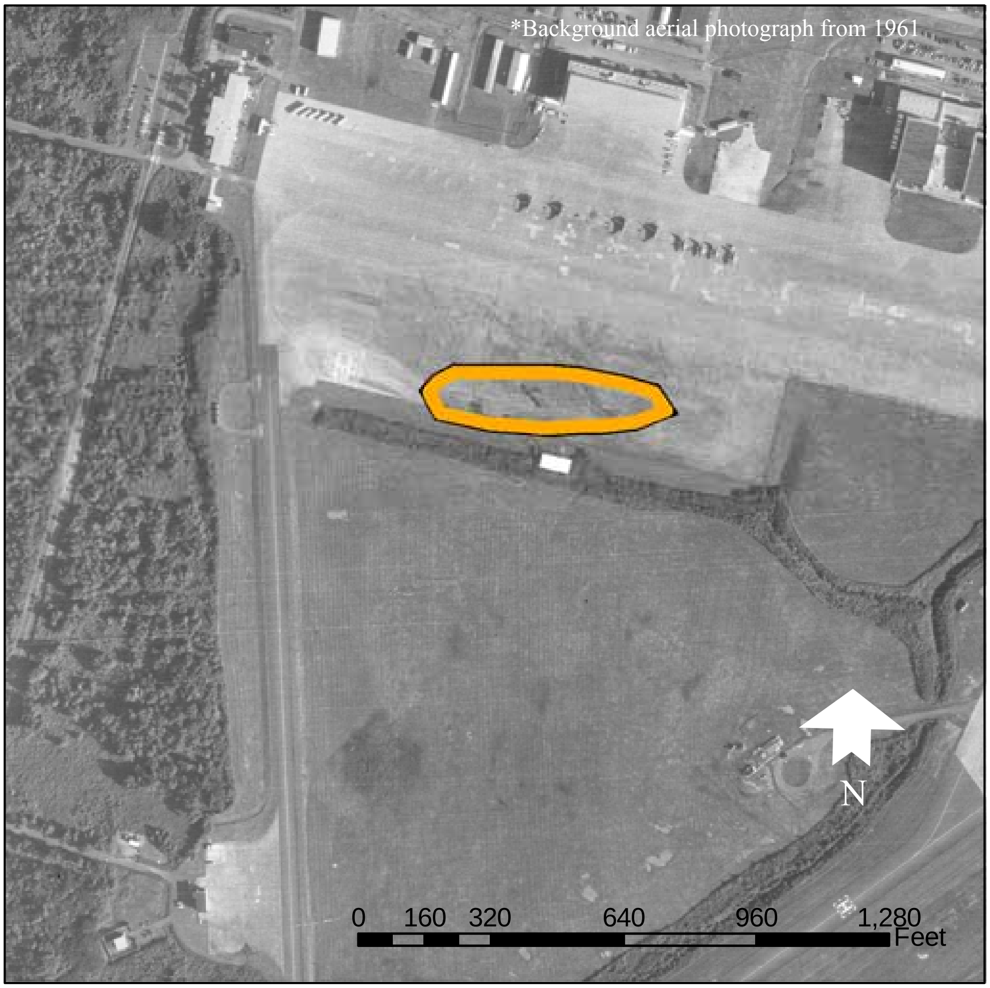


Figure 5-82. ECP Site 15 - Aircraft Parking Apron

5.4.15.2 Site Hydrogeology

ECP Site 15 is located in the inland flat lands, in the airfield area. Approximately 1.3- to 3.0-feet of fill material (mainly sand and gravel) was observed. Residual clay was observed immediately below the fill material. The borings were not advanced beyond 5-feet bgs, and no bedrock or groundwater was encountered.

5.4.15.3 Field Investigation and Sampling Program

As mentioned previously, there were no signs of staining or stressed vegetation observed at this site. Therefore, the originally proposed sample locations within the Draft Phase II ECP Work Plan (NAVFAC Atlantic, 2004b) were utilized.

A total of five soil borings (15E-01 through 15E-05) were advanced around the southern and eastern perimeters of the aircraft parking area as presented on Figure 5-83. Four soil borings were located south of the expanded aircraft apron, while one soil boring was located at the corner of the expanded aircraft apron and the original aircraft parking area.

One surface soil sample was collected from each soil boring location from a depth of 0 to 1 foot bgs. Subsurface soil samples were then collected from two-foot intervals and a minimum of two subsurface soil samples was obtained from each boring location. All five soil borings were drilled to a depth of 5 feet bgs. All surface and subsurface soil samples were screened in the field utilizing a FID and PID with the results recorded in the field logbook. The screening results were compared against background to indicate if the soil has been impacted by past operations. [See Appendix G for full PID and FID screening results on a per site basis.]

Soil samples submitted to the fixed-base laboratory included five surface soil samples (15E-SS01 through 15E-SS05) and five subsurface soil samples (15E-SB01-01, 15E-SB02-01, 15E-SB03-01, 15E-SB04-01, and 15E-SB05-02). These samples were submitted to the fixed-base analytical laboratory for analysis of Appendix IX VOCs, SVOCs, and metals, as well as TPH DRO and GRO analysis. The QA/QC sample collected at this site included one surface soil duplicate sample (15E-SS05D).

A groundwater program was not required for this site based on the FID/PID levels. The levels did not indicate any potential impact to groundwater.

5.4.15.4 Nature and Extent of Contamination

Five surface soil and five subsurface soil environmental samples were obtained from five locations south of and east of the aircraft parking area as shown on Figure 5-83. No groundwater samples were obtained based on the field screening performed with the FID/PID instruments. No detections above background were noted with these instruments. In addition to these soil samples, an additional duplicate environmental sample was obtained from the surface soil. The results of the analytical program can be seen in Table 5-53 through 5-56.

In the surface soil there were two VOCs, fifteen SVOCs, and TPH DRO detected. Fourteen inorganic compounds were detected as well. Location 15E-03 and 15E-04 has the highest concentrations of both the SVOCs and the DRO. These were also the locations with the highest inorganic concentrations.

150 0 75 150

1 inch = 150 ft.

LEGEND

- 1961 POLYGON FEATURE
- 1964 POLYGON FEATURE
- 1977 POLYGON FEATURE
- 1977 DRAINAGE
- 1985 POLYGON FEATURE
- 1995 POLYGON FEATURE
- SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
- ECP SITE BOUNDARY

SOURCE: GEO-MARINE, INC., SEPTEMBER 6, 2000.

Figure 5-83.
ECP Site 15 - Aircraft Parking Apron
Sample Location Map

Table 5-53. Summary of Organic Detections in Surface Soil at ECP Site 15 – Aircraft Parking Area

Site ID Sample ID Sample Date Sample Depth (ft bgs)	EPA Region III Industrial RBCs (ug/kg)	**EPA Region III Residential RBCs** (ug/kg)	15E-01 15E-SS01 05/09/04 0.00 - 1.00	15E-02 15E-SS02 05/09/04 0.00 - 1.00	15E-03 15E-SS03 05/09/04 0.00 - 1.00	15E-04 15E-SS04 05/09/04 0.00 - 1.00	15E-05 15E-SS05 05/09/04 0.00 - 1.00	15E-05 15E-SS05D 05/09/04 0.00 - 1.00	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 of Maximum Detection
Volatile Organic Compounds (ug/kg)													
Tetrachloroethene	5,300	1,200	5.6 U	5.6 U	5.2 J	6.6 J	1.9 J	5.6 U	0/6		0/6		15E-SS04
Chlorobenzene	2,000,000	160,000	5.6 U	5.6 U	2.5 J	2.6 J	5 U	5.6 U	0/6		0/6		15E-SS04
Semivolatile Organic Compounds (ug/kg)													
bis(2-Ethylhexyl)phthalate	200,000	46,000	390 U	380 U	1,000	210 J	380 U	380 U	0/6		0/6		15E-SS03
Butylbenzylphthalate	20,000,000	1,600,000	390 U	380 U	200 J	58 J	380 U	380 U	0/6		0/6		15E-SS03
Chrysene	390,000	87,000	390 U	380 U	680	100 J	120 J	45 J	0/6		0/6		15E-SS03
Dibenzo(a,h)anthracene	390	87	390 U	380 U	**140 J**	54 J	380 U	380 U	0/6		1/6	140J	15E-SS03
Fluoranthene	4,100,000	310,000	390 U	380 U	680	87 J	140 J	46 J	0/6		0/6		15E-SS03
Indeno(1,2,3-cd)pyrene	3,900	870	390 U	380 U	590 J	120 J	67 J	44 J	0/6		0/6		15E-SS03
Isophorone	3,000,000	670,000	390 U	380 U	620 U	550 U	410	380 U	0/6		0/6		15E-SS05
Anthracene	31,000,000	2,300,000	390 U	380 U	620 U	550 U	38 J	380 U	0/6		0/6		15E-SS05
Phenanthrene	NE	NE	390 U	380 U	210 J	550 U	380 U	380 U	NE		NE		15E-SS03
Pyrene	3,100,000	230,000	390 U	20 J	700	97 J	150 J	54 J	0/6		0/6		15E-SS03
Benzo(a)anthracene	3,900	870	390 U	380 U	350 J	100 J	62 J	380 U	0/6		0/6		15E-SS03
Benzo(a)pyrene	390	87	390 U	380 U	**380 J**	75 J	58 J	41 J	0/6		1/6	380J	15E-SS03
Benzo(b)fluoranthene	3,900	870	390 U	380 U	560 J	94 J	94 J	48 J	0/6		0/6		15E-SS03
Benzo(g,h,i)perylene	NE	NE	390 U	48 J	640	140 J	76 J	60 J	NE		NE		15E-SS03
Benzo(k)fluoranthene	39,000	8,700	390 U	380 U	260 J	44 J	81 J	39 J	0/6		0/6		15E-SS03
Total Petroleum Hydrocarbons (mg/kg)													
Diesel Range Organics	NE	NE	2.8 J	8.8	300	170	6	8.4	NE		NE		15E-SS03

Notes:
J - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
NE - Not Established.
ft bgs - feet below ground surface.
ug/kg - micrograms per kilogram.
mg/kg - milligrams per kilogram.

Table 5-54. Summary of Inorganic Detections in Surface Soil at ECP Site 15 – Aircraft Parking Area

Site ID Sample ID Sample Date Sample Depth (ft bgs)	EPA Region III Industrial RBCs (mg/kg)	**EPA Region III Residential RBCs** (mg/kg)	2x Average Detected Background (mg/kg)	15E-01 15E-SS01 05/09/04 0.00 - 1.00	15E-02 15E-SS02 05/09/04 0.00 - 1.00	15E-03 15E-SS03 05/09/04 0.00 - 1.00	15E-04 15E-SS04 05/09/04 0.00 - 1.00	15E-05 15E-SS05 05/09/04 0.00 - 1.00	15E-05 15E-SS05D 05/09/04 0.00 - 1.00	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**	Number Exceeding 2x Average Detected Background	Range Exceeding 2x Average Detected Background	Location of Maximum Detection
Appendix IX Inorganic Compounds (mg/kg)																
Silver	510	39	0.37	1.1 U	1.1 U	0.25 B	0.3 B	0.98 U	1.1 U	0/6		0/6		0/6		15E-SS04
Arsenic	1.9	0.43	2.4	**3.5**	**3.6**	**2.9**	**3.6**	**1**	**1.9**	4/6	2.9 - 3.6	6/6	1 - 3.6	4/6	2.9 - 3.6	15E-SS02, 15E-SS04
Barium	7,200	550	181	14	30	43	**1,400**	25	19	0/6		1/6	1,400	1/6	1,400	15E-SS04
Beryllium	200	16	0.45	0.06 B	0.092 B	0.2 B	0.23 B	0.095 B	0.097 B	0/6		0/6		0/6		15E-SS04
Cadmium	100	7.8	0.27	0.57 U	0.86	**16**	**24**	0.32 B	0.37 B	0/6		2/6	16 - 24	5/6	0.32B - 24	15E-SS04
Cobalt	2,000	160	44.0	2.4	6	11	10	16	13	0/6		0/6		0/6		15E-SS05
Chromium	310	23	59.3	11	17	**50**	**58**	**45**	**41**	0/6		4/6	41 - 58	0/6		15E-SS04
Copper	4,100	310	234	9.5	19	110	100	55	46	0/6		0/6		0/6		15E-SS03
Nickel	2,000	160	16.6	3.4 B	6.5	16	20	18	16	0/6		0/6		2/6	18 - 20	15E-SS04
Lead	400(1)	400(1)	125	4.6	19	390	**450**	16	23	1/6	450	1/6	450	2/6	390 - 450	15E-SS04
Tin	61,000	4,700	2.43	2.4 B	3 B	6.6 B	5.6 B	2.6 B	3 B	0/6		0/6		5/6	2.6B - 6.6B	15E-SS03
Vanadium	100	7.8	355	**22**	**46**	**94**	**70**	**79**	**87**	0/6		6/6	22 - 94	0/6		15E-SS03
Zinc	31,000	2,300	125	8.6 E	26 E	250 E	380 E	40 E	39 E	0/6		0/6		2/6	250E - 380E	15E-SS04
Mercury	31(2)	2.3(2)	0.11	0.022 U	0.005 B	0.054	0.061	0.015 B	0.015 B	0/6		0/6		0/6		15E-SS04

Notes:

B - The reported result is an estimated concentration that is less than the PQL, greater than or equal to the MDL.

U - The compound was analyzed for, but was not detected at or above the MDL/PQL.

E- The reported value is an estimated because of the presence of matrix interference.

(1) - 1996 Soil Screening Guidance.

(2) - Value based on the RBC for Mercuric Chloride.

NE - Not Established.

ft bgs - feet below ground surface.

mg/kg - milligrams per kilogram.

Table 5-55. Summary of Organic Detections in Subsurface Soil at ECP Site 15 – Aircraft Parking Area

Site ID Sample ID Sample Date Sample Depth (ft bgs)	EPA Region III Industrial RBCs (ug/kg)	**EPA Region III Residential RBCs** (ug/kg)	15E-01 15E-SB01-01 05/09/04 1.00 - 3.00	15E-02 15E-SB02-01 05/09/04 1.00 - 3.00	15E-03 15E-SB03-01 05/09/04 1.00 - 3.00	15E-04 15E-SB04-01 05/09/04 1.00 - 3.00	15E-05 15E-SB05-02 05/09/04 3.00 - 5.00	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 of Maximum Detection
Volatile Organic Compounds (ug/kg)												
Acetone	92,000,000	7,000,000	62 U	61 U	63 U	67 U	28 J	0/5		0/5		15E-SB05-02
Semivolatile Organic Compounds (ug/kg)												
bis(2-Ethylhexyl)phthalate	200,000	46,000	430 U	190 J	420 U	450 U	430 U	0/5		0/5		15E-SB02-01
Benzo(g,h,i)perylene	NE	NE	58 J	430 U	420 U	450 U	430 U	NE		NE		15E-SB01-01
Total Petroleum Hydrocarbons (mg/kg)												
Diesel Range Organics	NE	NE	3.6 J	2.9 J	3.2 J	4 J	2.7 J	NE		NE		15E-SB04-01

Notes:

J - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
NE - Not Established.
ft bgs - feet below ground surface.
ug/kg - micrograms per kilogram.
mg/kg - milligrams per kilogram.

Table 5-56. Summary of Inorganic Detections in Subsurface Soil at ECP Site 15 – Aircraft Parking Area

Site ID / Sample ID / Sample Date / Sample Depth (ft bgs)	EPA Region III Industrial RBCs (mg/kg)	**EPA Region III Residential RBCs** (mg/kg)	2x Average Detected Background (mg/kg)	15E-01 / 15E-SB01-01 / 05/09/04 / 1.00 - 3.00	15E-02 / 15E-SB02-01 / 05/09/04 / 1.00 - 3.00	15E-03 / 15E-SB03-01 / 05/09/04 / 1.00 - 3.00	15E-04 / 15E-SB04-01 / 05/09/04 / 1.00 - 3.00	15E-05 / 15E-SB05-02 / 05/09/04 / 3.00 - 5.00	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**	Number Exceeding 2x Average Detected Background	Range Exceeding 2x Average Detected Background	Location of Maximum Detection
Appendix IX Inorganic Compounds (mg/kg)															
Barium	7,200	550	222	17	35	85	77	100	0/5		0/5		0/5		15E-SB05-02
Beryllium	200	16	0.74	0.15 B	0.18 B	0.26 B	0.34 B	0.32 B	0/5		0/5		0/5		15E-SB04-01
Cobalt	2,000	160	30.0	9.4	4.9	12	19	19	0/5		0/5		0/5		15E-SB04-01, 15E-SB05-02
Chromium	310	23	133	10	9.8	15	15	16	0/5		0/5		0/5		15E-SB05-02
Copper	4,100	310	193	220	120	88	100	68	0/5		0/5		1/5	220	15E-SB01-01
Nickel	2,000	160	31.9	2.2 B	3.3 B	7.9	8.2	7.4	0/5		0/5		0/5		15E-SB04-01
Lead	400[1]	400[1]	8.68	0.53 B	1.8	2.7	2.6	2.2	0/5		0/5		0/5		15E-SB03-01
Tin	61,000	4,700	2.96	3.1 B	3.1 B	2.4 B	3.2 B	3.7 B	0/5		0/5		4/5	3.1B - 3.7B	15E-SB05-02
Vanadium	100	7.8	462	**270**	**170**	**130**	**210**	**160**	5/5	130 - 270	5/5	130 - 270	0/5		15E-SB01-01
Zinc	31,000	2,300	88.6	16 E	22 E	65 E	71 E	70 E	0/5		0/5		0/5		15E-SB04-01
Mercury	31[2]	2.3[2]	0.093	0.018 B	0.063	0.03	0.023 B	0.039	0/5		0/5		0/5		15E-SB02-01

Notes:

B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
E- The reported value is an estimated because of the presence of matrix interference.
[1] - 1996 Soil Screening Guidance.
[2] - Value based on the RBC for Mercuric Chloride.
NE - Not Established.
ft bgs - feet below ground surface.
mg/kg - milligrams per kilogram.

The subsurface soil had one VOC, acetone, two SVOCs, and TPH DRO detected in it. The organic compounds in the subsurface soil were found at locations coincident with the surface soil, but at much lower concentrations, with the exception of acetone, which was not detected in the surface soil. Inorganic concentrations were similar at all locations in the subsurface soil.

In general the contamination at this site was primarily related to fuel compounds, in particular PAHs and DRO. The DRO concentrations at two surface soil locations were 300 and 170 mg/kg. There were higher concentrations of barium, lead and zinc as well at these locations. The concentrations of DRO were not verified by the FID/PID screening during the investigation.

Comparison to criteria was done with all the results as shown in Tables 5-53 through 5-56. Dibenzo(a,h)anthracene and benzo(a)pyrene were quantified above the EPA Region III Residential RBCs. DRO does not have an established RBC. Several metals, including arsenic, barium, cadmium, chromium, and vanadium, had concentrations exceeding the EPA Region III Residential RBCs. Lead exceeded the 1996 soil screening guidance number of 400 mg/kg. Of these compounds, arsenic, barium, cadmium, and lead also exceeded twice the average detected background concentrations established for surface soil at NSRR. Copper, nickel, tin, and zinc also exceeded the background concentrations, but not any established RBC. Both vanadium and chromium are present in fairly high concentrations in the natural state at NSRR.

From the detections of fuel-related compounds and metals associated with fuel compounds at ECP Site 15, and their exceedance of criteria, it is concluded that the surface soil has been impacted by past site activities. A site investigation done by Blasland, Bouck & Lee, Inc. (1994) resulted in the detection of TPH around Building 794, located just south of the middle of the Aircraft Parking Area shown on Figure 5-82. The TPH detected during that study was found at depths of 4 through 10 feet bgs and was at similar concentrations to the present study. The release was likely a result of a UST in that location. It is unclear whether the TPH DRO detected during this ECP investigation is a result of the Building 794 UST release or releases associated with the Aircraft Parking Area. No groundwater samples were obtained at this site, but based on the reduction in concentrations from the surface soil to the subsurface soil during this investigation, it can be tentatively concluded that groundwater has not been impacted. This is further substantiated by the aforementioned site investigation done at Building 794. In that site characterization report, it was concluded that the groundwater was not impacted by the release of fuel compounds, based on actual analytical groundwater data obtained from wells located west of Building 794 near the former UST.

5.4.15.5 *Qualitative Risk Assessment*

A discussion on the COPCs and potential risks associated with the surface soil and subsurface soil at this site is provided below.

COPC Identification

Benzo(a)pyrene and dibenzo(a,h)anthracene are the only organic analytes identified as COPCs in surface soil at Site 15, with concentrations in one sample in excess of the residential RBC. Arsenic, barium, cadmium, and lead are the inorganic COPCs identified, with concentrations that exceed both the residential RBCs and the base background criteria. In addition, detected concentrations of chromium and vanadium exceed the residential RBCs but do not exceed base background criteria, thus, are not identified as COPCs.

No COPCs were identified for subsurface soil at Site 15. Vanadium concentrations exceed the residential RBC but are less than the base background value.

Potential Risk Discussion

The reasonably anticipated land use for the future at Site 15 can be approximated by the industrial/commercial use. This land use can be qualitatively assessed by comparing surface soil data to industrial RBCs. The results of this comparison shows that arsenic is the only COPC that exceeds the industrial RBC, while lead exceeds the soil screening criterion. Four arsenic concentrations moderately exceed the RBCs and background, ranging from 2.9 to 3.6 mg/kg. These concentrations are likely representative of background, as data collected by the United States Geologic Society to establish background concentrations in soil for Puerto Rico, include a maximum concentration of 22 mg/kg (Baker, 2003). The lead concentration in one sample of 450 mg/kg probably represents site-related contamination. Exposure to lead at high levels can damage children's ability to learn. Although long-term exposure to lead at Site 15 by children is unlikely, and a single sample does not reflect the probable exposure point concentration, this concentration poses a potential human health concern.

The potential risk posed by exposure to subsurface soil at Site 15 is extremely small due to the lack of COPCs.

5.4.15.6 *Summary of Site Conditions*

Past and present activities are impacting the environment at this site. At ECP Site 15, two PAHs and several inorganics were identified as COPCs in the surface soil. No other media contained any COPCs. Lead was found at a concentration that exceeds the 1996 soil screening criteria, and therefore, was identified as a human health concern. Only one location, 15E-04, had the high lead concentrations.

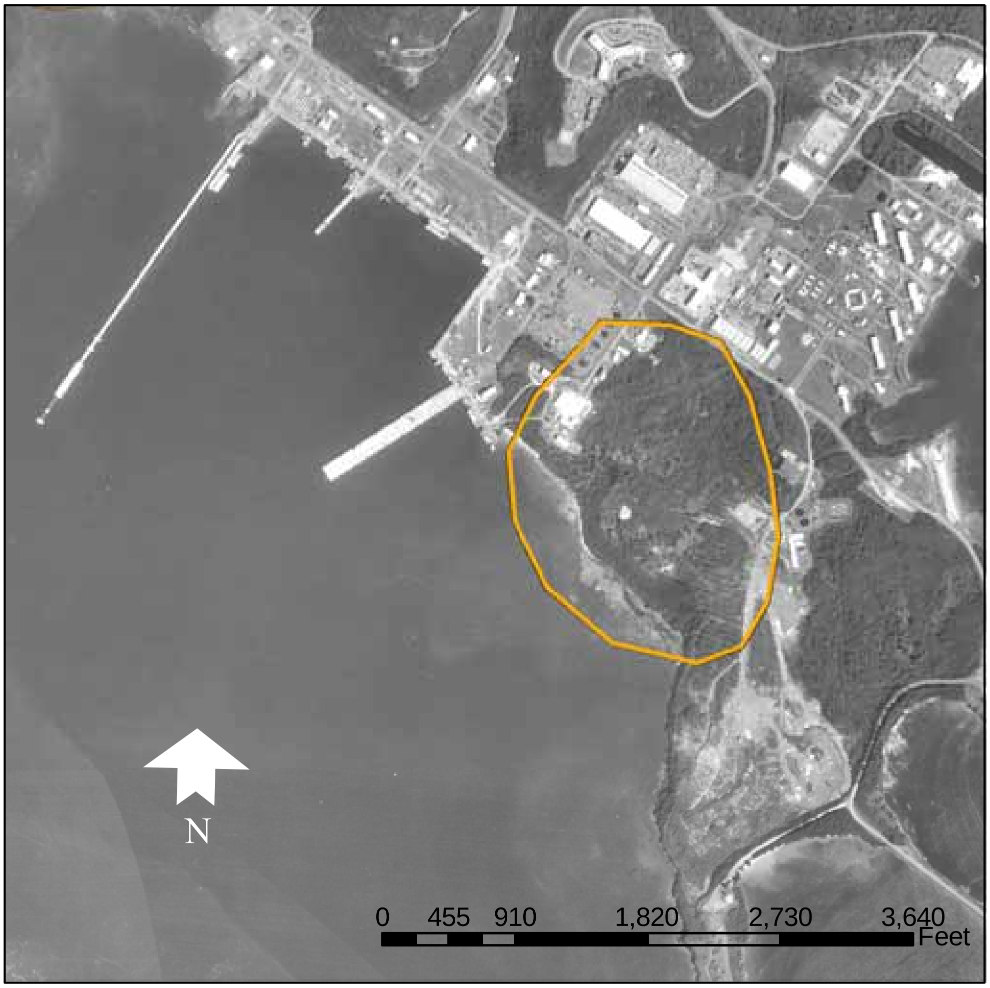
Further investigation at this site will be conducted under the RCRA Corrective Action/IRP process.

5.4.16 ECP Site 16

5.4.16.1 Site History and Description

This site is located southeast of Building 394 and northwest of the current base landfill and covers a large area of flat lying land consisting of open areas and areas covered by secondary growth vegetation (see Figure 5-84). The APA identified this area as PI Site 22, due to the observation of a large suspect disposal area with disturbed ground, debris, a cleared or graded area, and stressed vegetation from 1976-1983. In addition, containers or drums had been discarded in a vegetated area north of the main disposal area. The records review did not identify any activities in this area. The physical site inspection observed numerous piles of construction debris (metal, concrete, polyvinyl chloride [PVC] piping), but no drums or evidence of stains or stressed vegetation. Interviews confirmed the area as a construction and/or solid waste disposal site, including potential disposal of POL or HM containers. [See photos A-34 and A-35]

During the Phase II ECP investigation, numerous piles of construction debris (metal, concrete, and PVC piping) (Photograph G-40) were observed in different portions of the site, as was the case during the physical site inspection. There appeared to be more of a general solid waste type of debris (i.e., metal, rope, etc.), where as the central portion of the site appeared to have more of an excavation type of debris (i.e., concrete, rocks, etc.). However, there were no drums or evidence of stains or stressed vegetation. A majority of this site is covered in thick secondary growth vegetation (Photograph G-41). In addition, the central and southern portions of the site are classified as wetlands consisting of either estuarine-intertidal-scrub/shrub (broad-leaved evergreen), or estuarine-intertidal-unconsolidated shore (mud/organic/dead). Photograph G-42 presents a wetland area in the vicinity of soil boring location 16E-05.



*Background aerial photograph from 1995

Figure 5-84. ECP Site 16 - Disposal Area Northwest of Landfill

5.4.16.2 Site Hydrogeology

ECP Site 16 is located in near-shore flat lands. Heterogeneously distributed surface debris was observed across the site. Borings 16E-SB03 through 16E-SB06 were located in a mangrove swamp. Groundwater was very shallow in this area (generally less than 1-foot bgs). Soil (to a depth of approximately 1-foot bgs) was marine and consisted mainly of fine to coarse sand, with lesser amounts of shell and fossil fragments. The inland areas of the site (represented by borings 16E-SB01 and 16E-SB02) consisted of 3-feet of sand fill overlaying marine sediments and bedrock. At boring 16E-SB01, approximately 1-foot of marine sediments were observed and consisted of silt, clay, and peat layers. Weathered bedrock (Gabbro) was observed at boring 16E-SB01 beginning at 13.9-feet bgs. Groundwater was observed in the silt layer beginning at approximately 5-feet bgs. The underlying peat and bedrock were not water-bearing zones.

5.4.16.3 *Field Investigation and Sampling Program*

There were no signs of staining or stressed vegetation observed at this site. Therefore, the originally proposed sample locations within the work plan were utilized as presented on Figure 5-85.

Surface soil samples were collected utilizing a stainless steel spoon from each soil boring location from a depth of 0 to 1 foot bgs. Subsurface soil samples were only collected from soil boring 16E-01 and 16E-02 based on the depth that groundwater was encountered at soil boring locations 16E-03, 16E-04, 16E-05, and 16E-06. The groundwater at these four locations was encountered at depths ranging from 0.3 ft bgs to 1.2 ft bgs. Therefore, the subsurface soil collection at these locations did not take place. The subsurface soil that was obtained from 16E-01 and 16E-02 were collected to a depth of 15 feet bgs and 5 feet bgs, respectively. Groundwater at both locations was encountered at 5 feet bgs. The subsurface soil samples obtained at 16E-01 and 16E-02 were collected from two-foot intervals with a minimum of two subsurface soil samples obtained from each boring location. All surface and subsurface soil samples were screened in the field utilizing a FID and PID with the results recorded in the field logbook. The screening results were compared against background to indicate if the soil has been impacted by past operations. [See Appendix G for full PID and FID screening results on a per site basis.]

Soil samples submitted to the fixed-base laboratory included six surface soil samples (16E-SS01 through 16E-SS06) and two subsurface soil samples (16E-SB01-02 and 16E-SB02-02). These samples were submitted to the fixed-base analytical laboratory for full Appendix IX analysis. The QA/QC samples collected at this site include one surface soil duplicate (16E-SS01D) and one MS/MSD sample (16E-SS01MS/MSD).

A groundwater program followed the soil sampling program based on the PID/FID levels observed at each soil boring location indicating no contamination, the originally proposed locations for the three temporary monitor wells were utilized. The temporary monitor well located at soil boring location 16E-01, was installed and groundwater samples were collected. The groundwater samples collected at soil boring locations 16E-05 and 16E-06 were collected by digging a sump in the area of the soil boring due to the shallow depth of groundwater. The groundwater at these four locations (16E-03 through 16E-06) was collected utilizing the direct dip method immediately upon the sump filling with water. All groundwater samples were submitted to the fixed-base analytical laboratory for full Appendix IX analysis. The inorganic analysis requested was for dissolved metals only. The QA/QC samples collected at this site for groundwater included one duplicate sample (16E-GW01D).

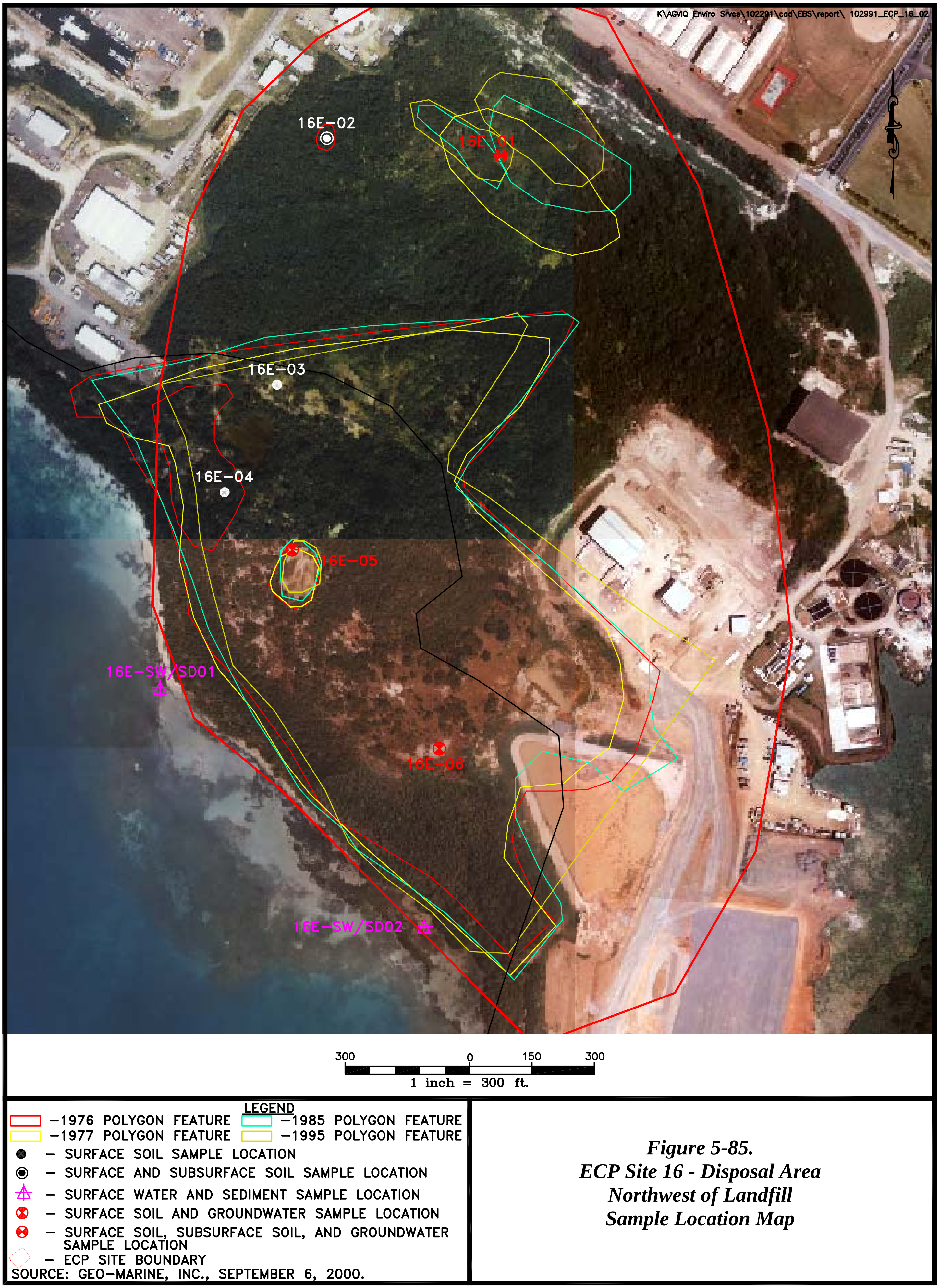


Figure 5-85.
ECP Site 16 - Disposal Area
Northwest of Landfill
Sample Location Map

A total two surface water and sediment sample locations were established off of the western coasts of this site within Ensenada Honda as presented on Figure 5-85. The surface water samples were obtained near the surface using the direct dip method, while sediment samples were obtained using a stainless steel spoon from a depth of 0.0 to 0.5 feet bgs. All surface water and sediment samples were submitted to the fixed-base analytical laboratory for full Appendix IX analysis.

5.4.16.4 Nature and Extent of Contamination

At ECP Site 16, environmental samples were collected from six surface soil, two subsurface soil, three groundwater, two surface water and two corresponding sediment locations as shown on Figure 5-85. Groundwater locations were pre-determined in the work plan (NAVFAC Atlantic, 2004b). No detections above background were noted with the PID/FID at this site. Duplicate environmental samples were obtained from the surface soil and the groundwater matrices (one each). Tables 5-57 through 5-65 contain the positive detections of the sampling program at this site.

In the surface soil, two VOCs and two SVOCs were detected at estimated concentrations. The VOCs were found at all locations except one, and the SVOCs were found at only one location, 16E-05. Fourteen inorganic compounds were detected at this site as well. Higher concentrations of inorganic compounds were found at location 16E-02 than the other locations. Both of these locations are found in small polygon areas defined by the aerial photographs from 1976 through 1995.

The analysis of subsurface soil at two locations at depth of 3-5 feet bgs resulted in the detection of one VOC, acetone, and eleven inorganic compounds. Acetone was found only at 16E-01. Similar concentrations of inorganic compounds were found in both samples.

Two VOCs were detected at very low estimated concentrations in the groundwater, and only at location 16E-01. Two SVOCs were found at location 16E-05, again at very low estimated concentrations. Five metals were found in the groundwater as well.

Sediment analyses from two locations in Ensenada Honda resulted in no detections of organic compounds, and quantification of thirteen inorganic compounds. Similar concentrations of inorganics were noted at both locations. Surface water analyses at the same two locations resulted in the detection of one VOC, bromoform, and four inorganic compounds. Most detections were found at location 16E-SW/SD02.

Table 5-57. Summary of Organic Detections in Surface Soil at ECP Site 16 – Disposal Area Northwest of Landfill

Site ID Sample ID Sample Date Sample Depth (ft bgs)	EPA Region III Industrial RBCs (ug/kg)	**EPA Region III Residential RBCs** (ug/kg)	16E-01 16E-SS01 05/13/04 0.00 - 1.00	16E-01 16E-SS01D 05/13/04 0.00 - 1.00	16E-02 16E-SS02 05/13/04 0.00 - 1.00	16E-03 16E-SS03 05/13/04 0.00 - 0.30	16E-04 16E-SS04 05/13/04 0.00 - 1.00	16E-05 16E-SS05 05/13/04 0.00 - 1.00	16E-06 16E-SS06 05/13/04 0.00 - 1.00	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 of Maximum Detection
Volatile Organic Compounds (ug/kg)														
Tetrachloroethene	5,300	1,200	2.4 J	5.5 J	2.1 J	2.3 J	5.4 U	2.3 J	5.2 U	0/7		0/7		16E-SS01D
Chlorobenzene	2,000,000	160,000	6.1 U	2.4 J	6.3 U	2.2 J	5.4 U	2.2 J	5.2 U	0/7		0/7		16E-SS01D
Semivolatile Organic Compounds (ug/kg)														
Indeno(1,2,3-cd)pyrene	3,900	870	440 U	450 U	420 U	480 U	390 U	46 J	390 U	0/7		0/7		16E-SS05
Benzo(g,h,i)perylene	NE	NE	440 U	450 U	420 U	480 U	390 U	42 J	390 U	NE		NE		16E-SS05
Pesticides/PCBs (ug/kg)														
Not Detected														
OP-Pesticides (ug/kg)														
Not Detected														
Chlorinated Herbicides (ug/kg)														
Not Detected														

Notes:
J - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
NE - Not Established.
ft bgs - feet below ground surface.
ug/kg - micrograms per kilogram.

Table 5-58. Summary of Inorganic Detections in Surface Soil at ECP Site 16 – Disposal Area Northwest of Landfill

Site ID Sample ID Sample Date Sample Depth (ft bgs)	EPA Region III Industrial RBCs (mg/kg)	**EPA Region III Residential RBCs** (mg/kg)	2x Average Detected Background (mg/kg)	16E-01 16E-SS01 05/13/04 0.00 - 1.00	16E-01 16E-SS01D 05/13/04 0.00 - 1.00	16E-02 16E-SS02 05/13/04 0.00 - 1.00	16E-03 16E-SS03 05/13/04 0.00 - 0.30	16E-04 16E-SS04 05/13/04 0.00 - 1.00	16E-05 16E-SS05 05/13/04 0.00 - 1.00	16E-06 16E-SS06 05/13/04 0.00 - 1.00	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**	Number Exceeding 2x Average Detected Background	Range Exceeding 2x Average Detected Background	Location of Maximum Detection
Appendix IX Inorganics (mg/kg)																	
Arsenic	1.9	0.43	2.4	**1.9**	**2.2**	**2**	**2.9**	**3.7**	**3.2**	**1.9**	5/7	2 - 3.7	7/7	1.9 - 3.7	3/7	2.9 - 3.7	16E-SS04
Barium	7,200	550	181	11	16	120	11	7.8	12	16	0/7		0/7		0/7		16E-SS02
Beryllium	200	16	0.45	0.51 U	0.051 B	0.43 B	0.06 B	0.047 B	0.057 B	0.085 B	0/7		0/7		0/7		16E-SS02
Cadmium	100	7.8	0.27	0.64 U	0.63 U	0.26 B	0.64 U	0.57 U	0.64 U	0.19 B	0/7		0/7		0/7		16E-SS02
Cobalt	2,000	160	44.0	1.4	1.4	27	2.5	0.76 B	2.4	13	0/7		0/7		0/7		16E-SS02
Chromium	310	23	59.3	5.8	5.8	19	7.2	4.3	7.8	**47**	0/7		1/7	47	0/7		16E-SS06
Copper	4,100	310	234	11	14	150	11	3	8.4	43	0/7		0/7		0/7		16E-SS02
Nickel	2,000	160	16.6	2.3 B	2.6 B	14	2.7 B	1.4 B	3.3 B	19	0/7		0/7		1/7	19	16E-SS06
Lead	400[1]	400[1]	125	2.8	2.3	7.9	1.9	0.77	1.4	3.3	0/7		0/7		0/7		16E-SS02
Tin	61,000	4,700	2.43	2 B	2.6 B	2.7 B	3.3 B	2.9 B	2.1 B	2.9 B	0/7		0/7		5/7	2.6B - 3.3B	16E-SS03
Vanadium	100	7.8	355	**14** N*	**18** N*	**96** N*	**20** N*	6 N*	**23** N*	**74** N*	0/7		6/7	14N* - 96N*	0/7		16E-SS02
Zinc	31,000	2,300	125	7	9.2	130	11	3.4	7	34	0/7		0/7		1/7	130	16E-SS02
Sulfide	NE	NE	28.48	34 U	34 U	32 U	36 U	29 U	37 U	30 B	NE		NE		1/7	30B	16E-SS06
Mercury	31[2]	2.3[2]	0.11	0.0079 B	0.0096 B	0.02 B	0.018 B	0.0086 B	0.0063 B	0.012 B	0/7		0/7		0/7		16E-SS02

Notes:

B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
N - The matrix spike recovery is not within control limtis.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
* - Duplicate analysis is not within control limits.
(1) - 1996 Soil Screening Guidance.
(2) - Value based on the RBC for Mercuric Chloride.
NE - Not Established.
ft bgs - feet below ground surface.
mg/kg - milligrams per kilogram.

Table 5-59. Summary of Organic Detections in Subsurface Soil at ECP Site 16 – Disposal Area Northwest of Landfill

Site ID Sample ID Sample Date Sample Depth (ft bgs)	EPA Region III Industrial RBCs (ug/kg)	**EPA Region III Residential RBCs** (ug/kg)	16E-01 16E-SB01-02 05/13/04 3.00 - 5.00	16E-02 16E-SB02-02 05/13/04 3.00 - 5.00	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 of Maximum Detection
Volatile Organic Compounds (ug/kg)									
Acetone	92,000,000	7,000,000	17 J	47 U	0/2		0/2		16E-SB01-02
Semivolatile Organic Compounds (ug/kg)									
Not Detected									
Pesticides/PCBs (ug/kg)									
Not Detected									
OP-Pesticides (ug/kg)									
Not Detected									
Chlorinated Herbicides (ug/kg)									
Not Detected									

Notes:

J - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
ft bgs - feet below ground surface.
ug/kg - micrograms per kilogram.

Table 5-60. Summary of Inorganic Detections in Subsurface Soil at ECP Site 16 – Disposal Area Northwest of Landfill

Site ID Sample ID Sample Date Sample Depth (ft bgs)	EPA Region III Industrial RBCs (mg/kg)	**EPA Region III Residential RBCs** (mg/kg)	2x Average Detected Background (mg/kg)	16E-01 16E-SB01-02 05/13/04 3.00 - 5.00	16E-02 16E-SB02-02 05/13/04 3.00 - 5.00	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**	Number Exceeding 2x Average Detected Background	Range Exceeding 2x Average Detected Background	Location of Maximum Detection
Appendix IX Inorganics (mg/kg)												
Arsenic	1.9	0.43	2.05	**6.1**	**6.4**	2/2	6.1 - 6.4	2/2	6.1 - 6.4	2/2	6.1 - 6.4	16E-SB02-02
Barium	7,200	550	222	10	13	0/2		0/2		0/2		16E-SB02-02
Beryllium	200	16	0.74	0.072 B	0.43 U	0/2		0/2		0/2		16E-SB01-02
Cobalt	2,000	160	30.0	1 B	1.1 U	0/2		0/2		0/2		16E-SB01-02
Chromium	310	23	133	13	2.9	0/2		0/2		0/2		16E-SB01-02
Copper	4,100	310	193	9.6	1.4 B	0/2		0/2		0/2		16E-SB01-02
Nickel	2,000	160	31.9	4.5 B	0.88 B	0/2		0/2		0/2		16E-SB01-02
Lead	400 (1)	400 (1)	8.68	0.95	0.54 U	0/2		0/2		0/2		16E-SB01-02
Tin	61,000	4,700	2.96	3.3 B	2.7 B	0/2		0/2		1/2	3.3B	16E-SB01-02
Vanadium	100	7.8	462	**17** N*	3 N*	0/2		1/2	17N*	0/2		16E-SB01-02
Zinc	31,000	2,300	88.6	8	1.4 B	0/2		0/2		0/2		16E-SB01-02

Notes:

B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
N - The matrix spike recovery is not within control limtis.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
* - Duplicate analysis is not within control limits.
(1) - 1996 Soil Screening Guidance.
ft bgs - feet below ground surface.
mg/kg - milligrams per kilogram.

Table 5-61. Summary of Organic Detections in Groundwater at ECP Site 16 – Disposal Area Northwest of Landfill

Site ID Sample ID Sample Date	Federal MCLs (ug/L)	EPA Region III Tap Water RBCs (ug/L)	PR Water Quality Standards (ug/L)	16E-01 16E-GW01 05/15/04	16E-01 16E-GW01D 05/15/04	16E-05 16E-GW05 05/12/04	16E-06 16E-GW06 05/12/04	Number Exceeding Federal MCLs	Range Exceeding Federal MCLs	Number Exceeding EPA Region III Tap Water RBCs	Range Exceeding EPA Region III Tap Water RBCs	Number Exceeding PR Water Quality Standards	Range Exceeding PR Water Quality Standards	Location of Maximum Detection
Volatile Organic Compounds (ug/L)														
2-Butanone	NE	700	NE	1.3 J	1.3 J	10 U	10 U	NE		0/4		NE		16E-GW01, 16E-GW01D
Acetone	NE	550	NE	6 J	25 U	25 U	25 U	NE		0/4		NE		16E-GW01
Semivolatile Organic Compounds (ug/L)														
Indeno(1,2,3-cd)pyrene	NE	0.092	NE	10 U	10 U	**0.85** J	10 U	NE		1/4	0.85J	NE		16E-GW05
Benzo(g,h,i)perylene	NE	NE	NE	10 U	10 U	1 J	10 U	NE		NE		NE		16E-GW05

Pesticides/PCBs (ug/L)
Not Detected

OP-Pesticides (ug/L)
Not Detected

Chlorinated Herbicides (ug/L)
Not Detected

Notes:
J - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
ug/L - micrograms per liter.
NE - Not Established.

Table 5-62. Summary of Inorganic Detections in Groundwater at ECP Site 16 – Disposal Area Northwest of Landfill

Site ID Sample ID Sample Date	Federal MCLs (mg/L)	**EPA Region III Tap Water RBCs** (mg/L)	PR Water Quality Standards (mg/L)	16E-01 16E-GW01 05/15/04	16E-01 16E-GW01D 05/15/04	16E-05 16E-GW05 05/12/04	16E-06 16E-GW06 05/12/04	Number Exceeding Federal MCLs	Range Exceeding Federal MCLs	**Number Exceeding EPA Region III Tap Water RBCs**	**Range Exceeding EPA Region III Tap Water RBCs**	Number Exceeding PR Water Quality Standards	Range Exceeding PR Water Quality Standards	Location Maximum Detection
Appendix IX (Dissolved) Inorganics (mg/L)														
Barium	2	0.26	NE	0.062	0.062	0.031	0.055	0/4		0/4		NE		16E-GW01, 16E-GW01D
Cobalt	NE	0.073	NE	0.01 U	0.01 U	0.0021 B	0.01 U	NE		0/4		NE		16E-GW05
Chromium	0.1	0.011	NE	0.0018 B	0.0015 B	0.01 U	0.0017 B	0/4		0/4		NE		16E-GW01
Nickel	NE	0.073	NE	0.04 U	0.04 U	0.0041 B	0.0042 B	NE		0/4		NE		16E-GW06
Vanadium	NE	0.0037	NE	**0.015** B	**0.019** B	0.05 U	**0.013**	NE		3/4	0.013 - 0.019B	NE		16E-GW01D

Total Cyanide and Sulfide (mg/L)
Not Detected

Notes:
B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
NE - Not Established.
mg/L - milligrams per liter.

Table 5-63. Summary of Inorganic Detections in Sediment at ECP Site 16 – Disposal Area Northwest of Landfill

Site ID Sample ID Sample Date Sample Depth (ft bgs)	Marine Sediment Screening Values (mg/kg)	16E-SW/SD01 16E-SD01 05/14/04 0.00 - 0.50	16E-SW/SD02 16E-SD02 05/14/04 0.00 - 0.50	Number Exceeding Marine Sediment Screening Values	Range Exceeding Marine Sediment Screening Values	Location of Maximum Detection
Appendix IX Inorganics (mg/kg)						
Silver	0.73	1.9 U	0.86 B	1/2	0.86B	16E-SD02
Arsenic	7.24	3.1	3 B	0/2		16E-SD01
Barium	48.0	8.3	11	0/2		16E-SD02
Cobalt	10.0	3.3	6.4	0/2		16E-SD02
Chromium	52.3	13	23	0/2		16E-SD02
Copper	18.7	21	41	2/2	21 - 41	16E-SD02
Nickel	15.9	5 B	9 B	0/2		16E-SD02
Lead	30.2	2	4.8	0/2		16E-SD02
Tin	3.40	3.5 B	6.1 B	2/2	3.5B - 6.1B	16E-SD02
Vanadium	57.0	21 N*	36 N*	0/2		16E-SD02
Zinc	124	24	35	0/2		16E-SD02
Sulfide	NA	160	680	NA		16E-SD02
Mercury	0.13	0.018 B	0.036 B	0/2		16E-SD02

Notes:

B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
N - The matrix spike recovery is not within control limtis.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
* - Duplicate analysis is not within control limits.
NA - Not Available.
ft bgs - feet below ground surface.
mg/kg - milligrams per kilogram.

Table 5-64. Summary of Organic Detections in Surface Water at ECP Site 16 – Disposal Area Northwest of Landfill

Site ID Sample ID Sample Date	PR Water Quality Standards (ug/L)	**Surface Water Screening Values** (ug/L)	16E-SW/SD01 16E-SW01 05/14/04	16E-SW/SD02 16E-SW02 05/14/04	Number Exceeding PR Water Quality Standards	Range Exceeding PR Water Quality Standards	**Number Exceeding Surface Water Screening Values**	**Range Exceeding Surface Water Screening Values**	Location Maximum Detection
Volatile Organic Compounds (ug/L)									
Bromoform	NE	640	1 U	1	NE		0/2		16E-SW02
Semivolatile Organic Compounds (ug/L)									
Not Detected									
Pesticides/PCBs (ug/L)									
Not Detected									
OP-Pesticides (ug/L)									
Not Detected									
Chlorinated Herbicides (ug/L)									
Not Detected									

Notes:
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
ug/L - micrograms per liter.
NE - Not Established.

Table 5-65. Summary of Inorganic Detections in Surface Water at ECP Site 16 – Disposal Area Northwest of Landfill

Site ID	PR Water Quality Standards	**Surface Water Screening Values**	16E-SW/SD01	16E-SW/SD02	Number Exceeding PR Water Quality Standards	Range Exceeding PR Water Quality Standards	**Number Exceeding Surface Water Screening Values**	**Range Exceeding Surface Water Screening Values**	Location
Sample ID			16E-SW01	16E-SW02					Maximum
Sample Date	(mg/L)	(mg/L)	05/14/04	05/14/04					Detection
Appendix IX (Total) Inorganics (mg/L)									
Barium	NE	50	0.0068 B	0.026	NE		0/2		16E-SW02
Chromium	0.011	0.0504	0.01 U	0.0015 B	0/2		0/2		16E-SW02
Vanadium	NE	0.120[1]	0.1 U	0.018	NE		0/2		16E-SW02
Zinc	0.081	0.086	0.025	0.012 B	0/2		0/2		16E-SW01

Notes:

B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
(1) - This chemical lacks a marine/estuarine surface water screening value. The value shown is a freshwater screening value.
NE - Not Established.
mg/L - milligrams per liter.

The VOCs and SVOCs found at the site are consistent with a former disposal area use. Inorganic concentrations are typical of background inorganics found at NSRR.

The analytical results were compared to criteria as shown in Tables 5-57 through 5-65. There was one organic compound, indeno(1,2,3-cd)pyrene, that exceeded the EPA Region III Tap Water RBC in the groundwater. In the soil, arsenic, chromium, and vanadium exceeded the EPA Region IIII Residential RBC. Of these two, only arsenic, however, also exceeded the background screening value established for surface soil and subsurface soil at NSRR. Concentrations of arsenic in subsurface soil were higher than in surface soil. Tin, nickel, zinc, and sulfide exceeded background concentrations of these compounds slightly. Vanadium exceeded the EPA Region III Tap Water RBCs in groundwater. This is likely due to high background vanadium concentrations in the soil at NSRR. In the sediment samples, silver, copper, and tin exceeded the marine sediment screening values in the sediment. No exceedances were noted in the surface water.

From the detections of compounds noted above, and the exceedance of criteria at this site, it is concluded that the soil may be slightly impacted from previous site activities by arsenic. However, this is debatable based on the arsenic concentrations representative of background at NSRR. The contamination is limited to areas around 16E-01 and 16E-02.

5.4.16.5 Qualitative Risk Assessment

A discussion on the COPCs and potential risks associated with the surface soil, subsurface soil, groundwater, surface water, and sediment collected at this site, is provided below.

COPC Identification

No organic COPCs were identified in surface soil at Site 16. Arsenic was the only inorganic COPC identified, with the concentration of three samples out of a total of seven in excess of both the residential RBC and the base background criterion. Chromium and vanadium were present at concentrations that exceeded the residential RBC but not their background criteria.

No organic COPCs were identified in subsurface soil at Site 16. Arsenic was the only inorganic COPC identified with concentrations that exceeded the residential RBC and the background criterion. Vanadium was detected at a concentration that exceeded the residential RBC but not the background criterion.

No organic COPCs were identified for sediment at Site 16 because no organics were detected. Silver, copper, and tin were the inorganic analytes identified as COPCs since they were detected at concentrations that exceeded the marine sediment screening values.

No COPCs were identified for surface water from Site 16.

The only organic COPC identified for groundwater was the PAH indeno(1,2,3-cd)pyrene and vanadium was the only inorganic COPC identified for groundwater.

<u>Potential Risk Discussion</u>

The reasonably anticipated land use for the future at Site 16 can be approximated by the industrial/commercial use. This land use can be qualitatively assessed by comparing data to industrial RBCs. The results of this comparison shows that arsenic levels in three samples (ranging in concentration from 2.9 to 3.7 mg/kg) exceed the industrial RBC and base background by a small degree. However, these concentrations are likely representative of background, as data collected by the United States Geologic Society to establish background concentrations in soil for Puerto Rico, include a maximum concentration of 22 mg/kg (Baker, 2003). The potential risk posed by exposure to arsenic in surface soil is low due to low concentrations that probably represent natural levels.

Significant exposure to subsurface soil is less likely than to surface soil, especially given the reasonably anticipated land use of industrial/commercial. A comparison of the arsenic data to the industrial RBC indicates that both subsurface samples (concentration of 6.1 and 6.4 mg/kg) exceed the RBC and background by a small degree. However, these concentrations are likely representative of background, as data collected by the United States Geologic Society to establish background concentrations in soil for Puerto Rico, include a maximum concentration of 22 mg/kg (Baker, 2003). The potential risk posed by exposure to arsenic in subsurface soil is low due to the unlikelihood of exposure and low concentrations that probably represent natural levels.

The likelihood of significant human exposure to sediment is small, however, the data can be compared to soil risk-based criteria (i.e., residential RBCs) to conservatively assess potential risk to the sediment under the assumption that over the long-term (approximately 30 years) today's sediment can be considered tomorrow's soil. Also, the data can be compared to base soil background values to help determine whether the detections represent natural conditions or possible contamination. Performing this comparison to the inorganic COPC data shows that detected concentrations of silver, copper and tin are all less than the residential RBCs and copper is also less than base soil background. Therefore, the potential human health risk posed by exposure to sediment at Site 16 is extremely low due to the unlikelihood of exposure and the low concentrations of COPCs; however, exposure to sediment may pose low potential risks to ecological receptors, although this risk is indeterminate.

The potential risk posed by exposure to surface water at Site 16 is extremely small due to the lack of COPCs.

Potential exposure to groundwater at NSRR is unlikely. Groundwater is not currently used for potable purposes because drinking water is available from El Yunque which supplies all of NSRR's present needs. The most likely exposure route to groundwater is from inhalation of vapors emitted from volatile organics through the overlying soil, particularly into buildings. Indeno(1,2,3-cd)pyrene and vanadium are not considered volatile. Furthermore, the single detection of indeno(1,2,3-cd)pyrene is at an estimated concentration (0.85 J μg/L) less than one-tenth of the reporting limit. The RBC used to select vanadium as a COPC is based on a noncarcinogenic toxicity criterion set at one-tenth of the level considered acceptable by EPA to account for potential additive effects of multiple contaminants. As there is only one noncarcinogenic COPC in groundwater at Site 16, the single contaminant RBC can be used for comparison, which is ten times higher than the tap water RBCs presented in Section 5.0 tables. Even though the vanadium levels in groundwater are probably a result of leaching from the generally high levels of vanadium in soil at NSRR, a comparison of the vanadium data to the single contaminant tap water RBC of 0.037 mg/L (based on the unlikely but assumed exposure via ingestion of groundwater) shows that the concentrations are less than this value. Therefore, groundwater at Site 16 from indeno(1,2,3-cd)pyrene and vanadium exposure does not appear to pose a significant potential human health concern due to the unlikelihood of exposure and low concentrations. The potential risk from groundwater exposure is very low even if the groundwater were to be used for potable purposes in the future.

5.4.16.6 Summary of Site Conditions

Preliminary assessment of the analytical data indicated only a slight impact to the environment at this site. Arsenic was identified as a COPC in both surface and subsurface soil, but at concentrations likely to be representative of background. A PAH and vanadium were COPCs in the groundwater. The PAH was found above the EPA Region III Tap Water RBC, but an unlikely exposure scenario was assumed for risk evaluation. The sediment contained silver, copper, and tin in excess of the marine screening criteria, but less than the Residential Soil RBC.

Further investigation at this site will be conducted under the RCRA Corrective Action/IRP process.

5.4.17 ECP Site 17

5.4.17.1 Site History and Description

This site is located at the Commissary parking lot, where a quarry once operated and an open grassy field adjacent to the parking lot (see Figure 5-86). The APA identified this area as PI Site 24, due to the observation of numerous drums in open storage on the south side of the former quarry/rock crusher site from 1976-1983, and at least 25 drums located near the rock crusher, with staining on the ground adjacent to them. The records review identified the area as former quarry site, but there were no records pertaining to drum storage or disposal. The physical site inspection observed remnants of the quarry area, but saw no signs of disposal, stains, or stressed vegetation. Interviews confirmed both storage and disposal of drums containing a tar-like substance in the area, which were uncovered during construction of the Commissary parking lot. The full extent of the disposal area is unknown. [See photo A-36]

There were no signs of a disposal area observed during the Phase II ECP investigation, nor were there any stains or stressed vegetation observed, as was the case during the physical site inspection. A majority of the area was covered in secondary growth vegetation.

*Background aerial photograph from 1976

Figure 5-86. ECP Site 17 - Quarry Disposal Site

5.4.17.2 *Site Hydrogeology*

ECP Site 17 is located in the upland area, near near-shore flatlands. Boring 17E-SB01 was located on a hill behind the Commissary, and within the former quarry. The surficial material consisted of sand and rock fragments, possibly spoils. Due to access, a drill rig could not be used, and a hand auger was not able to advance beyond 1.3-feet bgs. Fill material and residual clay was observed at boring 17E-SB02. The fill, consisting mainly of gravel, was observed to a depth of approximately 8-feet bgs. The residual clay exhibited a breccia appearance (e.g., a gravel in a clay matrix). Groundwater appeared in one or two fractures beginning at a depth of 20-feet, and was observed to have a good yield. At boring 17E-SB02, a fuel odor and staining were observed in the fill and residual clay, from a depth of approximately 5- to 10-feet bgs.

5.4.17.3 *Field Investigation and Sampling Program*

The area in the vicinity of a quarry disposal site was investigated at ECP Site 17. As mentioned previously, there were no signs of a disposal area, staining, or stressed vegetation observed at this site. Therefore, the originally proposed sample locations within the Draft Phase II ECP Work Plan (NAVFAC Atlantic, 2004b) were utilized as presented on Figure 5-87.

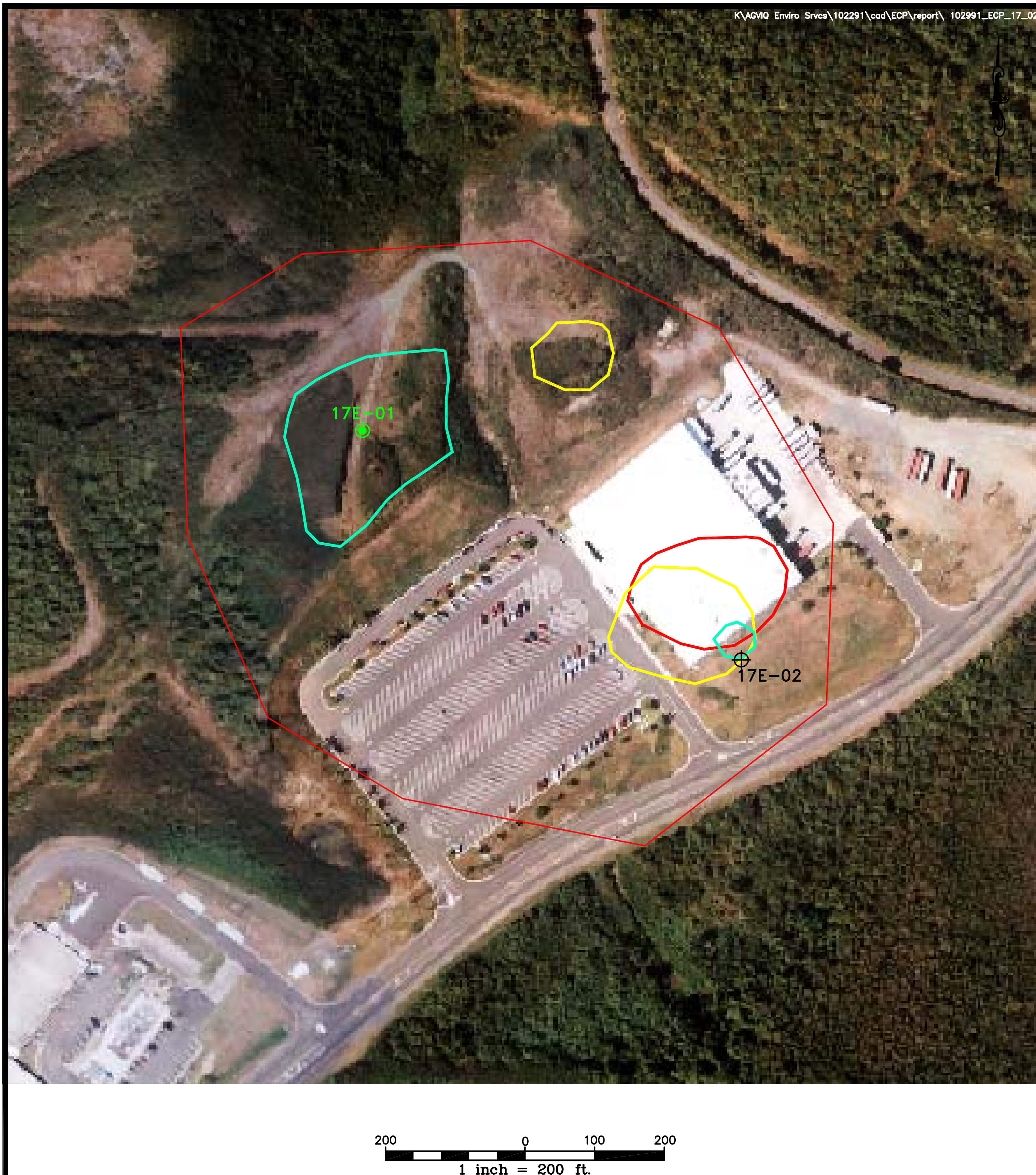
Two soil borings were advanced in two different areas of this site identified as being a fill or disposal area within the Phase I ECP Report (NAVFAC Atlantic, 2004a).

One surface soil sample was collected from soil boring location 17E-01 utilizing a hand auger in conjunction with a stainless steel spoon from a depth of 0 to 1 foot bgs. As described previously, solid rock was encountered at soil boring location 17E-01. Therefore, only one subsurface soil sample was collected utilizing a hand auger in conjunction with a stainless steel spoon, to a depth of 1.3 ft bgs. Surface soil was not obtained from soil boring location 17E-02 due to the construction of the new commissary. The surface soil from this location is not representative of the surface soil from the site, as proposed in the work plan (NAVFAC Atlantic, 2004b). Subsurface soil samples were collected from soil boring location 17E-02 were collected from two-foot intervals down to groundwater (24 feet bgs), with the total depth of the soil boring at 24 feet bgs.

All surface and subsurface soil samples from soil boring location 17E-02 were screened in the field utilizing a FID and PID with the results recorded in the field logbook. The screening results were compared against background to indicate if the soil has been impacted by past operations. [See Appendix G for full PID and FID screening results on a per site basis.]

Soil samples to be submitted to the fixed-base laboratory included one surface soil sample (17E-SS01) and three subsurface soil samples (17E-SB01-01, 17-SB02-01, and 17E-SB02-04). These samples were submitted to the fixed-base analytical laboratory for full Appendix IX analysis The QA/QC samples to be collected at this site include one surface soil duplicate sample (17E-SS01D), and one MS/MSD sample (17E-SS01MS/MSD).

A groundwater program followed the soil sampling program based on the PID/FID levels observed at soil boring location 17E-02, the originally proposed location for the temporary monitor well. The temporary monitor well was installed and groundwater samples were collected. The groundwater sample was submitted to the fixed-base analytical laboratory for full Appendix IX analysis. The inorganic analysis requested was for dissolved metals only.



LEGEND

- 1976 POLYGON FEATURE
- 1977 POLYGON FEATURE
- 1985 POLYGON FEATURE
- SUBSURFACE SOIL AND GROUNDWATER SAMPLE LOCATION
- SURFACE SOIL AND SUBSURFACE SOIL SAMPLE LOCATION
- ECP SITE BOUNDARY

SOURCE: GEO-MARINE, INC., SEPTEMBER 6, 2000.

Figure 5-87.
ECP Site 17 - Quarry Disposal Site
Sample Location Map

5.4.17.4 Nature and Extent of Contamination

One surface soil, three subsurface soil, and one groundwater environmental samples were obtained from two locations at the former Quarry Disposal Site, designated as ECP Site 17 as shown on Figure 5-87. The location of the groundwater sample was determined based on field screening of the soil samples by the FID and PID instruments. In addition to the regular environmental samples, one duplicate sample was obtained from the surface soil location 17E-01. The results of the analytical program can be seen in Tables 5-66 through 5-71.

In the surface soil, there were five VOCs, ten SVOCs, and twelve inorganic compounds quantified in the analyses for that location, 17E-01.

In the subsurface soil there were five VOCs, sixteen SVOCs, two pesticides, and thirteen inorganic compounds found at the two locations. The location with the most VOCs present was 17E-02 at a depth of 7-9 feet bgs. This corresponds well to the FID/PID screening performed in the field. The location with the most SVOCs present was 17E-01, corresponding with the associated surface soil sample, but higher concentrations were present in the subsurface soil. Pesticides were only detected in very low concentrations at 17E-02 at a depth of 1-3 feet bgs. Inorganic quantities were similar in all samples.

Groundwater environmental samples indicated that three VOCs, two SVOCs, and seven inorganic compounds were present at detectable levels. The VOC compounds detected in the groundwater at that location were also found in the subsurface soil at 17E-02. However, the SVOC compounds detected in the groundwater were not found in the soil at that location.

In general, the VOCs and SVOCs detected in the soil and groundwater samples are associated with fuel contamination and degreasing operations. They are also likely to be associated with the tar-like substance. Benzene, ethylbenzene, and xylene were present in the soil samples, as was acetone and carbon tetrachloride. Ethylbenzene and acetone were also found in the groundwater. The SVOC fraction detected consisted primarily of PAHs. A high concentration of 2-Methylnaphthalene was found in the subsurface soil at 17E-02, 7-9 feet bgs. This compound may have degraded and leached to the groundwater, resulting in the naphthalene detection. Inorganic compounds detected at ECP Site 17 are typically associated with background compounds present at NSRR.

Table 5-66. Summary of Organic Detections in Surface Soil at ECP Site 17 – Quarry Disposal Site

Site ID	EPA Region III Industrial RBCs	**EPA Region III Residential RBCs**	17E-01	17E-01	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 of Maximum Detection
Sample ID			17E-SS01	17E-SS01D					
Sample Date			05/06/04	05/06/04					
Sample Depth (ft bgs)	(ug/kg)	(ug/kg)	0.00 - 1.00	0.00 - 1.00					
Volatile Organic Compounds (ug/kg)									
Chlorobenzene	2,000,000	160,000	2 J	5.3 U	0/2		0/2		17E-SS01
Ethylbenzene	10,000,000	780,000	1.2 J	5.3 U	0/2		0/2		17E-SS01
Carbon tetrachloride	22,000	4,900	1.2 J	1.1 J	0/2		0/2		17E-SS01
Tetrachloroethene	5,300	1,200	1.8 J	5.3 U	0/2		0/2		17E-SS01
Xylene	20,000,000	1,600,000	6.6 J	10 U	0/2		0/2		17E-SS01
Semivolatile Organic Compounds (ug/kg)									
Benzo(b)fluoranthene	3,900	870	390 U	38 J	0/2		0/2		17E-SS01D
Benzo(a)anthracene	3,900	870	390 U	51 J	0/2		0/2		17E-SS01D
Benzo(k)fluoranthene	39,000	8,700	390 U	48 J	0/2		0/2		17E-SS01D
Dibenzo(a,h)anthracene	390	87	52 J	52 J	0/2		0/2		17E-SS01, 17E-SS01D
Chrysene	390,000	87,000	390 U	48 J	0/2		0/2		17E-SS01D
Benzo(a)pyrene	390	87	390 U	42 J	0/2		0/2		17E-SS01D
Fluoranthene	4,100,000	310,000	390 U	82 J	0/2		0/2		17E-SS01D
Indeno(1,2,3-cd)pyrene	3,900	870	57 J	69 J	0/2		0/2		17E-SS01D
Benzo(g,h,i)perylene	NE	NE	75 J	78 J	NE		NE		17E-SS01D
Pyrene	3,100,000	230,000	28 J	74 J	0/2		0/2		17E-SS01D
Pesticides/PCBs (ug/kg)									
Not Detected									
OP-Pesticides (ug/kg)									
Not Detected									
Chlorinated Herbicides (ug/kg)									
Not Detected									

Notes:

J - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
NE - Not Established.
ft bgs - feet below ground surface.
ug/kg - micrograms per kilogram.

Table 5-67. Summary of Inorganic Detections in Surface Soil at ECP Site 17 – Quarry Disposal Site

Site ID Sample ID Sample Date Sample Depth (ft bgs)	EPA Region III Industrial RBCs (mg/kg)	**EPA Region III Residential RBCs** (mg/kg)	2x Average Detected Background (mg/kg)	17E-01 17E-SS01 05/06/04 0.00 - 1.00	17E-01 17E-SS01D 05/06/04 0.00 - 1.00	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**	Number Exceeding 2x Average Detected Background	Range Exceeding 2x Average Detected Background	Location of Maximum Detection
Appendix IX Inorganics (mg/kg)												
Zinc	31,000	2,300	125.2	62	68	0/2		0/2		0/2		17E-SS01D
Lead	400(1)	400(1)	15.25	5.3	3.8	0/2		0/2		0/2		17E-SS01
Silver	510	39	0.37	1.1 B	0.55 B	0/2		0/2		2/2	0.55B - 1.1B	17E-SS01
Barium	7,200	550	181	60	47	0/2		0/2		0/2		17E-SS01
Beryllium	200	16	0.45	0.18 B	0.15 B	0/2		0/2		0/2		17E-SS01
Cobalt	2,000	160	44.0	21	21	0/2		0/2		0/2		17E-SS01, 17E-SS01D
Chromium	310	23	59.3	16	15	0/2		0/2		0/2		17E-SS01
Copper	4,100	310	234.2	120	95	0/2		0/2		0/2		17E-SS01
Nickel	2,000	160	16.55	15	17	0/2		0/2		1/2	17	17E-SS01D
Tin	61,000	4,700	2.43	3.4 B	3.3 B	0/2		0/2		2/2	3.3B - 3.4B	17E-SS01
Vanadium	100	7.8	354.5	**140**	**120**	2/2	120 - 140	2/2	120 - 140	0/2		17E-SS01
Mercury	31(2)	2.3(2)	0.11	0.03 S	0.022	0/2		0/2		0/2		17E-SS01

Notes:

B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
S - The result was determined by Method of Standard Addition.
(1) - 1996 Soil Screening Guidance.
(2) - Value based on the RBC for Mercuric Chloride.
NE - Not Established.
ft bgs - feet below ground surface.
mg/kg - milligrams per kilogram.

Table 5-68. Summary of Organic Detections in Subsurface Soil at ECP Site 17 – Quarry Disposal Site

Site ID Sample ID Sample Date Sample Depth (ft bgs)	EPA Region III Industrial RBCs (ug/kg)	**EPA Region III Residential RBCs** (ug/kg)	17E-01 17E-SB01-01 05/06/04 1.00 - 1.50	17E-02 17E-SB02-01 05/06/04 1.00 - 3.00	17E-02 17E-SB02-04 05/06/04 7.00 - 9.00	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 of Maximum Detection
Volatile Organic Compounds (ug/kg)										
Ethylbenzene	10,000,000	780,000	5.3 U	5 U	150	0/3		0/3		17E-SB02-04
Acetone	92,000,000	7,000,000	53 U	50 U	27 J	0/3		0/3		17E-SB02-04
Carbon tetrachloride	22,000	4,900	3.7 J	5 U	4.4	0/3		0/3		17E-SB02-04
Benzene	52,000	12,000	5.3 U	5 U	8.6	0/3		0/3		17E-SB02-04
Xylene	20,000,000	1,600,000	11 U	10 U	24	0/3		0/3		17E-SB02-04
Semivolatile Organic Compounds (ug/kg)										
Benzo(b)fluoranthene	3,900	870	310 J	38 J	8,000 U	0/3		0/3		17E-SB01-01
Benzo(a)anthracene	3,900	870	530	370 U	8,000 U	0/3		0/3		17E-SB01-01
Benzo(k)fluoranthene	39,000	8,700	410	24 J	8,000 U	0/3		0/3		17E-SB01-01
Dibenzo(a,h)anthracene	390	87	**110** J	37 J	8,000 U	0/3		1/3	110J	17E-SB01-01
Chrysene	390,000	87,000	530	36 J	8,000 U	0/3		0/3		17E-SB01-01
Dibenzofuran	200,000	16,000	78 J	370 U	8,000 U	0/3		0/3		17E-SB01-01
2-Methylnaphthalene	410,000	31,000	63 J	370 U	2,500 J	0/3		0/3		17E-SB02-04
Benzo(a)pyrene	390	87	**370**	370 U	8,000 U	0/3		1/3	370	17E-SB01-01
Anthracene	31,000,000	2,300,000	230 J	370 U	8,000 U	0/3		0/3		17E-SB01-01
Fluoranthene	4,100,000	310,000	1,100	370 U	8,000 U	0/3		0/3		17E-SB01-01
Fluorene	4,100,000	310,000	120 J	370 U	8,000 U	0/3		0/3		17E-SB01-01
Indeno(1,2,3-cd)pyrene	3,900	870	240 J	53 J	8,000 U	0/3		0/3		17E-SB01-01
Benzo(g,h,i)perylene	NE	NE	240 J	62 J	8,000 U	NE		NE		17E-SB01-01
Phenanthrene	NE	NE	830	370 U	8,000 U	NE		NE		17E-SB01-01
Pyrene	3,100,000	230,000	920	19 J	8,000 U	0/3		0/3		17E-SB01-01
Acenaphthene	6,100,000	470,000	170 J	370 U	8,000 U	0/3		0/3		17E-SB01-01
Pesticides/PCBs (ug/kg)										
4,4'-DDE	8,400	1,900	3.7 U	0.81 J	4 U	0/3		0/3		17E-SB02-01
4,4'-DDT	8,400	1,900	3.7 U	0.53 J	4 U	0/3		0/3		17E-SB02-01

OP-Pesticides (ug/kg)
Not Detected

Chlorinated Herbicides (ug/kg)
Not Detected

Notes:
J - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
NE - Not Established.
ft bgs - feet below ground surface.
ug/kg - micrograms per kilogram.

Table 5-69. Summary of Inorganic Detections in Subsurface Soil at ECP Site 17 – Quarry Disposal Site

Site ID Sample ID Sample Date Sample Depth (ft bgs)	EPA Region III Industrial RBCs (mg/kg)	**EPA Region III Residential RBCs** (mg/kg)	2x Average Detected Background (mg/kg)	17E-01 17E-SB01-01 05/06/04 1.00 - 1.50	17E-01 17E-SB02-01 05/06/04 1.00 - 3.00	17E-02 17E-SB02-04 05/06/04 7.00 - 9.00	Exceeding EPA Region III Industrial RBCs	Exceeding EPA Region III Industrial RBCs	**Exceeding EPA Region III Residential RBCs**	**Exceeding EPA Region III Residential RBCs**	Number Exceeding 2x Average Detected Background	Range Exceeding 2x Average Detected Background	Location of Maximum Detection
Appendix IX Inorganics (mg/kg)													
Zinc	31,000	2,300	88.6	60	39	42	0/3		0/3		0/3		17E-SB01-01
Lead	400[(1)]	400[(1)]	8.68	4.5	2.7	3.6	0/3		0/3		0/3		17E-SB01-01
Silver	510	39	0.46	0.32 B	1.1 U	1.1 U	0/3		0/3		0/3		17E-SB01-01
Arsenic	1.9	0.43	2.05	1.1 U	**0.9** B	1.1 U	0/3		1/3	0.9B	0/3		17E-SB02-01
Barium	7,200	550	222	57	72	81	0/3		0/3		0/3		17E-SB02-04
Beryllium	200	16	0.74	0.18 B	0.2 B	0.26 B	0/3		0/3		0/3		17E-SB02-04
Cobalt	2,000	160	30.0	20	18	22	0/3		0/3		0/3		17E-SB02-04
Chromium	310	23	133	16	19	**57**	0/3		1/3	57	0/3		17E-SB02-04
Copper	4,100	310	193	100	76	100	0/3		0/3		0/3		17E-SB01-01, 17E-SB02-04
Nickel	2,000	160	31.9	13	14	27	0/3		0/3		0/3		17E-SB02-04
Tin	61,000	4,700	2.96	2.6 B	2.7 B	2.7 B	0/3		0/3		0/3		17E-SB02-01, 17E-SB02-04
Vanadium	100	7.8	462	**130**	**100**	**150**	1/3	130 - 150	3/3	100 - 150	0/3		17E-SB02-04
Mercury	31[(2)]	2.3[(2)]	0.093	0.01 B	0.0085 B	0.016 B	0/3		0/3		0/3		17E-SB02-04

Notes:

U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
(1) - 1996 Soil Screening Guidance.
(2) - Value based on the RBC for Mercuric Chloride.
NE - Not Established.
ft bgs - feet below ground surface.
mg/kg - milligrams per kilogram.

Table 5-70. Summary of Organic Detections in Groundwater at ECP Site 17 – Quarry Disposal Site

Site ID Sample ID Sample Date	Federal MCLs (ug/L)	**EPA Region III Tap Water RBCs** (ug/L)	PR Water Quality Standards (ug/L)	17E-02 17E-GW01 05/09/04	Number Exceeding Federal MCLs	Range Exceeding Federal MCLs	**Number Exceeding EPA Region III Tap Water RBCs**	**Range Exceeding EPA Region III Tap Water RBCs**	Number Exceeding PR Water Quality Standards	Range Exceeding PR Water Quality Standards	Location Maximum Detection
Volatile Organic Compounds (ug/L)											
Ethylbenzene	700	130	700	3	0/1		0/1		0/1		17E-GW01
Acetone	NE	550	NE	6.8 J	NE		0/1		NE		17E-GW01
2-Butanone	NE	700	NE	1.9 J	NE		0/1		NE		17E-GW01
Semivolatile Organic Compounds (ug/L)											
Cresol, m & p	NE	NE	NE	1.8 J	NE		NE		NE		17E-GW01
Naphthalene	NE	0.65	NE	**1.3** J	NE		1/1	1.3J	NE		17E-GW01
Pesticides/PCBs (ug/L)											
Not Detected											
OP-Pesticides (ug/L)											
Not Detected											
Chlorinated Herbicides (ug/L)											
Not Detected											

Notes:

J - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
ug/L - micrograms per liter.
NE - Not Established.

Table 5-71. Summary of Inorganic Detections in Groundwater at ECP Site 17 – Quarry Disposal Site

Site ID / Sample ID / Sample Date	Federal MCLs (mg/L)	**EPA Region III Tap Water RBCs** (mg/L)	PR Water Quality Standards (mg/L)	17E-02 / 17E-GW01 / 05/09/04	Number Exceeding Federal MCLs	Range Exceeding Federal MCLs	**Number Exceeding EPA Region III Tap Water RBCs**	**Range Exceeding EPA Region III Tap Water RBCs**	Number Exceeding PR Water Quality Standards	Range Exceeding PR Water Quality Standards	Location Maximum Detection
Appendix IX Inorganics (mg/L)											
Mercury	0.002	0.0011[2]	0.002	0.00049 B	0/1		0/1		0/1		17E-GW01
Barium	2	0.26	NE	0.1	0/1		0/1		NE		17E-GW01
Cobalt	NE	0.073	NE	0.0039 B	NE		0/1		NE		17E-GW01
Chromium	0.1	0.011	NE	0.0013 B	0/1		0/1		NE		17E-GW01
Copper	1.3[1]	0.15	1.3	0.0041 B	0/1		0/1		0/1		17E-GW01
Nickel	NE	0.073	NE	0.0033 B	NE		0/1		NE		17E-GW01
Vanadium	NE	0.0037	NE	**0.012**	NE		1/1	0.012	NE		17E-GW01

Notes:

B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.

(1) - EPA action level.

(2) - Value based on the Tap Water RBC for Mercuric Chloride.

NE - Not Established.

mg/L - milligrams per liter.

Comparison to criteria for the various media are given in Tables 5-66 through 5-71. Dibenzo(a,h)anthracene (subsurface soil), benzo(a)pyrene (subsurface soil), and naphthalene (groundwater) exceeded the EPA Region III Residential RBCs (soil) and the EPA Region III Tap Water RBCs (groundwater). Arsenic (subsurface soil), chromium (subsurface soil), and vanadium (surface and subsurface soil, groundwater) exceeded the EPA Region III Residential RBCs. None of the concentrations of these compounds exceeded the established background concentrations at NSRR. In the surface soil, silver and tin slightly exceeded twice the average detected background concentrations, but did not exceed any RBC criteria.

From the detections of fuel compounds in both the soil and groundwater at the Quarry Disposal Site, it is likely that previous activities have impacted the environment at this site.

5.4.17.5 Qualitative Risk Assessment

A discussion on the COPCs and potential risks associated with the surface soil, subsurface soil, and groundwater at this site, is provided below.

COPC Identification

No COPCs were identified for surface soil at Site 17. Vanadium is present at concentrations that exceed the residential RBC but are less than the base background criterion.

Benzo(a)pyrene and dibenzo(a,h)anthracene are the only organic analytes identified as COPCs in subsurface soil at Site 17, with concentrations in one sample in excess of the residential RBC. Arsenic, chromium, and vanadium are detected at concentrations of that exceed the residential RBCs but do not exceed base background criteria, thus, are not identified as COPCs.

Naphthalene and vanadium are the only COPCs identified for groundwater at Site 17 as they were detected at concentrations that exceeded their tap water RBCs.

Potential Risk Discussion

The potential risk posed by exposure to surface soil at Site 17 is extremely small due to the lack of COPCs.

Significant exposure to subsurface soil is less likely than to surface soil, especially given the reasonably anticipated land use of industrial/commercial. The benzo (a)pyrene and dibenzo(a,h)anthracene concentrations (370 and 110 J μg/kg, respectively) are less than the industrial RBCs, indicating a low potential for significant risk from exposure to subsurface soil.

Potential exposure to groundwater at NSRR is unlikely. Groundwater is not currently used for potable purposes because drinking water is available from El Yunque which supplies all of NSRR's present needs. The most likely exposure route to groundwater is from inhalation of vapors emitted from volatile organics through the overlying soil, particularly into buildings. Vanadium is not volatile. Naphthalene is considered moderately volatile; however, this exposure route requires considerably higher concentrations than the direct ingestion exposure route. Furthermore, the detection of naphthalene is at an estimated concentration (1.3 J μg/L) almost one-tenth of the reporting limit. The RBCs used to select naphthalene and vanadium as COPCs are based on a noncarcinogenic toxicity criteria set at one-tenth of the level considered acceptable by EPA to account for potential additive effects of multiple contaminants. As there are only two noncarcinogenic COPCs in groundwater at Site 17, the single contaminant RBC can be used for comparison, which is ten times higher than the tap water RBCs. A comparison of the naphthalene data to the single contaminant tap water RBC for naphthalene of 6.5 μg/L (based on the unlikely but assumed exposure via ingestion of groundwater) shows that the concentration is less than this value. Similarly, for vanadium, this comparison shows that the concentration (0.012 mg/L) is less than the single contaminant tap water RBC of 0.037 mg/L. Therefore, groundwater at Site 17 from potential exposure to naphthalene and vanadium does not appear to pose a significant potential human health concern due to the unlikelihood of exposure and low concentrations. The potential risk from groundwater exposure is very low even if the groundwater were to be used for potable purposes in the future.

5.4.17.6 Summary of Site Conditions

At ECP Site 17, it is likely that past activities have impacted the environment. PAHs were identified above the residential RBC, but below the industrial RBC in the subsurface soil. Groundwater contained naphthalene and vanadium in excess of the Residential RBC for those compounds but an unlikely exposure scenario was used to evaluate the human health risk. Further investigation at this site will be conducted under the RCRA Corrective Action/IRP process.

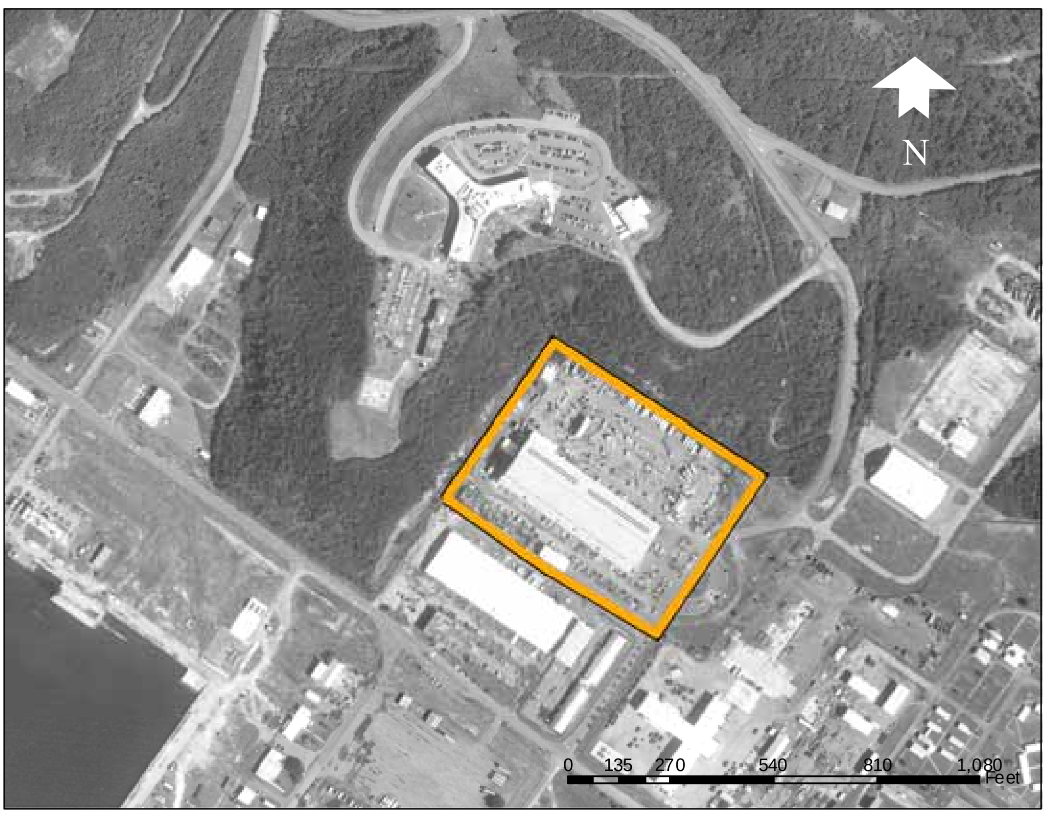
5.4.18 ECP Site 18

5.4.18.1 Site History and Description

[Note: This ECP Site encompasses SWMU 31/32 (see Section 5.3.31). The findings for this ECP Site are NOT applicable to SWMU 31/32, which is being addressed separately under the RCRA Corrective Action Program.]

This site immediately surrounds Building 31, the Public Works Department (PWD) (see Figure 5-88). The majority of the area is covered by pavement and the outer reaches covered by gravel/dirt. The area surrounding the building is best described as a level parking/storage lot. The APA identified this area as PI Site 25, due to the observation of numerous small spills, stains, and stressed vegetation from 1958-1995. The records review confirmed this area as the location of the PWD since at least the early 1950s, with activities at the site involving facility, vehicle, and equipment maintenance and refueling. The physical site inspection observed numerous small stains on the pavement surrounding the building. Interviews confirmed this site as the historic location of the PWD, with outdoor maintenance activities and numerous spills and leaks of POL and HM occurring throughout the usage period. [See photos A-37 through A-39]

During the Phase II ECP investigation, numerous small stains were observed, as was the case during the physical site inspection. However, there were no major stains observed at this site during the investigation.



*Background aerial photograph from 1958

Figure 5-88. ECP Site 18 - Building 31, Public Works Department

5.4.18.2 *Site Hydrogeology*

ECP Site 18 is located in the near-shore flatlands, but portions of the site area located in an excavated hill. Borings 18E-SB02 through 18E-SB04 were located in the excavated hill area. Bedrock was encountered immediately below the asphalt and gravel subbase (1- to 1.5-foot bgs). The bedrock was weathered, but hard. Refusal occurred at all three borings within 13-feet bgs. The area represented by boring 18E-SB01 and temporary well 18E-TW02 exhibited more typically near-shore characteristics. At boring 18E-SB01 a sequence of marine sand, silt, and clay was observed to boring termination. Groundwater was observed in a fine to medium sand layer at approximately 7-feet bgs. At temporary well 18E-TW02, a thin (1.5-foot thick) marine sand was observed immediately below the asphalt and gravel subbase. Residual sand and gravel was observed below the marine sand to a depth of approximately 8-feet bgs. Groundwater was observed in discontinuous zones in this residuum. Weathered bedrock (Gabbro) was observed beginning at approximately 8-feet bgs.

5.4.18.3 *Field Investigation and Sampling Program*

There were no signs of staining or stressed vegetation observed at this site. Therefore, the originally proposed sample locations within the work plan were utilized, with the exception of 18E-01. The decision was made in the field to relocate this boring to the northeast approximately 50 feet, to avoid any potential damage to the temporary well if positioned in the originally proposed location within the middle of the main entrance to the parking lot for Building 31.

A total of five soil borings were advanced in the PWD yard as presented on Figure 5-89. Subsurface soil samples were collected from each boring location, with the exception of 18E-TW02 as described below, from two-foot intervals with a minimum of two subsurface soil samples obtained from each boring location. The depth of the soil borings at this site ranged from 5.5 feet bgs to 13 feet bgs. All subsurface soil samples were screened in the field utilizing a FID and PID with the results recorded in the field logbook. The screening results were compared against background to indicate if the soil has been impacted by past operations. [See Appendix G for full PID and FID screening results on a per site basis.]

Soil samples submitted to the fixed-base laboratory included four subsurface soil samples (18E-SB01-01, 18E-SB02-03, 18E-SB03-01, and 18E-SB04-04). These samples were submitted to the fixed-base analytical laboratory for full Appendix IX analysis. The QA/QC samples collected at this site include one subsurface soil duplicate sample (18E-SB01D-01).

LEGEND

- SUBSURFACE SOIL AND GROUNDWATER SAMPLE LOCATION
- GROUNDWATER SAMPLE LOCATION
- SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
- ECP SITE BOUNDARY

SOURCE: GEO-MARINE, INC., SEPTEMBER 6, 2000.

Figure 5-89.
ECP Site 18 - Building 31,
Public Works Department
Sample Location Map

A groundwater program followed the soil sampling program. Based on the PID/FID levels observed at soil boring location 18E-01, a temporary monitor well was installed at this location as proposed. In addition, based on the PID/FID levels at the remaining three soil boring locations indicating no observed contamination, the decision was made to install an independent temporary monitor well at a location (18E-TW02) believed to be hydraulically down-gradient from the PWD building. The temporary monitor wells were installed and groundwater samples were collected and submitted to the fixed-base analytical laboratory for full Appendix IX analysis. The inorganic analysis requested was for dissolved metals only.

5.4.18.4 Nature and Extent of Contamination

Four subsurface soil and two groundwater environmental samples were collected from five locations shown on Figure 5-89 at the Public Works Department. The location of the groundwater sample location at 18E-01 was as proposed in the work plan (NAVFAC Atlantic, 2004b). Since no other soil boring screening resulted in any significant detections above background, it was decided to install the second temporary well at a location independent of any soil boring, and located downgradient of the Public Works Department. A duplicate subsurface soil sample was obtained from location 18E-01. Analytical results showing detections in the two media are given in Tables 5-72 through 5-74.

In the subsurface soil, no organic compounds were detected. Location 18E-01 had a significant FID reading at a depth of 6-8 feet bgs. However, the corresponding sample was taken from 1-3 feet bgs. The field geologist attributed the FID reading at 6-8 feet bgs to organic decay, and so the sample was not obtained from this interval. Thirteen inorganic compounds were detected in the subsurface soil.

In the groundwater, three VOCs and five inorganic compounds were detected. Most compounds were found only in the temporary well 18E-TW02. The VOCs were present at very low concentrations.

The VOCs found in the groundwater are associated with maintenance operations. The inorganic compounds are those typically present in the soil at NSRR.

Table 5-72. Summary of Inorganic Detections in Subsurface Soil at ECP Site 18 – Building 31 (Public Works Department)

Site ID	EPA Region III Industrial RBCs	**EPA Region III Residential RBCs**	2x Average Detected Background	18E-01	18E-01	18E-02	18E-03	18E-04	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**	Number Exceeding 2x Average Detected Background	Range Exceeding 2x Average Detected Background	Location of Maximum Detection
Sample ID				18E-SB01-01	18E-SB01D-01	18E-SB02-03	18E-SB03-01	18E-SB04-04							
Sample Date				05/04/04	05/04/04	05/04/04	05/04/04	05/04/04							
Sample Depth (ft bgs)	(mg/kg)	(mg/kg)	(mg/kg)	1.00 - 3.00	1.00 - 3.00	5.00 - 7.00	1.00 - 3.00	7.00 - 9.00							
Appendix IX Inorganics (mg/kg)															
Arsenic	1.9	0.43	2.05	**3.2**	**2.1**	**1**	1 U	0.99 U	2/5	2.1 - 3.2	3/5	1 - 3.2	2/5	2.1 - 3.2	18E-SB01-01
Barium	7,200	550	222	17	19	35	110	54	0/5		0/5		0/5		18E-SB03-01
Beryllium	200	16	0.74	0.085 B	0.077 B	0.19 B	0.13 B	0.22 B	0/5		0/5		0/5		18E-SB04-04
Cadmium	100	7.8	0.74	0.17 B	0.061 B	0.48 U	0.52 U	0.5 U	0/5		0/5		0/5		18E-SB01-01
Cobalt	2,000	160	30.0	7.1	8.4	38	31	5.9	0/5		0/5		2/5	31 - 38	18E-SB02-03
Chromium	310	23	133	**34** N	**33** N	13 N	5.8 N	8.6 N	0/5		2/5	33N - 34N	0/5		18E-SB01-01
Copper	4,100	310	193	49	55	200	92	180	0/5		0/5		1/5	200	18E-SB02-03
Nickel	2,000	160	31.9	11	11	17	12	11	0/5		0/5		0/5		18E-SB02-03
Lead	400[1]	400[1]	8.68	1.2	1.5	1.6	0.63	0.5 U	0/5		0/5		0/5		18E-SB02-03
Tin	61,000	4,700	2.96	2.9 B	3.2 B	3.1 B	1.5 B	2.9 B	0/5		0/5		2/5	3.1B - 3.2B	18E-SB01D-01
Vanadium	100	7.8	462	**53**	**50**	**110**	**130**	**89**	2/5	110 - 130	5/5	50 - 130	0/5		18E-SB03-01
Zinc	31,000	2,300	88.6	25	23	44	36	38	0/5		0/5		0/5		18E-SB02-03
Mercury	31[2]	2.3[2]	0.093	0.02 U	0.0051 B	0.0039 B	0.021 U	0.021 U	0/5		0/5		0/5		18E-SB01D-01

Notes:

B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.

N - The matrix spike recovery is not within control limtis.

U - The compound was analyzed for, but was not detected at or above the MDL/PQL.

(1) - 1996 Soil Screening Guidance.

(2) - Value based on the RBC for Mercuric Chloride.

NE - Not Established.

ft bgs - feet below ground surface.

mg/kg - milligrams per kilogram.

Table 5-73. Summary of Organic Detections in Groundwater at ECP Site 18 – Building 31 (Public Works Department)

Site ID Sample ID Sample Date	Federal MCLs (ug/L)	**EPA Region III Tap Water RBCs** (ug/L)	PR Water Quality Standards (ug/L)	18E-01 18E-GW01 05/07/04	18E-TW02 18E-GW02 05/07/04	Number Exceeding Federal MCLs	Range Exceeding Federal MCLs	**Number Exceeding EPA Region III Tap Water RBCs**	**Range Exceeding EPA Region III Tap Water RBCs**	Number Exceeding PR Water Quality Standards	Range Exceeding PR Water Quality Standards	Location Maximum Detection
Volatile Organic Compounds (ug/L)												
1,1-Dichloroethene	7	35	7	1 U	1.1	0/2		0/2		0/2		18E-GW02
2-Butanone	NE	700	NE	10 U	2.7 J	NE		0/2		NE		18E-GW02
Acetone	NE	550	NE	25 U	11 J	NE		0/2		NE		18E-GW02
Semivolatile Organic Compounds (ug/L)												
Not Detected												
Pesticides/PCBs (ug/L)												
Not Detected												
OP-Pesticides (ug/L)												
Not Detected												
Chlorinated Herbicides (ug/L)												
Not Detected												

Notes:

J - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
ug/L - micrograms per liter.
NE - Not Established.

Table 5-74. Summary of Inorganic Detections in Groundwater at ECP Site 18 – Building 31 (Public Works Department)

Site ID Sample ID Sample Date	Federal MCLs (mg/L)	**EPA Region III Tap Water RBCs** (mg/L)	PR Water Quality Standards (mg/L)	18E-01 18E-GW01 05/07/04	18E-TW02 18E-GW02 05/07/04	Number Exceeding Federal MCLs	Range Exceeding Federal MCLs	**Number Exceeding EPA Region III Tap Water RBCs**	**Range Exceeding EPA Region III Tap Water RBCs**	Number Exceeding PR Water Quality Standards	Range Exceeding PR Water Quality Standards	Location Maximum Detection
Appendix IX (Dissolved) Inorganics (mg/L)												
Barium	2	0.26	NE	0.076	**0.52**	0/2		1/2	0.52	NE		18E-GW02
Cobalt	NE	0.073	NE	0.01 U	0.011	NE		0/2		NE		18E-GW02
Copper	1.3[1]	0.15	1.3	0.02 U	0.013 B	0/2		0/2		0/2		18E-GW02
Nickel	NE	0.073	NE	0.04 U	0.006 B	NE		0/2		NE		18E-GW02
Vanadium	NE	0.0037	NE	0.01 U	**0.005** B	NE		1/2	0.005B	NE		18E-GW02

Total Cyanide & Sulfide (mg/L)

Not Detected

Notes:

B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
[1] - EPA action level.
NE - Not Established.
mg/L - milligrams per liter.

Comparison to criteria was done with the results shown in Tables 5-72 through 5-74. Arsenic (soil), chromium (soil), vanadium (soil and groundwater), and barium (groundwater) exceeded the EPA Region III Residential or Tap Water RBC criteria. The barium in the groundwater did not exceed the Federal MCL, however. Arsenic also exceeded twice the average detected background concentration for NSRR, but not by a significant amount. Cobalt, copper, and tin exceeded the background concentrations slightly, but did not exceed any RBCs for those compounds.

From the results of the analytical program at this site, it is unlikely that the environment has been negatively impacted by past and present operations at the Public Works Department. The presence of arsenic at concentrations above RBCs and background levels would likely result in no significant difference from background concentrations if a statistical test was done on the analytical data for arsenic.

5.4.18.5 Qualitative Risk Assessment

A discussion on the COPCs and potential risks associated with the subsurface soil and groundwater at this site is provided below.

COPC Identification

No organic COPCs were identified for subsurface soil at Site 18. Arsenic was the only inorganic COPC identified. Chromium and vanadium were detected at concentrations exceeding the residential RBC but not at concentration exceeding the base background criteria.

No organic COPCs were identified for groundwater, but barium and vanadium were identified as COPCs since they were detected at concentration that exceeds the tap water RBCs.

Potential Risk Discussion

Significant exposure to subsurface soil is less likely than to surface soil, especially given the reasonably anticipated land use of industrial/commercial. This land use can be qualitatively assessed by comparing data to industrial RBCs. Two arsenic detections are at concentrations (2.1 and 3.1 mg/kg) that exceed the industrial RBC of 1.9 mg/kg and moderately exceed the base background criterion. Nevertheless, these concentrations are still likely representative of background, as data collected by the United States Geologic Society to establish background concentrations in soil for Puerto Rico, include a maximum concentration of 22 mg/kg (Baker, 2003).

Potential exposure to groundwater at NSRR is unlikely. Groundwater is not currently used for potable purposes because drinking water is available from El Yunque which supplies all of NSRR's present needs. The most likely exposure route to groundwater is from inhalation of vapors emitted from volatile organics through the overlying soil, particularly into buildings. Barium and vanadium are not considered volatile. The RBC used to select barium and vanadium as COPCs are based on noncarcinogenic toxicity criteria set at one-tenth of the level considered acceptable by EPA to account for potential additive effects of multiple contaminants. As there are only two noncarcinogenic COPCs in groundwater at Site 16, the single contaminant RBC can be used for comparison, which is ten times higher than the tap water RBCs. The barium level is less than the single contaminant tap water RBC of 2.6 mg/L (based on the unlikely but assumed exposure via ingestion of groundwater), as well as the MCL established for drinking water supplies. The vanadium concentration in groundwater is likewise less than the single contaminant tap water RBC of 0.037 mg/L. Exposure to barium and vanadium in groundwater at Site 18 does not pose a significant potential human health concern due to the unlikelihood of exposure and the low concentrations of these COPCs. The potential risk from groundwater exposure is very low even if the groundwater were to be used for potable purposes in the future.

5.4.18.6 Summary of Site Conditions

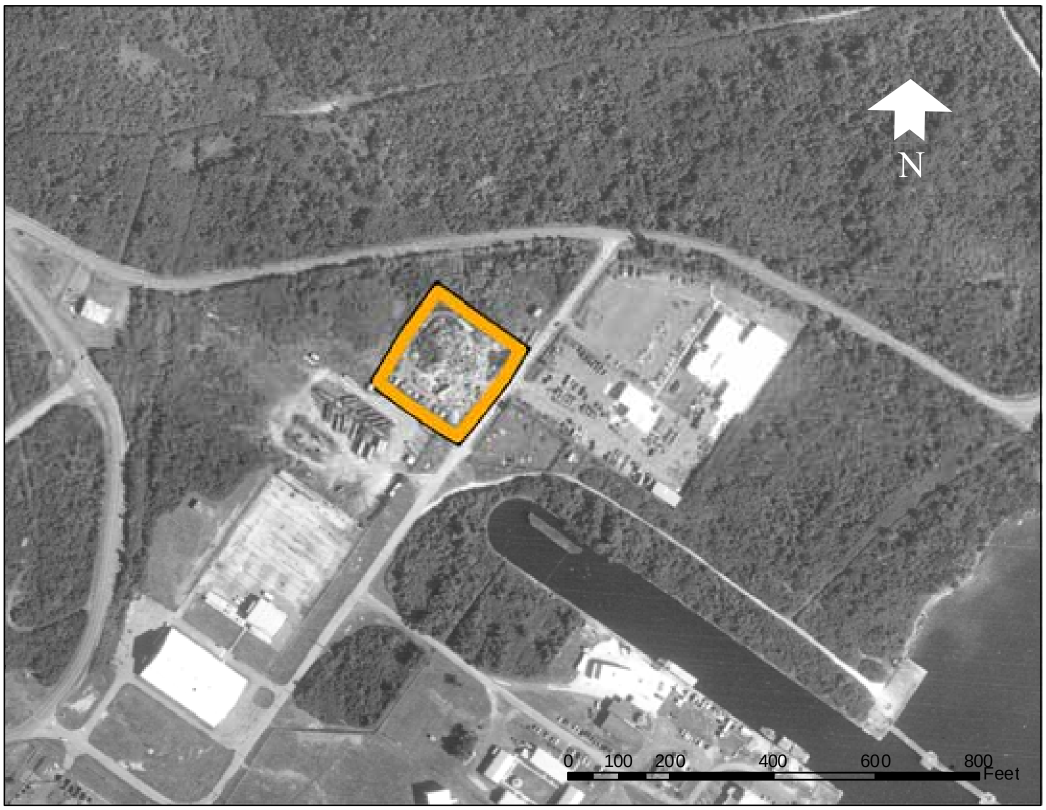
At ECP Site 18, it is unlikely that past and present activities have impacted the environment. Arsenic was identified above background as a COPC in the subsurface soil but is likely to still be representative of background concentrations. No further action is necessary.

5.4.19 ECP Site 19

5.4.19.1 Site History and Description

This site is the current location of the Defense Reutilization and Marketing Office (DRMO) Scrap Metal Recycling Yard, located near the Camp Moscrip area and the Dry Dock, at the eastern end of the base (see Figure 5-90). The site originally consisted of a large flat lying gravel covered storage yard as described in the Phase I ECP Report. However, the site boundary was expanded to include the secondary growth vegetation area around the perimeter of the storage yard during the field investigation, as per NAVFAC Atlantic's request, based on the amount of debris (i.e., wood, metal, etc.) observed in this area. The physical site inspection observed numerous small spills and stains of presumed POL, primarily from large pieces of construction equipment that were stored in the yard. The records review, APA, and interviews confirmed that this site has been operated as the DRMO Scrap Yard since the 1970s, and that numerous pieces of equipment and vehicles have been stored at the site for extended periods of time, resulting in numerous small releases of POL throughout the usage period. Portions of this site contain miscellaneous debris including vehicle frames and tires, as well as other equipment. [See photos A-40 and A-41]

Figure 5-90. ECP Site 19 - DRMO Scrap Metal Recycling Yard



*Background aerial photograph from 1958

As observed during the Phase II ECP field investigation, there were numerous areas within the recycling yard where the concrete pad was divided up into different storage areas based on the type of scrap metal that was to be disposed (Photograph G-43). Also presented within Photograph G-43, is the view looking northwest across the site at one of the temporary monitor wells installed at this site during the Phase II ECP investigation. The central and northeast portions of the recycling yard appeared to be scraped clean, with minor amounts of debris observed. In addition, piles of debris (i.e., wood, metal, etc.) were observed scattered across the wooded area around the perimeter of recycling yard as mentioned above, as well as a small building structure as presented in Photograph G-44 through G-47.

During the Phase II ECP Investigation, it was brought to the attention of the field crew that during base operations in the vicinity of this site, that two unidentified metal structures were uncovered. The Environmental Division of the PWD was then made aware of the uncovered metal structures. The PWD then arranged for them to be moved to a separate area of the Building 31 - PWD yard for further examination. After PWD personnel examined the structures, they requested that a representative from the field crew examine the two structures found. Based on the size, as well as their ordnance-like shape, the decision was made by PWD to have an ordnance expert come to inspect the structures to rule out the chance that they are unexploded ordnances. On May 12, 2004, a representative from the EODMU SIX Detachment Mayport arrived at the PWD to inspect the structures. The result of the inspection concluded that it was the belief of the EODMU SIX Detachment Mayport that both ordnance-shaped structures were inert.

5.4.19.2 Site Hydrogeology

ECP Site 19 is located in the near-shore flatlands. Fill was observed to be present from the ground surface to a depth of 7-feet to 13-feet. The fill material consisted of mainly sand and gravel, with lesser amounts of metal debris, silt, and clay. Marine sediments were observed immediately beneath the fill material. Fine to medium sand was observed at one boring, and peat was observed at another. Groundwater was apparent beginning in the fill material at a depth ranging from 6- to 8-feet bgs.

5.4.19.3 Field Investigation and Sampling Program

The former scrap metal and recycling yard was investigated at ECP Site 19. However, as mentioned previously, the site boundary was expanded to include the secondary growth vegetation area around the perimeter of the storage yard, as per NAVFAC Atlantic's request, based on the amount of debris (i.e., wood, metal, etc.) observed in this area. Therefore, the original sample locations within the recycling yard were field located, while the additional five surface soil locations were surveyed in upon the locations being determined.

Three soil borings (19E-01 through 19E-03) were advanced in the Former Scrap Metal and Recycling Yard as presented on Figure 5-91. It should be noted that the three soil borings were not located on top of the concrete pad that falls within this area.

300 0 150 300

1 inch = 300 ft.

LEGEND

- SURFACE SOIL, SUBSURFACE SOIL, AND GROUNDWATER SAMPLE LOCATION
- SURFACE SOIL SAMPLE LOCATION
- ECP SITE BOUNDARY

SOURCE: GEO-MARINE, INC., SEPTEMBER 6, 2000.

Figure 5-91.
ECP Site 19 - DRMO Scrap Metal Recycling Yard Sample Location Map

Surface soil samples were collected from this at a depth of 0 to 1 foot bgs. Subsurface soil samples were then collected from each boring location from two-foot intervals down to the groundwater interface (approximately 6 to 8 feet bgs). The depth of the soil borings at this site ranged from 14 feet bgs to 15 feet bgs.

All surface and subsurface soil samples were screened in the field utilizing a FID and PID with the results recorded in the field logbook. The screening results were compared against background to indicate if the soil has been impacted by past operations. Based on the observed piles of metal, wood, etc., found inside the wooded perimeter in the area around the recycling yard, the decision was made to collect six additional surface soil samples (19E-SS04 through 19E-SS09) in an attempt to determine if this environment has been negatively impacted by past practices. [See Appendix G for full PID and FID screening results on a per site basis.]

Soil samples submitted to a fixed-base laboratory included surface soil samples (19E-SS01 through 19E-SS09) and subsurface soil samples (19E-SB01-02, 19E-SB02-03, and 19E-SB03-03). These samples were submitted to the fixed-base analytical laboratory for full Appendix IX analysis.

A groundwater program followed the soil sampling program. One temporary monitor well was installed at each of the three soil boring locations (19E-01 through 19E-03) as presented on Figure 5-91. The temporary monitor wells were installed and groundwater samples (19E-GW01 through 19E-GW03) were collected. Groundwater samples were submitted to the fixed-base analytical laboratory for full Appendix IX analysis. The inorganic analysis requested was for dissolved metals only.

5.4.19.4 *Nature and Extent of Contamination*

Nine surface soil, three subsurface soil, and three groundwater samples were obtained from ECP Site 19 from nine locations as shown on Figure 5-91. The groundwater sample locations were pre-determined by the work plan (NAVFAC Atlantic, 2004b) and were not based on FID/PID screening. The results of the screening indicated that only one location had an exceedance of background in the soil vapor. No duplicate samples were taken at this site. The positive detections in the analytical results are shown on Tables 5-75 through 5-80.

Table 5-75. Summary of Organic Detections in Surface Soil at ECP Site 19 – DRMO Scrap Metal Recycling Yard

Site ID Sample ID Sample Date Sample Depth (ft bgs)	EPA Region III Industrial RBCs (ug/kg)	**EPA Region III Residential RBCs** (ug/kg)	19E-01 19E-SS01 05/06/04 0.00 - 1.00	19E-02 19E-SS02 05/06/04 0.00 - 1.00	19E-03 19E-SS03 05/06/04 0.00 - 1.00	19E-SS04 19E-SS04 05/13/04 0.00 - 1.00	19E-SS05 19E-SS05 05/13/04 0.00 - 1.00	19E-SS06 19E-SS06 05/13/04 0.00 - 1.00	19E-SS07 19E-SS07 05/13/04 0.00 - 1.00	19E-SS08 19E-SS08 05/13/04 0.00 - 1.00	19E-SS09 19E-SS09 05/13/04 0.00 - 1.00	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 of Maximum Detection
Volatile Organic Compounds (ug/kg)																
Carbon tetrachloride	22,000	4,900	2.6 J	2.9 J	5.6 U	7.9 U	6.8 U	5.8 U	6 U	6.5 U	6.3 U	0/9		0/9		19E-SS02
Xylene	20,000,000	1,600,000	9.7 U	11 U	3.8 J	16 U	14 U	12 U	12 U	13 U	12 U	0/9		0/9		193-SS03
Tetrachloroethene	5,300	1,200	4.8 U	5.6 U	5.6 U	7.9 U	3.8 J	5.7 J	6 U	6.5 U	6.3 U	0/9		0/9		19E-SS06
Chlorobenzene	2,000,000	160,000	4.8 U	5.6 U	5.6 U	7.9 U	6.8 U	1.8 J	6 U	6.5 U	6.3 U	0/9		0/9		19E-SS06
Semivolatile Organic Compounds (ug/kg)																
Butylbenzylphthalate	20,000,000	16,000,000	52 J	380 U	420 U	320 J	490 U	400 U	440 U	450 U	440 U	0/9		0/9		19E-SS04
Fluoranthene	4,100,000	310,000	34 J	380 U	41 J	540 U	490 U	200 J	440 U	56 J	440 U	0/9		0/9		19E-SS06
Indeno(1,2,3-cd)pyrene	3,900	870	43 J	380 U	420 U	540 U	490 U	190 J	440 U	450 U	440 U	0/9		0/9		19E-SS06
Pyrene	3,100,000	230,000	39 J	18 J	43 J	540 U	490 U	300 J	440 U	54 J	440 U	0/9		0/9		19E-SS06
Benzo(g,h,i)perylene	NE	NE	49 J	380 U	32 J	540 U	490 U	230 J	440 U	450 U	440 U	NE		NE		19E-SS06
Benzo(k)fluoranthene	39,000	8,700	26 J	380 U	420 U	540 U	490 U	350 J	440 U	450 U	440 U	0/9		0/9		19E-SS06
Chrysene	390,000	87,000	360 U	380 U	420 U	540 U	490 U	320 J	440 U	450 U	440 U	0/9		0/9		19E-SS06
Acenaphthylene	NE	NE	360 U	380 U	420 U	540 U	490 U	71 J	440 U	450 U	440 U	NE		NE		19E-SS06
Anthracene	31,000,000	2,300,000	360 U	380 U	420 U	540 U	490 U	48 J	440 U	450 U	440 U	0/9		0/9		19E-SS06
Benzo(a)anthracene	3,900	870	360 U	380 U	420 U	540 U	490 U	220 J	440 U	450 U	440 U	0/9		0/9		19E-SS06
Benzo(a)pyrene	390	87	360 U	380 U	420 U	540 U	490 U	**270** J	440 U	450 U	440 U	0/9		1/9	270J	19E-SS06
Benzo(b)fluoranthene	3,900	870	360 U	380 U	420 U	540 U	490 U	320 J	440 U	450 U	440 U	0/9		0/9		19E-SSS06
Pesticides/PCBs (ug/kg)																
Dieldrin	180	40	7.7	1.9 J	840 U	5.4 U	6.7	4 U	4.4 U	4.5 U	4.4 U	0/9		0/9		19E-SS01
Heptachlor	640	140	3.7 P	3.9 U	430 U	2.8 U	2.5 U	2 U	2.3 U	2.3 U	2.3 U	0/9		0/9		19E-SS01
4,4'-DDT	12,000	2,700	7.2 U	10	**5,300**	7.1	4.9 U	4.9	4.4 U	4.5 U	3.7 J	0/9		1/9	5,300	19E-SS03
4,4'-DDE	8,400	1,900	7.6	66	**4,700**	22	8.8	4.3	4.4 U	4.5 U	1 JP	0/9		0/9	4,700	19E-SS03
4,4'-DDD	8,400	1,900	7.2 U	1.4 JP	810 J	5.4 U	4.9 U	4 U	4.4 U	4.5 U	4.4 U	0/9		0/9		19E-SS03
Kepone	360	80	370 U	390 U	43,000 U	280 U	250 U	26 J	230 U	230 U	230 U	0/9		0/9		19E-SS06
Aroclor-1248	1,400	320	140	75 U	8,400 U	54 U	49 U	40 U	44 U	45 U	44 U	0/9		0/9		19E-SS01
Aroclor-1254	1,400	320	72 U	40 J	8,400 U	54 U	49 U	40 U	44 U	45 U	44 U	0/9		0/9		19E-SS02
Aroclor-1260	1,400	320	120	15 JP	8,400 U	54 U	73	40 U	44 U	45 U	44 U	0/9		0/9		19E-SS01

OP-Pesticides (ug/kg)
Not Detected

Chlorinated Herbicides (ug/kg)
Not Detected

Notes:

J - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
P - The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two GC columns or HPLC detectors.
NE - Not Established.
ft bgs - feet below ground surface.
ug/kg - micrograms per kilogram.

Table 5-76. Summary of Inorganic Detections in Surface Soil at ECP Site 19 – DRMO Scrap Metal Recycling Yard

Site ID Sample ID Sample Date Sample Depth (ft bgs)	EPA Region III Industrial RBCs (mg/kg)	**EPA Region III Residential RBCs** (mg/kg)	2x Average Detected Background (mg/kg)	19E-01 19E-SS01 05/06/04 0.00 - 1.00	19E-02 19E-SS02 05/06/04 0.00 - 1.00	19E-03 19E-SS03 05/06/04 0.00 - 1.00	19E-SS04 19E-SS04 05/13/04 0.00 - 1.00	19E-SS05 19E-SS05 05/13/04 0.00 - 1.00	19E-SS06 19E-SS06 05/13/04 0.00 - 1.00	19E-SS07 19E-SS07 05/13/04 0.00 - 1.00	19E-SS08 19E-SS08 05/13/04 0.00 - 1.00	19E-SS09 19E-SS09 05/13/04 0.00 - 1.00	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**	Number Exceeding 2x Average Detected Background	Range Exceeding 2x Average Detected Background	Location of Maximum Detection
Appendix IX Inorganics (mg/kg)																			
Silver	510	39	0.37	0.14 B	1 U	1.1 U	1.5 U	1.4 U	1.1 U	1.2 U	1.3 U	1.2 U	0/9		0/9		0/9		19E-SS01
Arsenic	1.9	0.43	2.4	**2.3**	**1.8**	**1** B	1.5 U	1.4 U	**3.8**	1.2 U	**4.6**	**1.5**	3/9	2.3 - 4.6	6/9	1 - 4.6	2/9	3.8 - 4.6	19E-SS08
Barium	7,200	550	181	83	82	130	67	89	46	53	120	140	0/9		0/9		0/9		19E-SS09
Beryllium	200	16	0.45	0.32 B	0.22 B	0.2 B	0.28 B	0.23 B	0.16 B	0.57	0.35 B	0.36 B	0/9		0/9		1/9	0.57	19E-SS07
Cadmium	100	7.8	0.27	4.2	0.28 B	1	0.77 U	0.87	0.35 B	3 U	0.65 U	0.62 U	0/9		0/9		5/9	0.28B - 4.2	19E-SS01
Cobalt	2,000	160	44.0	16	16	13	22	26	10	7.7	19	27	0/9		0/9		0/9		19E-SS09
Chromium	310	23	59.3	**27**	19	**25**	**28**	**24**	22	22	**24**	**34**	0/9		6/9	24 - 34	0/9		19E-SS09
Copper	4,100	310	234	120	110	110	170	250	210	290	170	180	0/9		0/9		2/9	250 - 290	19E-SS07
Nickel	2,000	160	16.6	44 E	17 E	21 E	15	16	11	6.4	12	14	0/9		0/9		3/9	17E - 44E	19E-SS01
Lead	400(1)	400(1)	125	73	9.3	56	26	67	58	4.6	13	21	0/9		0/9		0/9		19E-SS01
Tin	61,000	4,700	2.43	2.7 B	2.8 B	2.6 B	4 B	4.3 B	2.9 B	2.8 B	4.1 B	4 B	0/9		0/9		9/9	2.6B - 4.3B	19E-SS05
Vanadium	100	7.8	355	**100**	**110**	**85**	**130**	**130**	**65**	**270**	**160**	**150**	6/9	110 - 270	9/9	65 - 270	0/9		19E-SS07
Zinc	31,000	2,300	125	240	72	160	210 E	220 E	120 E	71 E	160 E	120 E	0/9		0/9		5/9	160 - 240	19E-SS01
Cyanide	2,000	160	0.52	0.53 U	0.56 U	0.63 U	0.8 U	0.72 U	0.6 U	0.65 U	0.36 B	0.37 B	0/9		0/9		0/9		19E-SS09
Sulfide	NE	NE	28.48	27 U	28 U	32 U	41 U	37 U	30 U	34 U	34 B	33 U	NE		NE		0/9		19E-SS08
Mercury	31(2)	2.3(2)	0.11	0.033	0.055	0.25 S	0.3 S	0.29 S	2.1	0.022 B	0.038	0.092 S	0/9		0/9		4/9	0.25S - 2.1	19E-SS06

Notes:
B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
S - The result was determined by Method of Standard Addition.
E - The reported value is an estimated because of the presence of matrix interference.
NE - Not Established.
ft bgs - feet below ground surface.
mg/kg - milligrams per kilogram.
(1) - 1996 Soil Screening Guidance.
(2) - Value based on the RBC for Mercuric Chloride.

Notes:
B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
S - The result was determined by Method of Standard Addition.
E - The reported value is an estimated because of the presence of matrix interference.
NE - Not Established.
ft bgs - feet below ground surface.
mg/kg - milligrams per kilogram.
(1) - 1996 Soil Screening Guidance.
(2) - Value based on the RBC for Mercuric Chloride.

Table 5-77. Summary of Organic Detections in Subsurface Soil at ECP Site 19 – DRMO Scrap Metal Recycling Yard

Site ID Sample ID Sample Date Sample Depth (ft bgs)	EPA Region III Industrial RBCs (ug/kg)	**EPA Region III Residential RBCs** (ug/kg)	19E-01 19E-SB01-02 05/06/04 3.00 - 5.00	19E-02 19E-SB02-03 05/06/04 5.00 - 7.00	19E-03 19E-SB03-03 05/06/04 5.00 - 7.00	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 of Maximum Detection
Volatile Organic Compounds (ug/kg)										
Carbon tetrachloride	22,000	4,900	5.1 U	1.1 J	5.2 U	0/3		0/3		19E-SB02-03
Semivolatile Organic Compounds (ug/kg)										
Not Detected										
Pesticides/PCBs (ug/kg)										
4,4'-DDT	8,400	1,900	7.4 U	1.2 JP	230	0/3		0/3		19E-SB03-03
4,4'-DDE	8,400	1,900	7.4 U	9	120	0/3		0/3		19E-SB03-03
4,4'-DDD	12,000	2,700	7.4 U	7.4 U	19 J	0/3		0/3		19E-SB03-03
OP-Pesticides (ug/kg)										
Not Detected										
Chlorinated Herbicides (ug/kg)										
Not Detected										

Notes:

J - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
P - The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two GC columns or HPLC detectors.
ft bgs - feet below ground surface.
ug/kg - micrograms per kilogram.

Table 5-78. Summary of Inorganic Detections in Subsurface Soil at ECP Site 19 – DRMO Scrap Metal Recycling Yard

Site ID Sample ID Sample Date Sample Depth (ft bgs)	EPA Region III Industrial RBCs (mg/kg)	**EPA Region III Residential RBCs** (mg/kg)	2x Average Detected Background (mg/kg)	19E-01 19E-SB01-02 05/06/04 3.00 - 5.00	19E-02 19E-SB02-03 05/06/04 5.00 - 7.00	19E-03 19E-SB03-03 05/06/04 5.00 - 7.00	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**	Number Exceeding 2x Average Detected Background	Range Exceeding 2x Average Detected Background	Location of Maximum Detection
Appendix IX Inorganics (mg/kg)													
Silver	510	39	0.46	0.13 B	1 U	0.12 B	0/3		0/3		0/3		19E-SB01-02
Barium	7,200	550	222	73	97	110	0/3		0/3		0/3		19E-SB03-03
Beryllium	200	16	0.74	0.15 B	0.14 B	0.18 B	0/3		0/3		0/3		19E-SB03-03
Cadmium	100	7.8	0.74	0.61	0.15 B	0.51 U	0/3		0/3		0/3		19E-SB01-02
Cobalt	2,000	160	30.0	23	23	20	0/3		0/3		0/3		19E-SB01-02, 19E-
Chromium	310	23	133	**37**	21	**28**	0/3		2/3	28 - 37	0/3		19E-SB01-02
Copper	4,100	310	193	130	130	120	0/3		0/3		0/3		19E-SB01-02, 19E-
Nickel	2,000	160	31.9	14 E	18 E	17 E	0/3		0/3		0/3		19E-SB02-03
Lead	400[1]	400[1]	8.68	1.1	1.6	5.7	0/3		0/3		0/3		19E-SB03-03
Tin	61,000	4,700	2.96	1.6 B	3 B	2.8 B	0/3		0/3		1/3	3B	19E-SB02-03
Vanadium	100	7.8	462	**110**	**140**	**100**	2/3	110 - 140	3/3	100 - 140	0/3		19E-SB02-03
Zinc	31,000	2,300	88.6	200	81	85	0/3		0/3		1/3	200	19E-SB01-02
Sulfide	NE	NE	32.58	28 B	28 U	27 U	NE		NE		0/3		19E-SB01-02
Mercury	31[2]	2.3[2]	0.093	0.0048 B	0.014 B	0.0055 B	0/3		0/3		0/3		19E-SB02-03

Notes:

B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
E - The reported value is an estimated because of the presence of matrix interference.
[1] - 1996 Soil Screening Guidance.
[2] - Value based on the RBC for Mercuric Chloride.
NE - Not Established.
ft bgs - feet below ground surface.
mg/kg - milligrams per kilogram.

Table 5-79. Summary of Organic Detections in Groundwater at ECP Site 19 – DRMO Scrap Metal Recycling Yard

Site ID Sample ID Sample Date	Federal MCLs (ug/L)	**EPA Region III Tap Water RBCs** (ug/L)	PR Water Quality Standards (ug/L)	19E-01 19E-GW01 05/10/04	19E-02 19E-GW02 05/10/04	19E-03 19E-GW03 05/10/04	Number Exceeding Federal MCLs	Range Exceeding Federal MCLs	**Number Exceeding EPA Region III Tap Water RBCs**	**Range Exceeding EPA Region III Tap Water RBCs**	Number Exceeding PR Water Quality Standards	Range Exceeding PR Water Quality Standards	Location Maximum Detection
Volatile Organic Compounds (ug/L)													
Ethyl benzene	700	130	700	1 U	0.61 J	1 U	0/3		0/3		0/3		19E-GW02
Toluene	1,000	75	1,000	1	1.2	1 U	0/3		0/3		0/3		19E-GW02
Carbon disulfide	NE	100	NE	1.3	1.6	1 U	NE		0/3		NE		19E-GW02
Semivolatile Organic Compounds (ug/L)													
Cresol, m & p	NE	NE	NE	10 U	1.8 J	10 U	NE		NE		NE		19E-GW02
Pesticides/PCBs (ug/L)													
4,4'-DDT	NE	0.20	NE	0.1 U	0.1 U	0.088 J	NE		0/3		NE		19E-GW03
4,4'-DDE	NE	0.20	NE	0.1 U	0.015 J	0.11	NE		0/3		NE		19E-GW03
4,4'-DDD	NE	0.28	NE	0.1 U	0.088 J	0.04 J	NE		0/3		NE		193-GW02
OP-Pesticides (ug/L)													
Not Detected													
Chlorinated Herbicides (ug/L)													
Not Detected													

Notes:
J - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
ug/L - micrograms per liter.
NE - Not Established.

Table 5-80. Summary of Inorganic Detections in Groundwater at ECP Site 19 – DRMO Scrap Metal Recycling Yard

Site ID Sample ID Sample Date	Federal MCLs (mg/L)	**EPA Region III Tap Water RBCs** (mg/L)	PR Water Quality Standards (mg/L)	19E-01 19E-GW01 05/10/04	19E-02 19E-GW02 05/10/04	19E-03 19E-GW03 05/10/04	Number Exceeding Federal MCLs	Range Exceeding Federal MCLs	**Number Exceeding EPA Region III Tap Water RBCs**	**Range Exceeding EPA Region III Tap Water RBCs**	Number Exceeding PR Water Quality Standards	Range Exceeding PR Water Quality Standards	Location Maximum Detection
Appendix IX (Dissolved) Inorganics (mg/L)													
Barium	2	0.26	NE	0.015	0.01 B	0.021	0/3		0/3		NE		19E-GW03
Cobalt	NE	0.073	NE	0.01 U	0.002 B	0.002 B	NE		0/3		NE		19E-GW02, 19E-GW03
Nickel	NE	0.073	NE	0.003 B	0.04 U	0.04 U	NE		0/3		NE		19E-GW01
Vanadium	NE	0.0037	NE	**0.026**	**0.014**	0.003 B	NE		2/3	0.014 - 0.026	NE		19E-GW01

Total Cyanide and Sulfide (mg/L)

Not Detected

Notes:

B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
NE - Not Established.
mg/L - milligrams per liter.

In the surface soil there were four VOCs detected in low, estimated concentrations. Also, twelve SVOCs, six pesticides, and three PCBs were quantified. The SVOC concentrations were all estimated, but the pesticide and PCB concentrations were well above the reporting limit. The VOC compounds were found only in five of the nine samples, and not all VOCs were found in every sample. In most cases only one VOC was found in each sample, with the exception of 19E-SS06, where two were quantified. SVOCs were found in six of the nine samples, with location 19E-SS06 containing the bulk of the SVOC compounds. High concentrations of pesticides were found in 19E-03, while the PCBs were primarily found in 19E-01, 19E-02, and 19E-SS05. Sixteen inorganic compounds were quantified in the surface soil. Similar concentrations were seen at all locations.

At the three subsurface sample locations, one VOC and three pesticides were detected. Also, fourteen inorganics were quantified. The location 19E-03 contained most of the pesticides, corresponding to the same location of high pesticides in the surface soil. Location 19E-02 contained the sole estimated VOC detection of carbon tetrachloride. Inorganic concentrations were similar in all three samples.

Groundwater detections consisted of three VOCs, one SVOC, and three pesticides. Four inorganics were also detected. The locations of the VOCs were 19E-01 and 19E-02, while the locations of the pesticides were 19E-02 and 19E-03, corresponding to the detections of these compounds in the subsurface soil. The inorganic concentrations were similar in the groundwater samples.

In general, some VOCs and the SVOCs detected at the site are associated with fuel and solvent contamination. Pesticide and PCB use is also evident. The groundwater contained fuel compounds not found in the soil samples, ethylbenzene, toluene, and m&p cresol.

Comparison to criteria was done with all the results of the analyses as shown in Tables 5-75 through 5-80. Organic compounds that exceeded EPA Region III Residential RBCs included 4,4'-DDT, 4,4'-DDE, and benzo(a)pyrene. These compounds only exceeded the criteria in the surface soil media. Several inorganic compounds exceeded RBCs, including arsenic (soil), chromium (soil), and vanadium (soil and groundwater). Only arsenic exceeded the established background concentration for NSRR at the site. Beryllium, cadmium, copper, mercury, nickel, tin, and zinc also exceeded background concentrations, but not RBC criteria. Vanadium exceedance in the groundwater is likely due to leaching of high naturally occurring vanadium in the soils.

From the detections of pesticides and PCBs at the site, it can be concluded that past operations have impacted the surface soil environment at the DRMO facility. The subsurface soil and the groundwater did not exhibit significant concentrations of these compounds, however, and it can be concluded that these two media are not impacted. Due to the limited nature of the ECP Phase II investigation, however, it is recommended that additional site characterization be done to confirm the site contamination.

5.4.19.5 Qualitative Risk Assessment

A discussion on the COPCs and potential risks associated with the surface soil, subsurface soil, and groundwater at this site, is provided below.

COPC Identification

Benzo(a)pyrene, 4,4'-DDE, and 4,4'-DDT are the only organic analytes identified as COPCs in surface soil at Site 19, with concentrations in one sample out of a total of nine in excess of the residential RBCs. Arsenic is the only inorganic COPC identified, with concentrations that exceed both the residential RBCs and the base background criteria. In addition, detected concentrations of chromium and vanadium exceed the residential RBCs but do not exceed base background criteria, thus, are not identified as COPCs.

No COPCs were identified for subsurface soil at Site 19. Chromium and vanadium concentrations exceed their residential RBCs but are less than the background value.

No organic COPCs were identified for groundwater. Vanadium is the only inorganic COPC, with concentrations in two of the three samples greater than the tap water RBC.

Potential Risk Discussion

Of the surface soil COPCs, only benzo(a)pyrene (at 270 µg/kg) exceeds the industrial RBC, which is more indicative of the reasonably anticipated land use at Site 19. Only one of nine surface soil samples had detectable concentrations of benzo(a)pyrene and this detection was less than the reporting limit. Given this distribution, exposure to conditions at the site is not expected to pose a significant potential risk due to a low concentration of benzo(a)pyrene for the site as a whole. Even though the 4,4'-DDE, and 4,4'-DDT concentrations are less than the industrial RBCs the concentrations (4,700 and 5,300 µg/kg, respectively) are sufficiently high to be of additional concern. Two arsenic detections are at concentrations (3.8 and 4.6 mg/kg) that exceed the industrial RBC of 1.9 mg/kg and moderately exceed the base background criterion. Nevertheless, these concentrations are still likely representative of background, as data collected by the United States Geologic Society to establish background concentrations in soil for Puerto Rico, include a maximum concentration of 22 mg/kg (Baker, 2003).

The potential risk posed by exposure to subsurface soil at Site 19 is extremely small due to the lack of COPCs.

Potential exposure to groundwater at NSRR is unlikely. Groundwater is not currently used for potable purposes because drinking water is available from El Yunque which supplies all of NSRR's present needs. The most likely exposure route to groundwater is from inhalation of vapors emitted from volatile organics through the overlying soil, particularly into buildings. Vanadium is not considered volatile. The RBC used to select vanadium as a COPC is based on noncarcinogenic toxicity criteria set at one-tenth of the level considered acceptable by EPA to account for potential additive effects of multiple contaminants. As there is only one noncarcinogenic COPC in groundwater at Site 19, the single contaminant RBC can be used for comparison, which is ten times higher than the tap water RBCs presented in Section 5.0 tables. The vanadium concentration in groundwater is likewise less than the single contaminant tap water RBC of 0.037 mg/L. Exposure to vanadium in groundwater at Site 19 does not pose a significant potential human health concern due to the unlikelihood of exposure and the low concentrations of the COPC. The potential risk from groundwater exposure is very low even if the groundwater were to be used for potable purposes in the future.

5.4.19.6 Summary of Site Conditions

This site has been impacted by previous activities at NSRR. At ECP Site 19, a PAH, pesticides, and arsenic were identified as COPCs above residential RBCs. Benzo(a)pyrene was also identified above industrial RBCs. No other COPCs were identified in the soil. Vanadium in the groundwater was found to exceed the tap water RBC, but unlikely exposure is assumed for groundwater, and the compound is not site-related.

Further investigation at this site will be conducted under the RCRA Corrective Action/IRP process.

5.4.20 ECP Site 20

5.4.20.1 Site History and Description

This site consists of specific portions of the JP-5 and diesel fuel marine (DFM) fuel pipelines, and the aircraft hydrant refueling pits. In 1995, NAVFAC Atlantic evaluated the integrity of specific portions of the base POL system. This evaluation identified leaks at two locations along the tested JP-5 line and at select valve pits, and indicated historic petroleum product impacts to soil at various locations throughout the tested portion of the JP-5 and DFM pipelines. No action has since been taken at these locations. In addition, interviews indicated that numerous small spills and leaks of jet fuel have occurred at the aircraft hydrant refueling pits since they went into operation in the early 1960s. [See photos A-42 through A-44]

During the Phase II ECP investigation, there were no apparent areas of surficial staining or stressed vegetation in the seven areas investigated. The seven areas investigated consisted of the following:

- Relatively flat area at the airfield north of Hangar 200, in the vicinity of valve pit (VP) -2).

- Flat grassy area located south of Valley Forge Road, and just east of Forrestal Drive. This area was along the edge of thick secondary growth vegetation.

- Flat lying area located just south of Forrestal Drive in the southeastern portion of the site, as presented in Photograph A-48. As presented in the photograph, this portion of the site contains grass that is routinely cut by base personnel.

- A flat lying area located just south of Forrestal Drive and east of ECP Site 6. This area was along the edge of thick secondary growth vegetation.

- A flat lying area located north of Forrestal Drive and east of the baseball field. This area was located adjacent to VP-8.

- Photograph A-49 presents another area of the site investigated consisting of an overgrown grassy area located along a power line north of ECP Site 5.

- A relatively flat lying area consisting of overgrown grass located northwest of ECP Site 5, along the road that intersects both Forrestal Drive and Valley Forge Road.

It should be noted that VP-6 and VP-6A that were suspected to be located in the vicinity of two of the areas investigated, are no longer present, and the lines were decommissioned. This information was obtained through an interview with Mr. Arnold Soto (NSRR personnel).

5.4.20.2 *Site Hydrogeology*

ECP Site 20 encompasses multiple geologic regions. Borings 20E-SB02 and 20E-SB06 represent near-shore flat land, exhibiting a fill/marine sediment/bedrock sequence. Groundwater was observed at boring 20E-SB06 beginning in a marine clay with some sand and gravel (10-feet bgs). Groundwater was observed at boring 20E-SB02 beginning in a marine sand (5-feet bgs). Borings 20E-SB03, 20E-SB04, and 20E-SB05 represent upland areas exhibiting a fill/residuum/bedrock sequence. Bedrock was encountered between 5- and 12-feet bgs at these borings. Groundwater was observed in the weather bedrock fractures. At 20E-SB05 evidence of groundwater was not observed during drilling, but did flow slowly into temporary well 20E-TW05. Groundwater was measured in the well to be approximately 10-feet bgs two days after installation. Groundwater was encountered in weathered bedrock at boring 20E-SB04 between 11.5- and 13-feet bgs. Probe refusal occurred at 20E-SB03 in weathered bedrock before groundwater was encountered (15-feet bgs). Boring 20E-SB01 represented the inland flatland area. Clay and sandy fill was observed at this boring, with groundwater beginning at 4.5-feet bgs. Boring 20E-SB07 while located near the harbor, reflected an upland geology (the fill/residuum/bedrock sequence). Based on the presence of an excavated hill along Forrestal Drive in this area, this boring appears to be in an excavated hill area (like parts of ECP Site 18). Probe refusal occurred at 20E-SB07 in weathered bedrock before groundwater was encountered (approximately 15-feet bgs).

Evidence of fuel line impacts was observed in two borings (20E-SB05 and 20E-SB06). At 20E-SB05, a strong fuel odor and staining were observed with elevated FID readings in the residual clay and bedrock, from a depth of approximately 8- to 20-feet bgs. At 20E-SB06, a slight fuel odor (with a slight FID response and no staining) was observed from a depth of approximately 10- to 11.9-feet bgs.

5.4.20.3 *Field Investigation and Sampling Program*

Multiple suspected spill areas and leaky valves and pipe runs located between Ofstie Airfield and Pier 1 were investigated at ECP Site 20.

There were no apparent areas of surficial staining or stressed vegetation in the areas investigated. Therefore, the originally proposed sample locations within the work plan were utilized.

A total of seven soil borings were advanced near suspected leaky valves and pipeline runs as presented on Figure 5-92. Subsurface soil samples were collected from two-foot intervals down to the groundwater interface. The depth of the soil borings at this site ranged from 10 feet bgs to 22 feet bgs. All subsurface soil samples were screened in the field utilizing a FID with the results recorded in the field logbook. The screening results were compared against background to indicate if the soil has been impacted by past operations. [See Appendix G for full PID and FID screening results on a per site basis.]

Soil samples submitted to the fixed-base laboratory included seven subsurface soil samples (20E-SB01-02, 20E-SB02-02, 20E-SB03-04, 20E-SB04-04, 20E-SB05-05, 20E-SB06-05, and 20E-SB07-06), one from each boring. These samples were submitted to the fixed-base analytical laboratory for analysis of Appendix IX VOCs, SVOCs, and metals and TPH DRO and GRO. The QA/QC samples collected at this site include one subsurface soil duplicate sample (20E-SB03-04D), and one MS/MSD sample (20E-SB01-02MS/MSD).

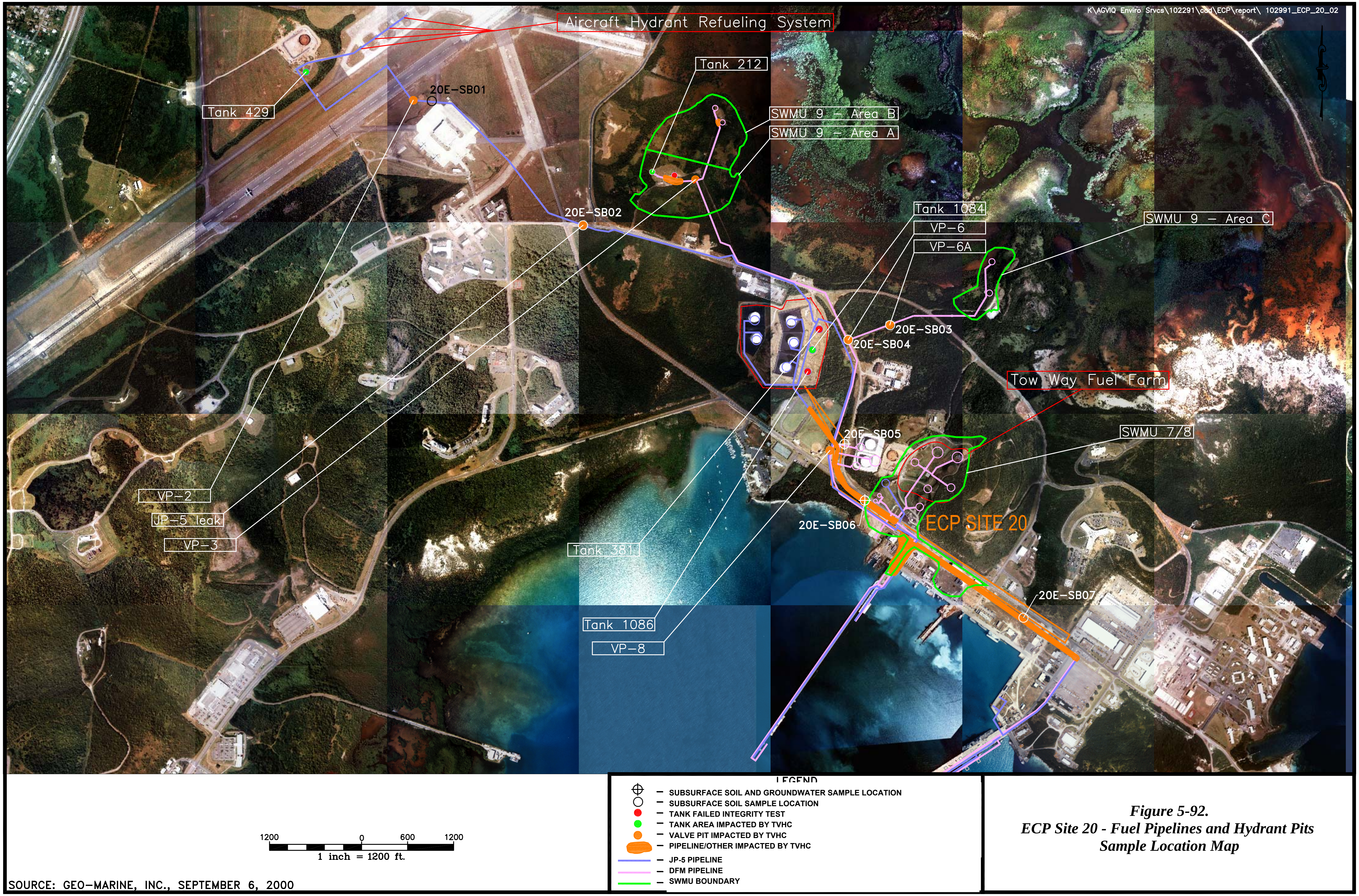
A groundwater program followed the soil sampling program. Based on the FID levels observed at soil boring locations 20E-SB05 and 20E-SB06, the decision was made to install one temporary monitor at each of these two locations as presented on Figure 5-92. The temporary monitor wells were installed and groundwater samples (20E-GW05 and 20E-GW06) were collected and submitted to the fixed-base analytical laboratory for Appendix IX VOCs, SVOCs, inorganics, as well as TPH DRO and GRO. The inorganic analysis requested was for dissolved metals only.

5.4.20.4 Nature and Extent of Contamination

Seven subsurface soil samples and two groundwater samples were obtained from seven locations at ECP Site 20 as shown on Figure 5-92. The locations of the soil (depth of sample) and groundwater samples were determined based on elevated FID readings taken on the soil samples and visual inspection of the soil at those locations. One duplicate environmental sample was obtained from the subsurface soil media. The results of the analytical program can be found in Tables 5-81 through 5-84.

Organic detections in the subsurface soil included five VOCs, seven SVOCs, and both TPH DRO and GRO. Fourteen inorganic compounds were also detected in this media. The highest concentrations of the organic compounds was found at location 20-SB05. With the exception of VOCs and TPH at 20E-SB05, other organic concentrations were estimated. Inorganic concentrations were similar at all locations.

The two groundwater environmental samples indicated that six VOCs, both TPH DRO and GRO, and six inorganic compounds were present above the reporting limits. Again, the location 20E-SB05 exhibited the highest concentrations of organics, corresponding to the soil sample results at that location. Concentrations of inorganics were slightly higher at 20E-SB05, with the exception of barium.



SOURCE: GEO-MARINE, INC., SEPTEMBER 6, 2000

Figure 5-92.
ECP Site 20 - Fuel Pipelines and Hydrant Pits Sample Location Map

Table 5-81. Summary of Organic Detections in Subsurface Soil at ECP Site 20 – Fuel Pipelines and Hydrant Pits

Site ID	EPA Region III	**EPA Region III**	20E-SB01	20E-SB02	20E-SB03	20E-SB03	20E-SB04	20E-SB05	20E-SB06	20E-SB07	Number Exceeding	Range Exceeding	**Number Exceeding**	**Range Exceeding**	
Sample ID	Industrial	**Residential**	20E-SB01-02	20E-SB02-02	20E-SB03-04	20E-SB03-04D	20E-SB04-04	20E-SB05-05	20E-SB06-05	20E-SB07-06	EPA Region III	EPA Region III	**EPA Region III**	**EPA Region III**	Location of
Sample Date	RBCs	**RBCs**	5/12/2004	05/11/04	5/12/2004	5/12/2004	05/11/04	05/11/04	05/11/04	05/11/04	Industrial	Industrial	**Residential**	**Residential**	Maximum
Sample Depth (ft bgs)	(ug/kg)	(ug/kg)	3.00 - 5.00	3.00 - 5.00	7.00 - 9.00	7.00 - 9.00	7.00 - 9.00	9.00 - 11.00	9.00 - 11.00	11.00 - 13.00	RBCs	RBCs	**RBCs**	**RBCs**	Detection
Volatile Organic Compounds (ug/kg)															
Ethylbenzene	10,000,000	780,000	5.8 U	5.2 U	5.5 U	5.6 U	6.1 U	35	5.6 U	5.8 U	0/8		0/8		20E-SB05-05
2-Butanone	61,000,000	4,700,000	29 U	26 U	28 U	28 U	31 U	85	28 U	29 U	0/8		0/8		20E-SB05-05
Chlorobenzene	2,000,000	160,000	2.4 J	3.3 J	5.5 U	5.6 U	6.1 U	13 U	5.6 U	5.8 U	0/8		0/8		20E-SB02-02
Acetone	92,000,000	7,000,000	58 U	52 U	55 U	56 U	61 U	280	56 U	58 U	0/8		0/8		20E-SB05-05
Tetrachloroethene	5,300	1,200	3.3 J	5.2 J	5.5 U	5.6 U	6.1 U	13 U	5.6 U	5.8 U	0/8		0/8		20E-SB02-02
Semivolatile Organic Compounds (ug/kg)															
Chrysene	390,000	87,000	390 U	46 J	370 U	380 U	57 J	460 U	380 U	400 U	0/8		0/8		20E-SB04-04
Dibenzo(a,h)anthracene	390	87	390 U	370 U	370 U	380 U	410 U	**120** J	380 U	400 U	0/8		1/8	120J	20E-SB05-05
Fluoranthene	4,100,000	310,000	390 U	40 J	370 U	380 U	40 J	460 U	380 U	400 U	0/8		0/8		20E-SB02-02, 20E-SB04-04
Indeno(1,2,3-cd)pyrene	3,900	870	390 U	32 J	370 U	380 U	410 U	130 J	380 U	400 U	0/8		0/8		20E-SB05-05
Pyrene	3,100,000	230,000	390 U	44 J	370 U	380 U	48 J	36 J	380 U	400 U	0/8		0/8		20E-SB04-04
Benzo(a)anthracene	3,900	870	390 U	370 U	370 U	380 U	47 J	460 U	380 U	400 U	0/8		0/8		20E-SB04-04
Benzo(g,h,i)perylene	NE	NE	390 U	370 U	370 U	380 U	410 U	140 J	380 U	400 U	NE		NE		20E-SB05-05
Total Petroleum Hydrocarbons (mg/kg)															
Diesel Range Organics	NE	NE	2.1 J	3.3 J	3.1 J	1.9 J	3.4 J	35	2.5 J	4 U	NE		NE		20E-SB05-05
Gasoline Range Organics	NE	NE	0.27 U	0.28 U	0.26 U	0.28 U	0.3 U	25	0.28 U	0.28 U	NE		NE		20E-SB05-05

Notes:
J - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was anlyzed for, but was not detected at or above the MDL/PQL.
NE - Not Established.
ft bgs - feet below ground surface.
ug/kg - micrograms per kilogram.
mg/kg - milligrams per kilogram.

Table 5-82. Summary of Inorganic Detections in Subsurface Soil at ECP Site 20 – Fuel Pipelines and Hydrant Pits

Site ID Sample ID Sample Date Sample Depth (ft bgs)	EPA Region III Industrial RBCs (mg/kg)	**EPA Region III Residential RBCs** (mg/kg)	2x Average Detected Background (mg/kg)	20E-SB01 20E-SB01-02 5/12/2004 3.00 - 5.00	20E-SB02 20E-SB02-02 05/11/04 3.00 - 5.00	20E-SB03 20E-SB03-04 5/12/2004 7.00 - 9.00	20E-SB03 20E-SB03-04D 5/12/2004 7.00 - 9.00	20E-SB04 20E-SB04-04 05/11/04 7.00 - 9.00	20E-SB05 20E-SB05-05 05/11/04 9.00 - 11.00	20E-SB06 20E-SB06-05 05/11/04 9.00 - 11.00	20E-SB07 20E-SB07-06 05/11/04 11.00 - 13.00	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**	Number Exceeding 2x Average Detected Background	Range Exceeding 2x Average Detected Background	Location of Maximum Detection
Appendix IX Inorganics (mg/kg)																		
Silver	510	39	0.46	0.15 B	1 U	1.1 U	1 U	1.2 U	1.3 U	0.22 B	1.1 U	0/8		0/8		0/8		20E-SB06-05
Arsenic	1.9	0.43	2.05	**0.85** B	**2.2**	1.1 U	1 U	1.2 U	**1.1** B	1 U	1.1 U	1/8	2.2	3/8	0.85B - 2.2	1/8	2.2	20E-SB02-02
Barium	7,200	550	222	140 N*	21	67 N*	68 N*	27	71	56	41	0/8		0/8		0/8		20E-SB01-02
Beryllium	200	16	0.74	0.29 B	0.073 B	0.33 B	0.33 B	0.33 B	0.24 B	0.19 B	0.18 B	0/8		0/8		0/8		20E-SB03-04, 20E-SB03-04D, 20E-SB04-04
Cadmium	100	7.8	0.74	0.57 U	0.2 B	1.1 U	0.52 U	0.6 U	0.66 U	0.52 U	0.55 U	0/8		0/8		0/8		20E-SB02-02
Cobalt	2,000	160	30.0	22	9.6	27	33	23	14	28	17	0/8		0/8		1/8	33	20E-SB03-04D
Chromium	310	23	133	15	**32**	**67**	**120**	4.6	14	21	10	0/8		3/8	32 - 120	0/8		20E-SB03-04D
Copper	4,100	310	193	150	54	76	88	**340**	120	140	120	0/8		1/8	340	1/8	340	20E-SB04-04
Nickel	2,000	160	31.9	13	9.9	23	32	9.7	9.5	12	13	0/8		0/8		1/8	32	20E-SB03-04D
Lead	400(1)	400(1)	8.68	3.2	11	1.4	1.6	8.1	8.9	6.6	1.3	0/8		0/8		2/8	8.9 - 11	20E-SB02-02
Tin	61,000	4,700	2.96	3 B	2.1 B	2.9 B	2.4 B	2.7 B	3 B	2.9 B	2.5 B	0/8		0/8		2/8	3B - 3B	20E-SB01-02, 20E-SB05-05
Vanadium	100	7.8	462	**190** N	**61**	**170** N	**200** N	**120**	**290**	**160**	**180**	7/8	120 - 290	8/8	61 - 290	0/8		20E-SB05-05
Zinc	31,000	2,300	88.6	170 NE*	27	92 NE*	96 NE*	66	58	93	73	0/8		0/8		4/8	92NE* - 170NE*	20E-SB01-02
Mercury	31(2)	2.3(2)	0.093	0.0094 B	0.0052 B	0.02 U	0.02 U	0.007 B	0.025 U	0.022 U	0.023 U	0/8		0/8		0/8		20E-SB01-02

Notes:

B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
N - The matrix spike recovery is not within control limits.
E - The reported value is an estimated because of the presence of matrix interference.

* - Duplicate analysis is not within control limits.
(1) - 1996 Soil Screening Guidance.
(2) - Value based on the RBC for Mercuric Chloride.
NE - Not Established.
ft bgs - feet below ground surface.
mg/kg - milligrams per kilogram.

* - Duplicate analysis is not within control limits.
(1) - 1996 Soil Screening Guidance.
(2) - Value based on the RBC for Mercuric Chloride.
NE - Not Established.
ft bgs - feet below ground surface.
mg/kg - milligrams per kilogram.

Table 5-83. Summary of Organic Detections in Groundwater at ECP Site 20 – Fuel Pipelines and Hydrant Pits

Site ID Sample ID Sample Date	Federal MCLs (ug/L)	**EPA Region III Tap Water RBCs** (ug/L)	PR Water Quality Standards (ug/L)	20E-SB05 20E-GW05 05/15/04	20E-SB06 20E-GW06 05/15/04	Number Exceeding Federal MCLs	Range Exceeding Federal MCLs	**Exceeding EPA Region III Tap Water RBCs**	**Exceeding EPA Region III Tap Water RBCs**	Number Exceeding PR Water Quality Standards	Range Exceeding PR Water Quality Standards	Location Maximum Detection
Volatile Organic Compounds (ug/L)												
Ethylbenzene	700	130	700	**840** D	1 U	1/2	840	1/2	840	1/2	840	20E-GW05
Benzene	5	0.34	5	**3.2**	1 U	0/2		1/2	3.2	0/2		20E-GW05
Iodomethane	NE	NE	NE	0.25 J	1 U	NE		NE		NE		20E-GW05
Acetone	NE	550	NE	79	25 U	NE		0/2		NE		20E-GW05
Carbon disulfide	NE	100	NE	1 U	1.2	NE		0/2		NE		20E-GW06
Xylene	10,000	21	NE	**410**	2 U	0/2		1/2	410	NE		20E-GW05
Semivolatile Organic Compounds (ug/L)												
Not Detected												
Total Petroleum Hydrocarbons (mg/L)												
Diesel Range Organics	NE	NE	NE	1.6	0.15	NE		NE		NE		20E-GW05
Gasoline Range Organics	NE	NE	NE	51	0.01 J	NE		NE		NE		20E-GW05

Notes:

J - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
D - The reported result is from a secondary dilution.
ug/L - micrograms per liter.
mg/L - milligrams per liter.
NE - Not Established.

Table 5-84. Summary of Inorganic Detections in Groundwater at ECP Site 20 – Fuel Pipelines and Hydrant Pits

Site ID Sample ID Sample Date	Federal MCLs (mg/L)	**EPA Region III Tap Water RBCs** (mg/L)	PR Water Quality Standards (mg/L)	20E-SB05 20E-GW05 05/15/04	20E-SB06 20E-GW06 05/15/04	Number Exceeding Federal MCLs	Range Exceeding Federal MCLs	**Number Exceeding EPA Region III Tap Water RBCs**	**Range Exceeding EPA Region III Tap Water RBCs**	Number Exceeding PR Water Quality Standards	Range Exceeding PR Water Quality Standards	Location Maximum Detection
Appendix IX (Dissolved) Metals (mg/L)												
Barium	2	0.26	NE	0.19	0.24	0/2		0/2		NE		20E-GW06
Cobalt	NE	0.073	NE	0.022	0.0015 B	NE		0/2		NE		20E-GW05
Copper	0.1	0.011	NE	**0.017** B	0.011 B	0/2		1/2	0.017B	NE		20E-GW05
Nickel	NE	0.073	NE	0.0055 B	0.04 U	NE		0/2		NE		20E-GW05
Lead	0.015[1]	NE	0.015	0.031	0.005 U	1/2	0.031	NE		1/2	0.031	20E-GW05
Vanadium	NE	0.0037	NE	**0.014**	**0.011**	NE		2/2	0.011 - 0.014	NE		20E-GW05

Total Cyanide and Sulfide (mg/L)

Not Detected

Notes:

B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
(1) - EPA action level.
NE - Not Established.
mg/L - milligrams per liter.

The VOCs and SVOCs detected are associated with fuel contamination from past and present activities at this site. Location 20E-SB05 is associated with Valve Pit No. 8. It is likely that some leakage from this valve pit has occurred and impacted the environmental conditions at the site. Monitoring wells from previous investigations at this site located near 20E-SB05 have not indicated any free product in them during the past six months (Cape Environmental, 2004).

Comparison to criteria was done with all the analytical results. Organic compounds which exceeded EPA Region III Residential RBCs in the soil included only dibenzo(a,h) anthracene. Organic compounds in groundwater that exceeded EPA Region III Tap Water RBCs included ethylbenzene, benzene, and xylene. Ethylbenzene also exceeded the Federal MCL. Inorganic compounds that exceeded EPA Region III RBCs, both for soil and tap water, include arsenic (soil), chromium (soil), copper (soil and groundwater), and vanadium (soil and groundwater). Arsenic (at 20E-SB02) and copper (at 20E-SB04) also exceeded twice the average detected background concentrations established for NSRR in subsurface soil. Other compounds that exceeded background concentrations include cobalt, nickel, lead, tin, and zinc, although none of these compounds exceeded any RBCs for NSRR. High naturally occurring vanadium in the soil is presumed to be the cause of the vanadium exceedance in the groundwater. Lead exceeded the EPA action level and the Puerto Rico Water Quality Standard of 0.015 mg/L at one location (20E-SB05) in the groundwater. This location is also the location with the elevated fuel compound detections.

From the detections of fuel compounds and exceedance of criteria for ethylbenzene, benzene, xylene, and lead in the groundwater, it can be concluded that the groundwater near 20E-SB05 has been impacted by activities occurring at this site. Soil at this location does not appear to be contaminated significantly above any RBCs.

5.4.20.5 Qualitative Risk Assessment

A discussion on the COPCs and potential risks associated with the subsurface soil and groundwater at this site, is provided below.

COPC Identification

Dibenzo(a,h)anthracene is the only organic analyte identified as a COPC in subsurface soil at Site 20, with a concentration in one sample in excess of the residential RBC. Arsenic and copper are the only inorganic analytes identified as COPCs with concentrations exceeding both the residential RBC and base background. Chromium and vanadium were present in at least one sample at a concentration that exceeds the residential RBCs but none of these concentrations exceeded the base background criteria.

Benzene, ethyl benzene and xylene were identifed as COPCs for groundwater at Site 20. Copper and vanadium were the only inorganic COPCs identified in groundwater.

Potential Risk Discussion

Significant exposure to subsurface soil is less likely than to surface soil, especially given the reasonably anticipated land use of industrial/commercial. The dibenzo(a,h)anthracene and copper concentrations (120 J µg/kg and 340 mg/kg, respectively) are less than their industrial RBCs, indicating a low potential for significant risk from exposure to subsurface soil. A lone arsenic concentration from a total of eight samples (2.2 mg/kg) exceeds the industrial RBC; however, this concentration is still likely representative of background, as data collected by the United States Geologic Society to establish background concentrations in soil for Puerto Rico, include a maximum concentration of 22 mg/kg (Baker, 2003).

Potential exposure to groundwater at NSRR is unlikely. Groundwater is not currently used for potable purposes because drinking water is available from El Yunque which supplies all of NSRR's present needs. The most likely exposure route to groundwater is from inhalation of vapors emitted from volatile organics through the overlying soil, particularly into buildings. Benzene, ethyl benzene and xylene are volatile; however, the concentrations necessary to cause this exposure pathway to be of concern is considerably higher than the concentration to cause groundwater ingestion to be of concern (i.e., the pathway used for the tap water RBC). Copper and vanadium are not considered volatile. The RBCs used to select all of the Site 20 groundwater COPCs are based on noncarcinogenic toxicity criteria (except for benzene which is a carcinogen) set at one-tenth of the level considered acceptable by EPA to account for potential additive effects of multiple contaminants. As there are only four noncarcinogenic COPCs in groundwater at Site 16, the single contaminant RBC can be used for comparison, which is ten times higher than the tap water RBCs presented in Section 5.0 tables. The ethyl benzene, copper, and vanadium concentrations from samples from two monitoring wells do not exceed their single-contaminant RBCs (based on the unlikely but assumed exposure via ingestion of groundwater). However, the ethyl benzene concentration (840 D µg/L) exceeds both the Puerto Rico water quality standard and the MCL for drinking water supplies, while the xylene concentration exceeds the single-contaminant tap water RBC of 210 µg/L but is significantly less than the MCL of 10,000 µg/L. The single detection of benzene at 3.2 µg/L exceeds the tap water RBC but is less than the Puerto Rico water quality standard and MCL of 5 µg/L. Considering all of these qualitative considerations, groundwater at Site 20 does not appear to pose a significant potential human health concern, due to the unlikelihood of exposure and relatively low concentrations of COPCs. In the unlikely future use of groundwater for potable purposes, the groundwater would potentially pose a moderate level of risk.

5.4.20.6 Summary of Site Conditions

Activities associated with this site have impacted the soil and groundwater. Dibenzo(a,h)anthracene, arsenic, and copper were identified as COPCs based on their exceedance of residential RBCs in the soil. Industrial RBCs were used to qualitatively evaluate the site risk and no exceedance of these RBCs was noted for these compounds. The VOCs of ethylbenzene, benzene, and xylene, and inorganics of copper and vanadium were present in the groundwater in excess of criteria. Exposure to humans of site groundwater is unlikely. However, due to the presence of benzene as a COPC, a moderate risk is assumed if exposure would occur.

Further investigation at this site will be conducted under the RCRA Corrective Action/IRP process.

5.4.21 ECP Site 21

5.4.21.1 Site History and Description

Building 803 is the pump house for the emergency fire deluge system (Photographs A-52 and A-53), and is located in the Waterfront area next to Pier 3 (see Figure 5-54 for location). The physical site inspection identified releases of suspected waste oil and diesel fuel throughout the floor of the building, as well as numerous discarded oil filters. The floor of the building is constructed with an access area/manway that leads directly into Ensenada Honda. [See photos A-45 and A-46]

As was the case during the physical site inspection, numerous stains were observed during the Phase II ECP investigation. Photographs G-54 through G-57 present the locations on the floor and wall where wipe samples were collected during this investigation. In addition to the oil filters that were observed on the floor, three batteries were observed on the floor just inside the door to the structure (Photograph G-58). The access/manway doors in the floor of the building leading directly into the Ensenada Honda were also observed during this investigation as presented in Photograph G-59. In addition, both doors to the structure as well as three ventilation openings on the roof of Building 803, were all observed to be open to the outside elements (Photograph G-52). Therefore, during a rain event, water would be able to penetrate the inside of this building. Photograph G-60 presents a view within Building 803 looking towards the northwest, of a portion of the emergency fire deluge system.

5.4.21.2 *Field Investigation and Sampling Program*

A total of four wipe samples were collected from the floor and walls of the interior of the building. It should be noted that the number and locations of wipe samples were determined in the field based on visual observations of site conditions (e.g., chemical staining), as proposed in the decision tree for this site found within the Draft Phase II ECP Work Plan (NAVFAC Atlantic, 2004b). Based on the visual observations, it was decided that three wipe samples on the floor and one wipe sample on a wall inside the building would be sufficient to determine if there has been any negative impact to the interior of the building based on past site practices.

The wipe samples were collected utilizing laboratory-supplied containers with gauze pads soaked in the appropriate solution based on the analysis requested. The samples submitted to the fixed-base laboratory included four wipe samples (21E-WS01 through 21E-WS04). These samples were submitted for analysis of Appendix IX SVOCs, PCBs, and metals. The QA/QC samples collected at this site included one wipe sample duplicate (21E-WS03D) and one MS/MSD sample (21E-WS03MS/MSD).

5.4.21.3 *Nature and Extent of Contamination*

Wipe samples from four locations, three on the floor and one on the wall, were obtained from the interior of Building 803, also known as ECP Site 21. The locations of the samples were determined from visual inspection. Results are shown on Tables 5-85 and 5-86.

Organic detections consisted of two SVOCs, bis(2-ethylhexyl) phthalate, and di-n-butylphthalate. Bis(2-ethylhexyl) phthalate is used as an organic pump fluid and di-n-butylphthalate is used as a manometer fluid. Both of these uses are consistent with those associated with an emergency fire pump house.

Inorganic detections vary by about five orders of magnitude. A Toxic Substance Control Act regulation (Section 403) specifies a limit of lead on the floor of a residence to be less than 40 microgram/ square foot. This concentration converts to 0.0043 milligrams per 100 centimeters squared (mg/100 cm2). All concentrations of lead on surfaces of Building 803 are higher than this standard.

Based on the analytical results from the wipe samples inside this building, it appears that contamination resulting from past activities at this location has occurred.

Table 5-85. Summary of Organic Detections in Wipe Samples at ECP Site 21 – Building 503

Site ID	21E-WS01	21E-WS02	21E-WS03	21E-WS03	21E-WS04	Number of	Range of	Location of
Sample ID	21E-WS01	21E-WS02	21E-WS03	21E-WS03D	21E-WS04	Positive	Positive	Maximum
Sample Date	05/09/04	05/09/04	05/09/04	05/09/04	05/09/04	Detections	Detections	Detection
Semivolatile Organic Compounds (ug/100 cm^2)								
bis(2-Ethylhexyl)phthalate	3.8 J	10 U	10 U	10 U	10 U	1/5	3.8J	21E-WS01
Di-n-butylphthalate	10 U	10 U	1.7 J	10 U	10 U	1/5	1.7J	21E-WS03
PCBs (ug/100 cm^2)								
Not Detected								

Notes:

J - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
ug/100 cm^2 - micrograms per 100 centimeters squared.

Table 5-86. Summary of Inorganic Detections in Wipe Samples at ECP Site 21 – Building 503

Site ID	21E-WS01	21E-WS02	21E-WS03	21E-WS03	21E-WS04	Number of	Range of	Location of
Sample ID	21E-WS01	21E-WS02	21E-WS03	21E-WS03D	21E-WS04	Positive	Positive	Maximum
Sample Date	05/09/04	05/09/04	05/09/04	05/09/04	05/09/04	Detections	Detections	Detection
Appendix IX Metals (mg/100 cm^2)								
Silver	0.00012 B	0.00015 B	0.000006 B	0.0005 U	0.000016 B	4/5	0.000006B - 0.00015B	21E-WS02
Arsenic	0.0035	0.0012	0.0005 U	0.0001 B	0.00021 B	4/5	0.0001B - 0.0035	21E-WS01
Barium	0.061	0.015	0.0007	0.0012	0.0017	5/5	0.0007 - 0.061	21E-WS01
Beryllium	0.00019	0.000092	0.000006 B	0.000007 B	0.00001 B	5/5	0.000006B - 0.00019	21E-WS01
Cadmium	0.021	0.0025	0.00068	0.00081	0.0006	5/5	0.0006 - 0.021	21E-WS01
Cobalt	0.0095	0.0025	0.000096 B	0.0002 B	0.00015 B	5/5	0.000096B - 0.0095	21E-WS01
Chromium	0.087	0.039	0.00087	0.0018	0.0013	5/5	0.00087 - 0.087	21E-WS01
Copper	0.64	0.046	0.012	0.0073	0.0041	5/5	0.0041 - 0.64	21E-WS01
Mercury	0.000033	0.00002	0.00002 U	0.00002 U	0.00002 U	2/5	0.00002 - 0.000033	21E-WS01
Nickel	0.023	0.02	0.00053	0.00075	0.00067	5/5	0.00053 - 0.023	21E-WS01
Lead	0.39	0.062	0.0045	0.0062	0.0083	5/5	0.0045 - 0.39	21E-WS01
Antimony	0.00059	0.00032	0.000042 B	0.000075 B	0.000098 B	5/5	0.000042B - 0.00059	21E-WS01
Selenium	0.00012 B	0.000073 B	0.00025 U	0.00025 U	0.000039 B	3/5	0.000039B - 0.00012B	21E-WS01
Tin	0.0099	0.0037	0.0015 B	0.0019 B	0.0014 B	5/5	0.0014B - 0.0099	21E-WS01
Thallium	0.000045 B	0.000021 B	0.0001 U	0.00007 B	0.0001 U	3/5	0.000021B - 0.00007B	21E-WS03D
Vanadium	0.025	0.0094	0.0004 B	0.00065	0.0021	5/5	0.0004B - 0.025	21E-WS01
Zinc	1.3	0.22	0.043	0.057	0.035	5/5	0.035 - 1.3	21E-WS01

Notes:

B - The reported result is an estimated concentration that is less than the PQL, but greater than or equal to the MDL.
U - The compound was analyzed for, but was not detected at or above the MDL/PQL.
mg/100 cm^2 - milligrams per 100 centimeters squared.

5.4.21.4 *Qualitative Risk Assessment*

A discussion on the COPCs and potential risks associated with the wipe samples collected at this site is provided below.

COPC Identification

COPCs cannot be properly identified for the wipe samples collected from Building 803 at Site 21 due to the lack of comparison criteria. PCBs were the primary concern at this site and were not detected. Bis(2-ethylhexyl) phthalate and di-n-butyl phthalate were the only organic analytes detected and each was detected in a single sample out of five total samples at estimated concentrations less than the reporting limit. All inorganic analytes were detected.

Potential Risk Discussion

Although it is difficult to draw conclusions about potential health risk posed by exposure to conditions at Site 21, it is unlikely that significant health concerns are presented due to the expected minimal exposure to surfaces at the site.

5.4.21.5 *Summary of Site Conditions*

Building 803 was evaluated using wipe samples, which were then analyzed for SVOCs, pesticides/PCBs and inorganics. Based on the results of the qualitative risk assessment, it was determined that the lead concentration exceeds the TSCA standard for residential lead-based paint dust. PCBs were not detected. Due to the highly unlikely scenario that this building would be used for residential purposes, it was determined that there is a low potential for risk to human health.

Further investigation at this site will be conducted under the RCRA Corrective Action/IRP process.

5.4.22 *ECP Site 22*

This site consists of Bldg. 2300, the U.S. Army Reserve Boat Maintenance Facility, located in the Waterfront area near Pier 1 (see Figure 5-54 for location). The RR, PSI, and interviews identified that over a 20-year period, this facility routinely conducted painting and stripping (hydroblasting) operations in the main maintenance bay, with waste frequently exiting the facility either into the trench drain and associated oil water separator or to the ground surface immediately outside the building. No investigation or remediation at this facility is documented. Further investigation at this site will be conducted under the RCRA Corrective Action/IRP process.

5.4.23 *ECP Site 23*

This site consists of Piñeros and Cabeza de Perro islands. The RR and interviews indicated that these islands have been used for military training and maneuvering exercises since the late 1950s (see Section 5.11). Training exercises are reported to have included Explosive Ordnance Disposal (EOD) demolition training with up to 5 pounds of plastic explosives, and maneuvering exercises have included the use of pyrotechnic devices (e.g., flares), training grenades, claymore mines, and various types of small arms munitions. The PSI observed numerous spent small arms munitions and flares, but no potential munitions or explosives of concern (MEC). In addition, the shoreline of the western half of Piñeros Island is heavily posted (of recent origin) with signs warning of the presence of unexploded ordnance (UXO). The PSI included a significant portion of the island. No UXO was identified. Furthermore, the ECP investigation uncovered no evidence that either island was ever used as an impact area. [See photos A-47, A-48, A-80 and A-81]

5.5 *USTS/ASTS/OWSs*

The ECP PSIs included all known current underground storage tanks (USTs), aboveground storage tanks (ASTs) and oil/water separators (OWSs). Sections 5.5.1-5.5.3 discuss the available evidence regarding USTs, ASTs, and OWSs. Figure 5-93 identifies the locations of all current NSRR USTs and ASTs, and Figure 5-94 identifies the location of all current NSRR OWSs.

Some prior/current USTs and ASTs are being investigated under the IRP (see Section 5.3), and it may be presumed that initial investigations at NSRR would have identified potential/confirmed releases for other historic/current storage tanks. However, no documentation of investigations/remediations of leaking storage tanks prior to the initiation of the IRP exists. PSIs did not identify evidence of previous storage tanks (not already documented or under investigation) such as fill ports or vent pipes, although several of the sites identified through aerial photograph analysis suggest the location of possible former USTs (see Section 5.4).

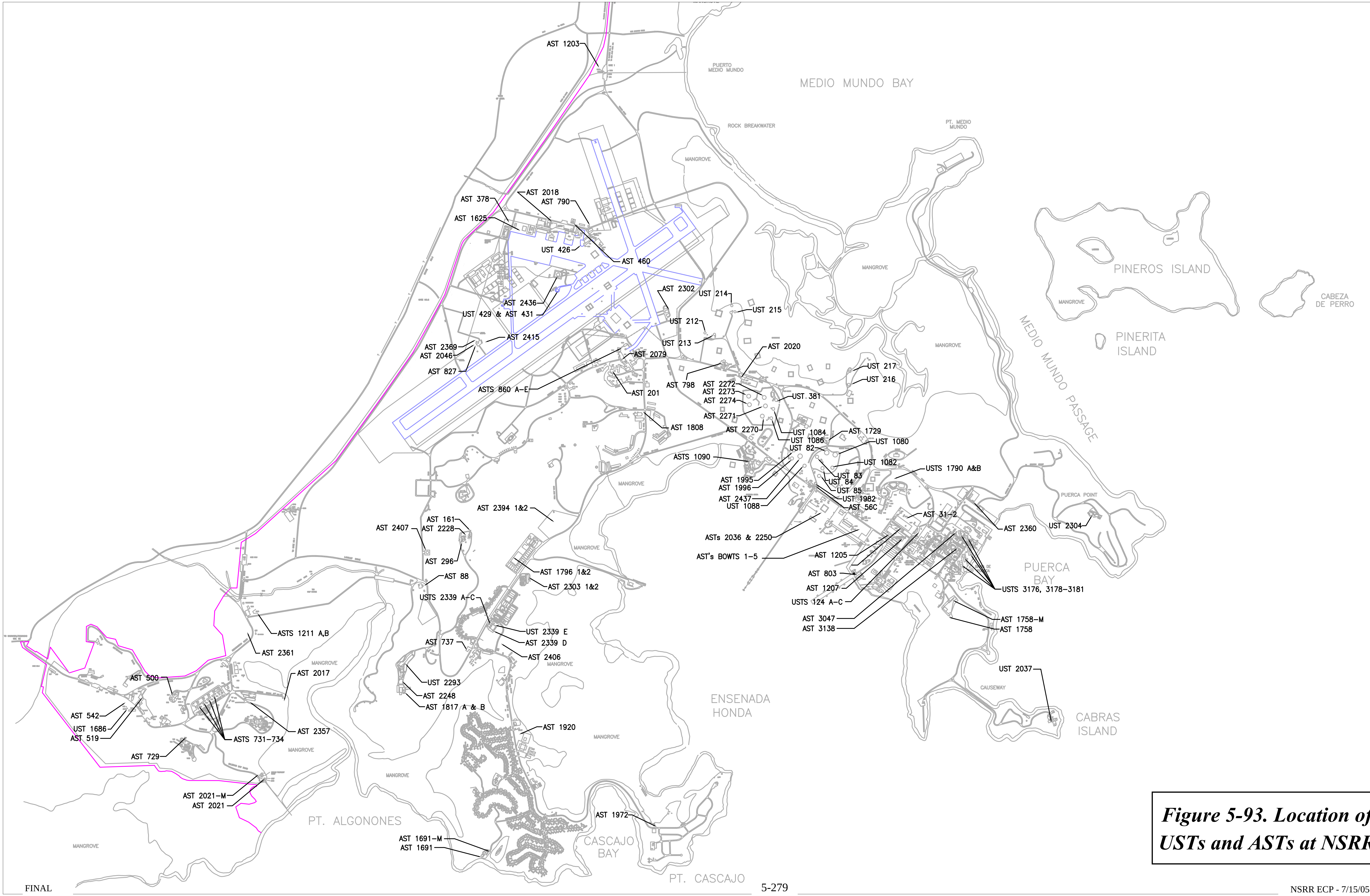


Figure 5-93. Location of USTs and ASTs at NSRR

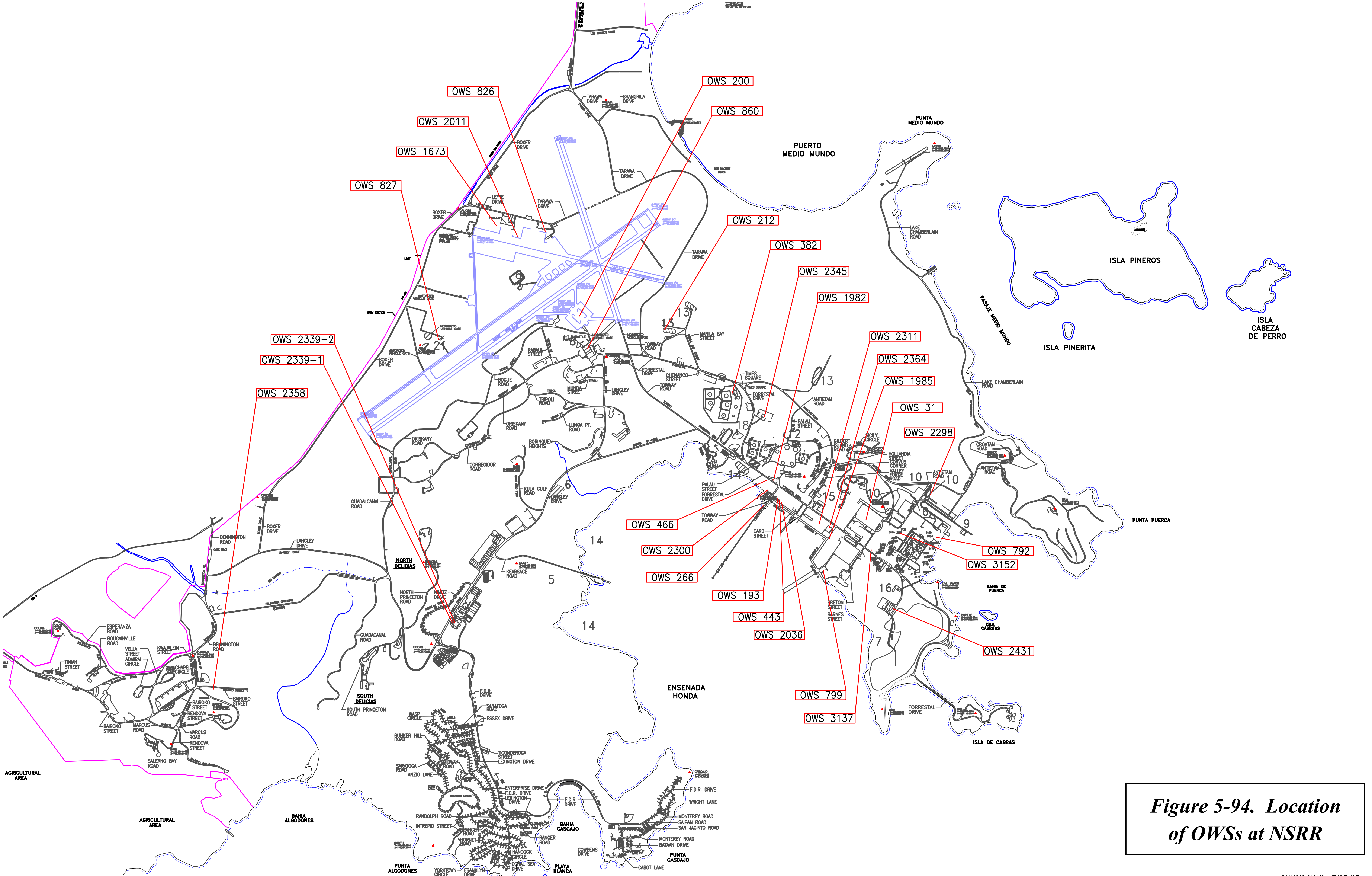


Figure 5-94. Location of OWSs at NSRR

5.5.1 USTs

Currently, NSRR has thirty-seven (37) operational USTs, including (24) that are empty or are out of service. Visual inspection of the fill ports and pumps associated with these USTs did not identify any spills or releases, and no stains were observed. Except as noted in Section 5.4, no undocumented in-place, out-of-service USTs were identified during PSIs. A summary of all operable UST systems (accurate as of March 2005) is presented in Table 5-87 and Figure 5-93. All USTs at NSRR, including the seventeen bunkered (i.e., cut and cover) ASTs listed in Table 5-87, are regulated by the requirements of 40 CFR 280 (Baker 2003). [See photos 113 and 114]

Available data shows that seventy-seven additional USTs were removed prior to 1998. Ten of the current operable USTs replaced similarly sized tanks whose installation dates are unavailable (seven replacements were installed in 1996, two in 1997, and one at an unknown date). USTs 31A, 31B, and 31C (containing mogas, mogas, and diesel, repectively) were owned by Esso Standard Oil and closed in 2002. A summary of known past USTs (i.e., known USTs not listed in Table 5-87) is presented in Table 5-88. Any contaminated soils identified during the tank replacements were excavated and disposed of off NSRR property. All replaced tanks were closed in accordance with 40 CFR 280.

The Tow Way Fuel Farm, which includes current bulk USTs 1080 (see photo A-113), 1082, 1088, 82, 83, 84 and 85, is being investigated under the IRP as SWMU-7/8 (See Section 5.3). Several large spills that have occurred at the Tow Way Fuel Farm and other UST sites are discussed in Section 5.2.4.

In May 2002, a Notice of Violation (NOV) was issued for 8 NSRR USTs. Current tanks 1686, 3176, 3178, 3179, 3180 and 3181 had inoperative leak detection systems, and tanks 56A and 56B had been out of service for more than two years and not properly closed. Repairs to the leak detection systems were completed in March 2003, and tanks 56A and 56B were permanently closed in May 2003. In a letter dated February 25, 2004 the EPA recognized closure of this NOV.

Table 5-87. Summary of all Currently Operable UST Systems at NSRR

Tank ID	Location[1]	Capacity (gal)	Material Stored	Year Installed
1080	Tow Way Fuel Farm	1,165,000	DFM[2]/Empty	1968
1082	Tow Way Fuel Farm	1,165,000	DFM/Empty	1968
1084	By ASTs 2270-2274	1,181,000	JP-5[3]/Empty	1968
1086	By ASTs 2270-2274	1,181,000	JP-5/Empty	1968
1088	Tow Way Fuel Farm	425,000	JP-5/Empty	1968
124A	Gas filling station directly East of PW, Bldg. 31	2,500	Diesel	1996
124B	Gas filling station directly East of PW, Bldg. 31	6,000	mogas	1996
124C	Gas filling station directly East of PW, Bldg. 31	6,000	mogas	1996
1686	Bundy laundry Bldg.	10,000	JP-5/Empty	1996
1790A	Hospital	6,000	JP-5	1996
1790B	Hospital	6,000	JP-5	1996
1982	Fuels pump station	550	Waste oil/Empty	1996
2037	Generator Bldg., Cabras Island	600	Diesel/Empty	1997
212	Behind fire station	50,000	Diesel/Empty	1940
213	Behind fire station, Bldg. 798	50,000	Mogas/Empty	1940
214	Behind fire station, Bldg. 798	248,000	Diesel/Empty	1941
215	Behind fire station, Bldg. 798	245,000	Diesel/Empty	1941
216	Behind telephone cable hut, Bldg. 233	245,000	Diesel/Empty	1941
217	Behind telephone cable hut, Bldg. 233	247,000	Used Oil/Empty	1941
2293	ROC Mechanical Bldg., South Delicias	4,000	Diesel	1997
2304	Telemetry Site, Punta Puerca	4,000	Diesel	1989
2339A	NEX Autoport	10,000	Mogas/Empty	1994
2339B	NEX Autoport	10,000	Mogas/Empty	1994
2339C	NEX Autoport	10,000	Mogas/Empty	1994
2339E	NEX Autoport	500	Waste oil/Empty	1994
3176	Camp Moscrip (BLDG. 3176)	1,000	Diesel	1996
3178	Camp Moscrip (BLDG. 3178)	1,000	Diesel	1996
3179	Camp Moscrip (BLDG. 3179)	1,000	Diesel	1996
3180	Camp Moscrip (BLDG. 3180)	1,000	Diesel	1996
3181	Camp Moscrip (BLDG. 3181)	1,000	Diesel	1996
381	West of bulk fuel ASTs 2270-2274	1,180,000	JP-5/Empty	1955
426	Aircraft operations Bldg.	800	Diesel	1993
429	Flightline, Ofstie Airfield	218,000	JP-5/Empty	1955
82	DFM Hill, Tow Way Fuel Farm	2,115,000	DFM/Empty	1940
83	DFM Hill, Tow Way Fuel Farm	1,157,000	DFM/Empty	1940
84	DFM Hill, Tow Way Fuel Farm	585,000	None/Empty	1944
85	DFM Hill, Tow Way Fuel Farm	1,152,000	None/Empty	1944

Source: Ruiz

Note: Shading indicates bunkered ASTs, which are also regulated under 40 CFR 280

1. See Figure 5-93, Tank Location Map
2. DFM = Diesel fuel marine
3. JP-5 = Jet propulsion fuel

Table 5-88. Summary of Known Past UST Systems at NSRR

Tank ID	Capacity (gal)	Fuel Type	Location/ Building No.	Date Installed	Date Removed
124A[1]	2,000	Mogas	124	N/A[2]	5/96
124 B	5,000	Mogas	124	N/A	5/96
124 C	5,000	Mogas	124	N/A	5/96
124 D	550	Waste Oil	124	N/A	4/96
1513	280	Diesel	1513	N/A	8/96
1587 B	5,000	Mogas	1587	N/A	1993
1686	10,000	Diesel	1686	N/A	7/96
1738 A	10,000	Mogas	1738	N/A	12/95
1738 B	550	Waste Oil	1738	N/A	12/95
1738 C	10,000	Mogas	1738	N/A	12/95
1738 D	10,000	Mogas	1738	N/A	12/95
1790 A	6,000	Diesel	1790	N/A	10/96
1790 B	6,000	Diesel	1790	N/A	10/96
1796	280	Diesel	1796	N/A	1/97
1808	5,000	Diesel	1808	N/A	1/97
1817	18,000	Diesel	1817	N/A	1997
1936	1,000	Diesel	1936	N/A	1997
1970	1,000	Diesel	1970	N/A	3/97
1982	550	Waste Oil	1982	N/A	8/96
1983	550	Diesel	1983	N/A	1993
201 A	2,000	Unknown	201	N/A	1993
201 B	2,000	Unknown	201	N/A	1993
2037	600	Diesel	2037	N/A	1/97
208	50,000	Avgas	Airfield	N/A	N/A
209	50,000	Avgas	Airfield	N/A	N/A
210	50,000	Avgas	Weapons	N/A	1995
211	50,000	Avgas	Weapons	N/A	1995
229A	4,000	Diesel	Weapons	N/A	1999
229 B	4,000	Diesel	Weapons	N/A	1999
2293	4,000	Diesel	2293	N/A	1997
2302	2,000	Diesel	2302	N/A	8/96
28	5,000	Diesel	28	N/A	1993
2842-B	5,000	Diesel	3188	N/A	1997
298	300	Diesel	298	N/A	2/99
31 A (Esso)	8,000	Mogas	31	N/A	2002
31 B (Esso)	10,000	Mogas	31	N/A	2002
31 C (Esso)	6,000	Diesel	31	N/A	2002
34	550	Waste Oil	31	N/A	2/98
382	550	Waste JP-5	--	N/A	4/96
386A	550	Waste Oil	2248	N/A	12/96
426	2,000	Diesel	426	1993	1993
429 R	5,000	JP-5	Flightline	N/A	1996

Table 5-88. Summary of Known Past UST Systems at NSRR (cont.)

Tank ID	Capacity (gal)	Fuel Type	Location/ Building No.	Date Installed	Date Removed
433	290	Waste Oil	433	N/A	1993
443	550	Waste Oil	193	N/A	3/96
470	25,000	Mogas	470	N/A	1995
471	25,000	Mogas	471	N/A	1995
510	4,000	Unknown	515	N/A	1993
515	550	Waste Oil	515	N/A	1996
520 A	550	Waste Oil	520	N/A	1996
520 B	12,000	Mogas	520	N/A	1996
520 C	12,000	Mogas	520	N/A	1996
520 D	10,000	Diesel	520	N/A	1996
55	5,000	Unknown	DFM Hill	N/A	3/97
56 A	15,000	DFM	564	1996	2003
56 A	10,500	DFM	56	N/A	8/96
56 B	15,000	DFM	56	1996	2003
56 B	10,500	DFM	56	N/A	8/96
724	5,000	Diesel	724	N/A	6/96
729	1,000	Diesel	729	N/A	8/96
730	10,000	Diesel	730	N/A	1995
731	1,000	Diesel	731	N/A	8/96
732	1,000	Diesel	732	N/A	8/96
733	1,000	Diesel	733	N/A	8/96
734	1,000	Diesel	734	N/A	8/96
735	1,000	Diesel	735	N/A	1993
760	280	Unknown	760	N/A	1993
777	3,000	Diesel	777	N/A	1993
794	550	Unknown	794	N/A	1993
801	NA	Avgas	801	N/A	1993
803	275	Diesel	803	N/A	1993
860	550	Waste Oil	860	N/A	12/96
99	10,000	Unknown	DFM Hill	N/A	1993

Source: DMG 1997
1. Shading indicates tanks replaced with similarly sized tanks
2. N/A = Not available

5.5.1.1 *Monitored Natural Attenuation Study*

A Monitored Natural Attenuation (MNA) study of seven former UST sites and one current AST site at NSRR is being performed by the Navy. The Year 4 summary report, dated December 2004, presents the findings of the study along with recommendations based on those findings. The monitoring protocols presented in the report, including sampling parameters, locations, and frequency, are in accordance with the monitoring protocols developed by the Underground Storage Tank Management Division (USTMD) of the EQB for the UST sites

(MNA 2004). The EQB-accepted recommendations of the study are provided in Table 5-89.

Table 5-89. MNA Status and Recommendations at NSRR

Site	Type of Contamination	Status of Contamination[1]	EQB Accepted Recommendations
124 (4 USTs)	Soil Contamination	Decreased to undetectable limits	Discontinue soil monitoring
	Groundwater Contamination	Still exists	If groundwater contamination levels remain below EQB criteria for two more MNA events, discontinue groundwater monitoring. If levels are detected, continue groundwater monitoring for MW2[3] and MW5.
731 (1 UST)	Soil Contamination	TPH still exists	Continue current annual soil and groundwater monitoring protocols for TPH only.
	Groundwater Contamination	Not Contaminated	N/A
734 (1 UST)	Soil Contamination	Still exists	Continue current annual soil monitoring protocols for TPH only.
	Groundwater Contamination	Still exists	Continue current annual groundwater monitoring protocols for TPH only.
735 (1 UST)	Groundwater Contamination	Still exists	Continue current annual groundwater monitoring protocols for TPH only.
1995 (1 AST)	Groundwater Contamination	Still exists	Continue current annual groundwater monitoring protocols for TPH only.
2842B (1 UST)	Soil Contamination	Not part of study	N/A
	Groundwater Contamination	Free Product still exists	Continue monitoring at MW1 on quarterly basis. Discontinue groundwater monitoring of MW5.
1738 (3 USTs)	Soil Contamination	Not part of study	
	Groundwater Contamination	Still exists	Continue current monitoring protocol for MW1, MW2, and MW
520 (4 USTs)	Soil Contamination	Not part of study	
	Groundwater Contamination	Still exists	Continue current monitoring protocol for MW2 and MW5. Discontinue groundwater monitoring of MW1 and MW7.

1. Status of MNA sites as of March 2005 Source: MNA 2003
2. TPH = Total Petroleum Hydrocarbons
3. MW = Monitoring well, and subsequent number (e.g. 2) identifies specific MW at particular site

5.5.2 ASTs

Ninety ASTs were operational on NSRR as of December 2002 (Baker 2003). Available records document an additional thirteen historic tanks, since removed;

eight have been removed since 1995. It may logically be inferred that many more [than thirteen] ASTs previously existed at NSRR, but there are no records available that document their existence/disposition. In addition, given the ongoing NSRR closure activities, the precise number of ASTs in operational use changes frequently. The most recent comprehensive summary of NSRR AST systems is presented in Table 5-90 below.

Tank 1995, identified in Table 5-90 below, is currently inactive and empty, and it is the only AST included in the NSRR MNA study being performed by the Navy (see Section 5.5.1.1).

NSRR and its tenant commands frequently use portable or mobile ASTs for temporary fuel storage (see photo A-102). Although many of these tanks were identified during site visits, due to their transient locations they have not been listed in this ECP Report. No records of spills/incidents associated with these ASTs exist.

Visual inspection of all ASTs (see photos A-119 and A-120) and surrounding areas did not identify any spills, releases, or stains. [Note: see Section 5.2.4 for a discussion of historic spills at NSRR.]

Table 5-90. AST Summary at NSRR

Facility	Type of Tank	Tank Number	Nominal Capacity	Type of Oil
AFWTF	AST	2248	5,000	Diesel
	AST	860 D	5,000	JP-5
	AST	860 F	500	WD-40
	AST (DW[1])	860 A	250	Mogas
	AST (DW)	860 B	250	Smoke oil
	AST (DW)	860 E	4,000	JP-5
	AST (DW)	860 G	250	JP-5
	AST (Vaulted)	1729	2,000	Diesel
	AST (Vaulted)	2228	500	Diesel
	AST DW	378	2,000	Diesel
	AST Vaulted	2079	250	Diesel
Ofstie Airfield	AST	1625	500	JP-5
	AST (Vaulted)	2415	500	Diesel
Camp Moscrip	AST (Vaulted)	3047	1,000	Diesel
	AST (Vaulted)	3138	1,000	Diesel
Crash Crew	AST	2046 A	5,500	JP-5
	AST (Vaulted)	2369	500	Diesel
	AST (Vaulted)	827 A	12,000	Flamtex
FRT	AST (Vaulted)	2250	12,000	Used Oil
	AST (DW)	2036	2,000	Used Oil
Fuels Division	AST	1995	4,200,000	DFM
	AST	1996	4,200,000	DFM
	AST	2270	4,200,000	JP-5
	AST	2271	4,200,000	JP-5
	AST	2272	4,200,000	JP-5
	AST	2273	4,267000	JP-5
	AST	2274	4,200,000	JP-5
	AST	2436	2,640,000	DFM
	AST	2437	4,200,000	DFM
	AST	431	300	JP-5
	AST	1090 A	2,500	Diesel
MWR	AST	1090 B	1,500	Mogas
	AST	1090 C	500	Mogas
	AST	201	600	Used Oil
	AST (Vaulted)	1211 B	6,000	Diesel
	AST (Vaulted)	1211-A	1,000/1,000	Diesel/Mogas
NEX	AST	2339 D	550	Diesel
	AST (Vaulted)	1796	250	Diesel
Public Works Department (PWD)	AST	1203	250	Diesel
	AST	1758	550	Diesel
	AST	2017	200	Diesel
	AST	2018	350	Diesel
	AST	2020	200	Diesel
	AST	2021	400	Diesel
	AST	2303-2	500	Diesel
	AST	2406	550	Diesel
	AST	296	500	Diesel
	AST	31-1	1,000	Diesel
	AST	31-2	2,000	Used Oil
	AST	542	550	Diesel

Table 5-90. AST Summary at NSRR (cont.)

Facility	Type of Tank	Tank Number	Nominal Capacity	Type of Oil
PWD (cont.)	AST	737	250	Diesel
	AST	BOWTS[2]-1	50,000	Oily Waste Water
	AST	BOWTS-2	50,000	Oily Waste Water
	AST	BOWTS-3	1,000	Used Oil
	AST	BOWTS-4	1,000	Used Oil
	AST	BOWTS-5	1,000	Used Oil
	AST (Dike)	1207	500	Diesel
	AST (Dike)	2407	1,000	Diesel
	AST (Dike)	56 C	5,000	Used Oil
	AST (DW)	1691-M	8,000	Methanol
	AST (DW)	1758 M	8,000	Methanol
	AST (DW)	2021 M	8,000	Methanol
	AST (DW)	803	275	Used Oil
	AST (integral)	2394 A	200	Diesel
	AST (integral)	2394 B	2,000	Diesel
	AST (Vaulted)	1205	1,000	Diesel
	AST (Vaulted)	161	500	Diesel
	AST (Vaulted)	1691	1,000	Diesel
	AST (Vaulted)	1808	5,000	Diesel
	AST (Vaulted)	1817 A	5,000	Diesel
	AST (Vaulted)	1817 B	5,000	Diesel
	AST (Vaulted)	1920	500	Diesel
	AST (Vaulted)	1972	250	Diesel
	AST (Vaulted)	2302	2,000	Diesel
	AST (Vaulted)	2303-1	1,000	Diesel
	AST (Vaulted)	2357	500	Diesel
	AST (Vaulted)	2360	500	Diesel
	AST (Vaulted)	2361	500	Diesel
	AST (Vaulted)	296	500	Diesel
	AST (Vaulted)	460	500	Diesel
	AST (Vaulted)	500	1,000	Diesel
	AST (Vaulted)	519	250	Diesel
	AST (Vaulted)	729	1,000	Diesel
	AST (Vaulted)	731	1,000	Diesel
	AST (Vaulted)	732	1,000	Diesel
	AST (Vaulted)	733	1,000	Diesel
	AST (Vaulted)	734	1,000	Diesel
	AST (Vaulted)	790	250	Diesel
	AST (Vaulted)	798	500	Diesel
	AST (Vaulted)	88	500	Diesel

Source: Baker 2003

1. DW = Double-walled tank protection

2. BOWTS = Bilge and oily wastewater treatment system

5.5.3 Oil/Water Separators (OWS)

As of December 2002, 29 oil/water separators were operational at NSRR (see photos A-12 through A-14). Given the ongoing site closure activities, the precise number of OWSs in operational use changes frequently. Records are not available to identify OWSs that may have been abandoned prior to this point. The

29 OWSs were associated with vehicle washracks and were investigated as part of the *Wastewater Pretreatment Units Evaluation* conducted in 2002. Of the 29 OWSs, all have the capacity to receive process wastewater flow and are adequately sized to do so. The process wastewater is defined as wastewater that is generated from the use of the potable water system located at each washrack. All of the OWSs also receive storm water inflow during rain events. Eight were identified as being undersized for handling the storm water runoff generated during a 1-hour, 5-year storm event (5 inches), which is the design criteria for new OWSs as dictated in the 1997 DOD OWS Guidance Manual. Four were identified as having structural problems, including exposed reinforcing steel and crumbling aggregate. Three were identified as having blocked drainage lines. Three OWSs were identified as discharging to a storm water drainage ditch instead of to the sanitary sewer system as the other OWSs do. They are located in fueling areas and are used to separate oil from storm water runoff while also acting as a containment area if there happened to be an oil spill. The OWSs have effluent valves on the drainage lines to prevent an accidental spill release into the storm water drainage ditch and are covered under the Spill Prevention Control and Countermeasures (SPCC) plan. Table 5-91 identifies the existing oil/water separators and notes any problems identified with each one. Each OWS is cleaned as needed, depending on use. Except as noted above, the ECP investigation uncovered no new environmental issues associated with the OWSs.

A comprehensive listing of all former OWSs at NSRR was not identified during the conduct of the ECP. However, several of the SWMUs associated with the IRP involve OWSs (SWMUs 4, 12, 23, 24, 35, and 36). See Section 5.3 for a further discussion regarding these SWMUs.

Table 5-91. OWSs at NSRR

Location Number	Location Name	Structural Problems?	Blocked Drain Line?	Adequately Sized?	Discharge to Sanitary?
31	PWD- Transportation	No	No	No	Yes
193	Aircraft Fuel Truck Area – Hose Storage	No	No	Yes	Yes
200	Aircraft Hangar	No	No	No	Yes
212/213	Bulk Fuel Storage Tanks	No	No	Yes	No
266	Pier 1	No	No	Yes	Yes
382	Aircraft Fuel Truck Area	Yes	No	Yes	No
443	Aircraft Fuel Truck Area - Parking	No	No	Yes	No
466	Aircraft Fuel Compound	No	No	Yes	Yes
792	Boat Maintenance Shop	No	No	No	Yes
799	Oil Pollution Control System – Pier 3	No	No	Yes	Yes
826	Aerospace Ground Support	No	No	Yes	Yes
827	Fire Department – Crash Crew	No	No	Yes	Yes
860	Drone Support	Yes	No	Yes	Yes
1673	AIMD Ground Support Equipment Paintshop	No	No	Yes	Yes
1982	Fuel Pump House Facility	No	No	Yes	Yes
1985	Vehicle Wash Rack – Surface Ops	No	No	Yes	Yes
2011	Aircraft Washrack	No	No	No	Yes
2036	Shore Support Building (fiberglass repair shop)	No	No	No	Yes
2298	U.S. Army Reserve Motor Pool	No	No	Yes	Yes
2300	U.S. Army Reserve Marine Maintenance Shop	Yes	No	Yes	Yes
2311	Temporary Washrack	No	No	No	Yes
2339-1	Service Station/Mini Mart	No	No	Yes	Yes
2339-2	Service Station/Mini Mart	No	No	Yes	Yes
2345	Garbage Truck Washrack	No	Yes	No	Yes
2358	USMC – Vehicle Maintenance Area	No	No	Yes	Yes
2364	Heavy Equipment Wash Area	No	No	Yes	Yes
2431	Waste Management Area	No	Yes	Yes	Yes
3137	SeaBees Camp – Alpha Co.	No	Yes	Yes	Yes
3152	SeaBees Camp – Bravo Co.	Yes	No	No	Yes

Source: CH2MHill 2002, Baker 2003

5.6 *AIR EMISSIONS*

The air quality in the vicinity of NSRR is in attainment for all criteria pollutants. NSRR is within the Puerto Rico Air Quality Control Region, and has adopted the National Ambient Air Quality Standards (NAAQS) regarding the maximum permissible average and peak concentrations for the criteria pollutants nitrogen oxide (NOx), sulfur dioxide (SO_2), carbon monoxide (CO), ozone (O_3), respirable particulate matter (PM_{10}) and lead (Pb). EQB administers the ambient air quality program in conjunction with EPA, Region II. In particular, EQB is responsible for permitting minor air pollution sources while EPA administers the Prevention of Significant Deterioration (PSD) program and authorizes major source permits (TEC 1993).

The Puerto Rico EQB issued a draft Title V Operating Permit, number TV9711-19-0397-0012, to NSRR in Spring 2003. This draft permit went into public review on July 8, 2003, where NSRR presented extensive comments/changes due to the relocation of many tenant commands. A final Title V Operating Permit has not yet been issued by the EQB.

NSRR has a wide variety of small emission sources, which operate intermittently, with no set operation schedule. Most emissions are generated by combustion sources, which are powered by diesel, JP-5, gasoline or propane gas. During full station operations, the combined emissions from these combustion sources had the potential to emit more than 100 tons per year of NO_x, CO and volatile organic compounds (VOC), making NSRR a major stationary source of criteria pollutants. The internal combustion generators that supply energy in emergencies are considered insignificant sources because each one operates less than 500 hours per year.

VOCs and hazardous air pollutants (HAP's) are also generated in painting activities, cleaning operations associated with aircraft and ship maintenance and repair and other day-to-day activities. Significant emission units at NSRR include: boilers, machine parts cleaning, engine testing, fuel storage tanks, and painting operations. Because of station closure, and subsequent reduction in station activity, many of the air emission sources associated with aircraft and boat maintenance have been discontinued or operate at a greatly reduced frequency. A list of the registered sources at NSRR is included in Table 5-92.

As a condition of the permit, NSRR is required to retain records of all required monitoring data and support information for a period of 5 years from the date of the monitoring sample, measurement, report or application. There is no documentation of any current, or previous NOVs issued to NSRR as a result of a deviation from the Title V Permit.

Table 5-92. Description of Significant Air Emission Units at NSRR

Emission Unit ID	Description	Building Number	Control Device
EU – 23	Spray Paint Booth (Aircraft Components)	1673	Extraction system and scrubber
EU – 29	Fuel Truck Loading/Unloading	192A	None
EU – 30	Underground Storage Tank for storage of 50,736 gallons of gasoline	192A	None
EU – 37	1.895 mmBtu/hr Boiler fired on JP-5	1790	None
EU – 38	1.895 mmBtu/hr Boiler fired on JP-5	1790	None
EU – 41	1.095 mmBtu/hr Boiler fired on JP-5	1790	None
EU – 45	1.004 mmBtu/hr Boiler fired on JP-5	729	None
EU – 63	Spray Paint Booth (heavy equipment, automobiles)	3188	Extraction system and scrubber
EU – 79	Two 1-ton Chlorine Containers	88	None
EU – 81	Spray Paint Booth (BOSC)	2022/31	Filters with 90% efficiency and HVLP sprayer with 80% efficiency.
EU – 82	Spray Paint Booth (Garbage Dumpsters)	Landfill	Filters with 90% efficiency and HVLP sprayer with 80% efficiency.
EU – 91	1.08 mmBtu/hr Boiler fired on diesel	731	None
EU – 96	3.348 mmBtu/hr Boiler fired on diesel	1808	None
EU – 97	2.600 mmBtu/hr Boiler fired on diesel	1808	None
EU – 102	Touch-up Painting (Aircraft)	Hanger 200	Partial Closure
EU – 120	8,020 gal Storage Tank (Methanol)	1691	None
EU – 121	8,020 gal Storage Tank (Methanol)	2019	None
EU – 122	8,020 gal Storage Tank (Methanol)	2021	None
--	8,000 gal AST (gasoline)	Golf Course	None
F – 8	Touch-up Painting (Ships/Boats)	2300	None
F – 12	Touch-up Painting (Ships/Boats)	Various Bldgs	None
F – 13	Touch-up Painting (Ships/Boats)	2036	None
F – 14	Touch-up Painting (Ships/Boats)	2300	None
F – 17	Touch-up Painting (Ships/Boats)	2351	None
F – 18	Touch-up Painting (Ships/Boats)	2252	None
F – 20	Flush Cleaning (Aircraft)	Hanger 1625	None
F – 22	Touch-up Painting (Aircraft)	Hanger 1625	None
F – 24	Touch-up Painting (Aircraft)	Ofstie Airfield	None

Notes: Table taken from NSRR Title V Permit No. TV9711-19-0397-0012

5.7 ASBESTOS CONTAINING MATERIALS (ACM)

The last large-scale survey to identify friable, accessible, and damaged (FAD) asbestos containing material (ACM) was performed approximately 20 years ago. No further information regarding the scope or findings resulting from this survey was identified. However, several more recent ACM surveys have been performed at specific sites at NSRR.

In March and April 1990, an ACM survey of 90 buildings at NSRR was performed. A variety of buildings were inspected including station housing facilities, administrative offices and industrial buildings. ACM or suspected ACM was identified in 77 of the 90 buildings surveyed. The investigation revealed the following typical uses of ACM in the buildings:

- Friable
  - Insulation on pipes, pipe fittings, and ducts;
  - Insulation on tanks, boilers, and other equipment;
  - Insulation and expansion joints on air handling equipment;
  - Ceiling tile;
  - Wallboard;
  - Gaskets and seals on mechanical equipment.
- Non-Friable
  - Floor tile;
  - Asbestos cement panels (a/k/a transite);
  - Asbestos cement exterior siding;
  - Acoustical tiles;
  - Shingles;
  - Built-up roofing;
  - Floor tile and roofing mastic;
  - Asbestos cement pipe; and
  - Tarpaper.

The report included recommendations for management and control of these materials; however, no documentation was available regarding asbestos abatement resulting from the survey (Weston, 1991).

In May and June 1995 an ACM survey was conducted in the following areas at NSRR: Community 3096 – Capehart Housing, Community 3097 – SR 3 and 4 Housing, Community 3098 – Turnkey Housing, Community 3099 – Flag Quarters, and Community 3100 – Algodones Housing. Results of the 1995 survey are summarized in Table 5-93.

Table 5-93. NSRR 1995 Asbestos Survey Results

Location	Material	% of Units with ACM	Material Condition	Friability
Community 3096 – Capehart Housing				
Throughout Interior	Floor Tile & Mastic	100	Good	Non
Description: 12” x 12”; brown speckled pattern; smooth texture				
Throughout Interior	Floor Tile & Mastic	100	Good	Non
Description: 9” x 9”; brown speckled pattern; smooth texture; assumed ACM				
Throughout Interior	Floor Tile & Mastic	100	Good	Non
Description: 12” x 12”; brown; smooth texture				
Throughout Interior	Floor Tile & Mastic	100	Good	Non
Description: 12” x 12”; tan speckled pattern; smooth texture				
Throughout Interior	Floor Tile & Mastic	100	Good	Non
Description: 12” x 12”; beige speckled pattern; smooth texture				
Community 3097 – SR 3 & 4 Housing				
Throughout Interior	Floor Tile & Mastic	54	Good	Non
Description: 12” x 12”; brown				
Throughout Interior	Floor Tile & Mastic	7	Good	Non
Description: 12” x 12”; brown speckled pattern				
Throughout Interior	Floor Tile & Mastic	7	Good	Non
Description: 12” x 12”; medium brown speckled pattern				
Throughout Interior	Floor Tile & Mastic	11	Good	Non
Description: 12” x 12”; white/beige; assumed ACM				
Community 3098 – Turnkey Housing				
Throughout Interior	Popcorn Ceiling	100	Good	Non
Description: white; rough texture; sprayed-on				
Utility 1	Floor Tile & Mastic	65	Good	Non
Description: 12” x 12”; white with blue specks; assumed ACM				
Mechanical 1	Floor Tile & Mastic	54	Good	Non
Description: 12” x 12”; white with blue specks				
Hallway 1	Floor Tile & Mastic	50	Good	Non
Description: 12” x 12”; white with blue specks; assumed ACM				
Kitchen 1	Floor Tile & Mastic	8	Good	Non
Description: 12” x 12”; yellow speckled pattern; assumed ACM				
Bedroom 1/2/3, Hallway ½, Kitchen 1, Living 1	Floor Tile & Mastic	12	Good	Non
Description: 12” x 12”; white with gray specks; assumed ACM				
Throughout Interior	Floor Tile & Mastic	44	Good	Non
Description: 12” x 12”; white with brown specks; assumed ACM				

Table 5-93. NSRR 1995 Asbestos Survey Results (cont.)

Location	Material	% of Units with ACM	Material Condition	Friability
Community 3098 – Turnkey Housing				
Throughout Interior	Floor Tile & Mastic	29	Good	Non
Description: 12" x 12"; medium brown				
Bathroom 1/2/3	Linoleum & Mastic	44	Good	Non
Description: yellow speckled pattern				
Bathroom 1/2/3	Linoleum & Mastic	23	Good	Non
Description: blue/black pattern				
Bathroom 1/2/3	Linoleum & Mastic	13	Good	Non
Description: green speckled pattern				
Bathroom1. Kitchen 1	Linoleum & Mastic	38	Good	Non
Description: yellow				
Kitchen 1	Linoleum & Mastic	4	Good	Non
Description: black and white pattern; assumed ACM				
Bathroom 1/2/3, Kitchen 1	Linoleum & Mastic	21	Good	Non
Description: Green				

Source: Asbestos Activity Summary, 1998

The 1995 survey identified ACM in 100 percent of the housing units sampled in the Capehart and Turnkey housing areas. ACM was also identified in some of the units in the SR 3 & 4 housing area. All identified ACM was determined to be non-friable and in good condition (DON 1998a).

In August 1998, an asbestos survey was performed in Building 161, Building DN2-3 and Building 1625. Results of the sampling indicated the presence of ACM in roof panel material collected from Building 161 and green floor tile and mastic collected in Building DN2-3. These materials are considered category one, non-friable ACM, according to 40 CFR Part (DMG 1998b). No asbestos abatement was performed as part of this survey and no documentation is available regarding abatement resulting from the survey.

An asbestos investigation was conducted in Level C of Building 386 in August 2003, prior to planned modernization/rehabilitation of that facility. Analytical results from the bulk samples collected indicate that the vinyl floor tiles and bitumen mastic glue were ACM. ACM identified as part of the investigation was noted to be non-friable and in good condition (GRE 2003).

A sign posted inside Building 663 (see photos A-86 and A-87), identified during an ECP site visit, indicated that ACM is present within that building. Due to the age of some of the facilities, it is likely that ACM is present in many of the older buildings that remain at NSRR that have not yet been surveyed.

A comprehensive station-wide ACM survey is underway and targeted for completion in late Summer 2005. When published, this report can be consulted for the most up-to-date ACM information.

5.8 PESTICIDES

Contracting and coordination of the station-wide pesticide and vegetation management program is the responsibility of the Public Works Department, Facilities Support Contracting Division and the designated Pest Management Coordinator. The Pesticide Compliance and Pest Management Plan (PCPMP) sets policy and provides guidance for pesticide management and pest control operations at NSRR. The PCPMP describes requirements for all aspects of pesticide management including storage, mixing, use, disposal, safety, reporting, and spill control and response. All pesticide operations at NSRR are conducted in accordance with Federal, Commonwealth and Navy regulations (PWSD 2002).

Pesticide application is performed by a contractor whose personnel are licensed, commercial pesticide applicators, certified by the Puerto Rico Department of Agriculture. Pesticides are applied on a monthly basis in some buildings and on a quarterly basis in others, but are applied more frequently as needed to maintain the levels of performance indicated in the NSRR Pest Control Contract (PWSD 2002).

Outdoor pesticide use practices are limited to the developed part of NSRR and perimeter fence line weed control. Measures to minimize pesticide drift and prevent pesticide runoff are implemented whenever outdoor pesticide applications are conducted. DoD personnel trained in pest control technology inspect all contract pest control services. Upon inspection, the DoD inspectors have the authority to halt any contract pesticide application that:

- Endangers or presents a hazard to humans, or animals, or the environment;
- Violates contract specifications, applicable Commonwealth of Puerto Rico regulations, applicable DoD/Navy/NSRR regulation, or local laws; or
- Violates the pesticide label.

The regional entomologist must approve all pesticides proposed for use by contractors or purchased for use by in-house personnel. DoD personnel who apply pesticides as part of their job description must be certified in accordance with the DoD "Plan for the Certification of Pesticide Applicators". The station golf course employs the only "in-house" DoD Certified Applicator for pest and vegetation control at the golf course and driving range (PWSD 2002).

All golf course pesticides are stored in Building 2371. Buildings 31 (the Public Works building), 2034 (the main pesticides building) and 3152 (the Naval Mobil Construction Battalion Pest Control Facility) are also used for the storage and mixing of pesticides (see photos A-49 through A-51 and A-69 through A-71). All pesticide storage and mixing locations are included in the installation spill contingency plan. Spill containment/cleanup kits are maintained at all pesticide storage/mixing areas and in all pest control vehicles. No evidence of contamination due to current or former pesticide and herbicide use was identified at these locations.

Pesticide application contractors are responsible for the disposal of any excess pesticides, pesticide containers, or items contaminated with pesticides at an off-station location at their own expense. Disposal of pesticides and pesticide containers generated at the golf course and self-help locations is coordinated by the Public Works Department and conducted according to Federal and Commonwealth laws.

Building 121 was an EPA-permitted hazardous waste storage facility that was used for long-term storage of outdated pesticides, including DDT (EEI 1984). This building was designated SWMU 19 and is discussed further in Section 5.3. Building number 64 (SWMU 53) and 258 (SWMU 13), which were historically used for pesticide storage, are included in the IR program (see Section 5.3).

5.9 POLYCHLORINATED BIPHENYLS (PCBS)

Only one PCB containing-transformer remains at NSRR. The transformer, located in Building 386, appears to be in good condition and is checked monthly by a station contractor for possible leaks (see photos A-52 and A-53). All other PCB-contaminated transformers and equipment were removed from NSRR prior to 1998 (NSRR 2004). Due to the age of the majority of facilities and the size of the station, it is possible that PCB-contaminated fluorescent light ballasts and other minor PCB sources may be present on NSRR.

Several locations on the NSRR property, including a large area near the current bowling alley, have been identified as former storage areas for PCB-containing equipment. A more detailed discussion of these sites is included in Section 5.3 of this report.

5.10 MEDICAL WASTES

The facilities at NSRR that historically generated medical wastes are the hospital, dental office and veterinary clinic. Immediately prior to closure of NSRR, medical waste generated at the dental office and the veterinary clinic was transported to the hospital for staging until the next medical waste pickup. The Bio-Hazardous Waste Management Plan governed the handling, storage and disposal of bio-hazardous waste generated by, or delivered to, the hospital. Medical waste generated at NSRR included the following:

- Isolation waste;
- Cultures and stocks of infectious agents;
- Human blood and blood products;
- Pathological wastes;
- Contaminated sharps;
- Waste from surgery and autopsies;
- Wastes of labor, delivery, and postpartum;
- Miscellaneous laboratory waste;
- Dialysis waste; and
- Gloves and other barrier items worn by personnel as protection in the handling of body fluids.

Waste was disposed of in specified red biohazard bags, transported to Building 2434, the biohazard waste storage building, and placed in designated storage containers until pickup (see photos A-54 and A-55). A manifest was then prepared and signed by the designated Environmental Protection Specialist (EPS). The EPS kept a copy of the manifest for tracking and filing.

A small amount of radioactive material was present at the hospital laboratory during the PSIs. Uranyl Nitrate is a low-level radioactive compound formerly used by the hospital laboratory. The Uranyl Nitrate was removed from NSRR on February 10, 2004 and disposed of by New World Technology in accordance with Federal, Commonwealth and Navy regulations.

The ECP investigation uncovered no environmental issues associated with medical waste. However, a medical waste incinerator was investigated under the IRP (SWMU 15). The incinerator (former Building 1928) was taken out of operation in October 1998 and was removed from this site in the fall of 1999. Currently, the area where the former Building 1928 existed is now grass covered. There is no visual evidence of any releases observed from this unit based on the 2003 ECP inspection.

5.11 MUNITIONS AND EXPLOSIVES OF CONCERN (MEC)

This section presents the results of the ECP investigation of munitions and explosives of concern (MEC), which at NSRR includes:

- Small arms ranges
- Explosive Ordnance Demolition (EOD) activities
- Potential Unexploded Ordnance (UXO) issues
- Ammunition storage magazines (not technically an MEC issue but presented in this section for continuity)

The results of the ECP investigation with regard to MEC issues is presented in Table 5-94. The location of ECP Sites involving small arms ranges and training areas are depicted in Figure 5-95.

5.11.1 Small Arms Ranges

As shown in Table 5-94, NSRR has one area of active small arms ranges (the Punta Medio Mundo Peninsula). The table also describes the location/operational history of former small arms ranges. With all, the environmental concern is lead deposited in the backstops of the ranges (as well as lead shot at the former skeet range).

5.11.2 Heavy (Crew-Served) Weapon Ranges

The ECP investigation uncovered no evidence of crew-served (i.e., requiring more than one person to operate) weapon ranges on NSRR. Given NSRR's proximity to the island of Vieques, with its vast range/impact areas, it is logical to assume such ranges would have existed only at Vieques, if at all.

5.11.3 UXO/Impact Areas

No impact areas (artillery, mortar, bombs, etc.) were identified on NSRR property. Given the fact that all sections of the station property are or were built-up, it is highly unlikely that an impact area could have been safely situated on the station, and given the station's proximity to Vieques Island, it is improbable there would be a need for an impact area on the station.

Table 5-94. ECP Sites involving Small Arms Ranges/Training Areas

LOCATION[1]	USE	Dates of Operation	Site Photo No.	ECP Site No.[2]	REMARKS
Punta Medio Mundo Peninsula	Small Arms Ranges Possible EOD Activities	1950s (est.) - Current	A-15-17	1	The Punta Medio Mundo peninsula on the northeast side of the station is the location of both active and historic small arms ranges. It is clear from aerial photography analysis that range locations have moved periodically throughout the peninsula since the station was established. There is no evidence this peninsula was ever used as a range for crew-served weapons or as a firing point or impact area for indirect fire weapons (e.g., artillery, mortars). In addition, a 1958 aerial photo identified three conical pits consistent with use for munitions disposal or detonation. Records reviews, physical site inspections, and interviews conducted during the PSI investigation provided no further evidence of use of these pits for munitions disposal or detonation.
Punta Puerca	Small Arms Range	1940s-early 1950s (est.)	A-103-106	4	A 1958 aerial photo identified structures and clearing associated with a small arms range. An historic station map (circa 1950s) identified this area as a former rifle range. Interviews confirmed use of the area as a rifle range in the 1940's. The PSI identified what appeared to be a concrete berm backstop and target placements running parallel to the shoreline approximately 50 yards inland. The location of the presumed target structures behind the berm suggest the berm may have been used (in addition to its use as a bullet backstop) as protection for target attendants and that the bullets landed in the sea.
Site of Current BEQ	Pistol Range	1940s-mid-1950s (est.)	A-28	9	A 1958 aerial photo identified a cleared rectangular area with ground scarring consistent with a small arms range (already showing signs of being overgrown at this time). Station historic maps (1940s-1956) identified this area as a former pistol range. Interviews did not confirm or repudiate use of the area as a pistol range. The PSI could not detect evidence of a former pistol range, since the area is currently disturbed/ covered by the new BEQ.
Southwest End of Airfield	Skeet Range	1940s-1950s (est.)	A-29, 30	10	A 1958 aerial photo identified two small structures consistent with a skeet range. Historic maps also identify a skeet range in this location. The PSI did not observe any evidence of former skeet range; however, interviews confirmed use of area as a skeet range in the 1940s, possibly 1950s.
Piñeros and Cabeza de Perro islands	Small Arms Maneuver Training, EOD[3] Training, Potential UXO[4]	1950s – 1990s	A-47, 48, 80, 81	23	Record reviews and interviews indicate that these islands have been used for military training and maneuvering exercises since the late 1950s. Training exercises are reported to have included EOD operations with up to 5 pounds of plastic explosives, and maneuvering exercises have included the use of pyrotechnic devices (e.g., flares), training grenades, claymore mines, and various types of small arms munitions. On Piñeros Island, the PSI observed numerous spent small arms munitions and flares, but no evidence of crew-served or heavy weapons usage. The PSI identified no evidence of military activity on Cabeza Island. There is no evidence either island was ever used as a range for crew-served weapons or as a firing point or impact area for indirect fire weapons (e.g., artillery, mortars). The shoreline of the western half of Piñeros Island is heavily posted (of recent origin) with signs warning of the presence of UXO. The PSI included a significant portion of the island. No UXO was identified. Furthermore, the ECP investigation uncovered no evidence that either island was ever used as an impact area.
MUNITIONS STORAGE					
The NSRR ammunition storage magazines are located primarily in a large area just south of the Ofstie Field runway. A smaller magazine storage area is directly south of this larger area. The Weapons Department operates the ammunition storage areas (approximately 141 ha [348 ac] including 37 magazines and 10 ready service lockers) (see Figure 5-77). The ammunition magazines have an earth-turf grass cover and therefore require regular maintenance. The areas around the magazines and ready service lockers are maintained once a month. To aid in preventing fires in these areas, regulations require that the grass near the magazines be no more than 18 inches in height, grass cuttings raked during dry periods, and no power mowers be used within 5 feet of the magazine fence line. Historically, these magazines were used to store a variety of small arms and aircraft munitions, as well as munitions/explosives to support maneuver training (flares, mines, etc). At the time of the ECP investigation, many of the magazines were emptied and sealed in preparation for a closure inspection by Navy munitions clearance experts.					

1 – See Figure 5-76
2 – See Section 5.4
3 – Explosive Ordnance Disposal
4 – Unexpolded Ordnance

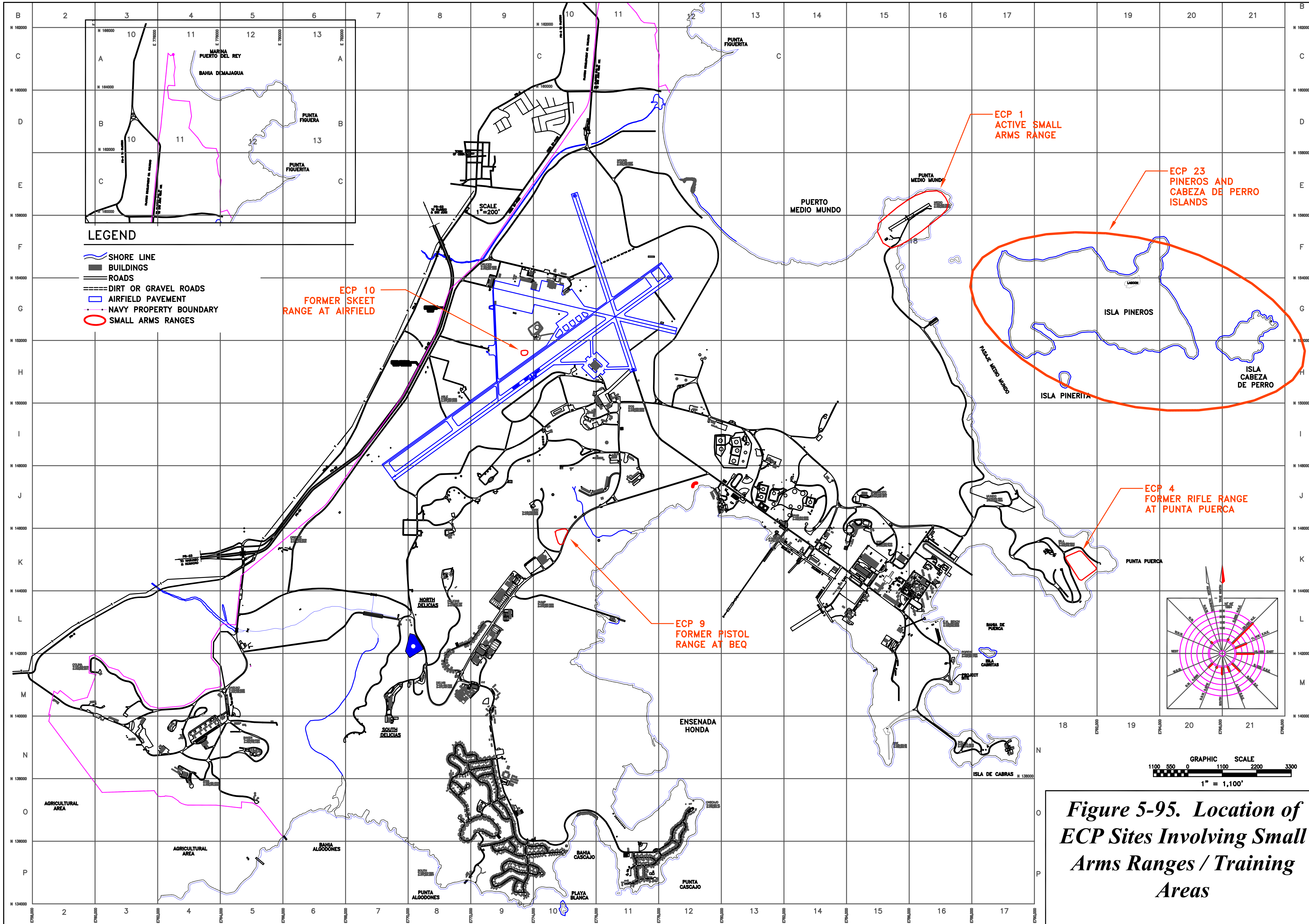


Figure 5-95. Location of ECP Sites Involving Small Arms Ranges / Training Areas

NAVAL STATION ROOSEVELT ROADS EXPLOSIVE SAFETY QUANTITY DISTANCE ARCS

BUILDING NUMBER	MAGAZINE DESIGNATION	ALLOWED CAPACITY (LBS)	ESQD DISTANCE	CLASS & DIVISION	TABLE IN NAVSEA OP-5
300	1 Y 1	300,000	100'	1.4S	7-22
301	1 Y A&B	5,000	800'	1.2G/1.2H (08)	7-17
302	1 Y 3	300,000	800'	1.2D(08)	7-17
303	1 Z 4	100,000	100'	1.4G	7-22
305	3HT1	15,000	1,250'	1.1B	7-9
306	3HT2	7,500	400'	1.2G(04)	7-16
307	3HT3	15,000	1,250'	1.1D	7-9
308	3HT4	15,000	1,250'	1.1B	7-9
309	3HT5	15,000	1,250'	1.1G	7-9
310	3HT6	15,000	1,250'	1.1F	7-9
311	4BTX1	55,000	1,520'	1.1D	7-9
312	4BTX2	100,000	1,655'	1.1G	7-9
313	4BTX3	50,000	1,475'	1.1D	7-9
314	4BTX4	30,000	1,250'	1.1D	7-9
358	7NC1	125,000	500'	1.3G	7-20
359	7NC2	10,000	400'	1.2D(04)	7-16
360	7NC4	125,000	380'	1.3L	7-38
380	AQM OP-BLDG	6,000	600'	1.3L	7-38
384	2X T 2X	40,000	1,370'	1.1E	7-9
764	7NC5	125,000	800'	1.2C(08)	7-17
765	7NC6	125,000	100'	1.4C	7-22
766	7NC7	30,000	1,250'	1.1D	7-9
777	TEMP. STORAGE	5	100'	1.4C	7-22
1625	TEMP. STORAGE	20	100'	1.4C	7-22
1681	4BTX5	100,000	1,855'	1.1D	7-9
1682	4BTX6	60,000	1,565'	1.1D	7-9
1682A	4BTX7	60,000	350'	1.1D	7-9
2023	BOMB BUILD-UP	30,000	280'	1.1	7-9
TENT CITY	CBT ACFT LDG AREA	30,000	1,250'	1.1	7-9
CL RWY 18	CAR CBT ACFT LDG AREA	30,000	1,250'	1.1	7-9
CL RWY 36	MSL CBT ACFT LDG AREA	11,400	700'	1.1	7-10
PIER 2	ORDINANCE HANDLING	20,000/230,000	400'	1.2(04)/1.3	7-16/7-20
PIER 3	ORDINANCE HANDLING	2,500	1,250'	1.1	7-9
SMALL CRAFT	ORDINANCE HANDLING	1,000	1,250'	1.1	7-9
WET SLIP AREA	ORDINANCE HANDLING	200	100'	1.3/1.4	7-20/7-22
RSL 1 CABRAS	TEMP. STORAGE	1,000	100'	1.3	7-20
RSL 2 CABRAS	TEMP. STORAGE	25	400'	1.2(04)	7-16
RSL 3 (860)	TEMP. STORAGE	25	100'	1.4	7-22
RSL 4 (394)	TEMP. STORAGE	25	100'	1.3	7-20
RSL 5 BBU	TEMP. STORAGE	200	100'	1.4	7-22
RSL 6 BBU	TEMP. STORAGE	200	100'	1.3	7-20
RSL 7 BBU	TEMP. STORAGE	100	1,250'	1.1	7-9
RSL 8 NSWU-4	TEMP. STORAGE	200	75'	1.3	7-20
RSL 9 (H200)	TEMP. STORAGE	200	75'	1.3	7-20
RSL 1589 & 1591	TEMP. STORAGE	200	75'	1.3	7-20
RSL 1593 & 1623	TEMP. STORAGE	200	100'	1.4	7-22
RSL 1665-1668	TEMP. STORAGE	200	100'	1.3	7-20
TRK HOLDING AREA	ORDINANCE HANDLING	30,000	1,250'	1.1	7-9
RSL 10 (EOD)	TEMP. STORAGE	100	670'	1.1	7-9
RSL 11 (EOD)	TEMP. STORAGE	100	670'	1.1	7-9
RSL 12 (H200)	TEMP. STORAGE	200	100'	1.3	7-20
BULKHEAD "C"	ORDINANCE HANDLING	5,000	116'	1.3/1.4	7-20/7-22
BULKHEAD "D"	ORDINANCE HANDLING	20	100'	1.4	7-22

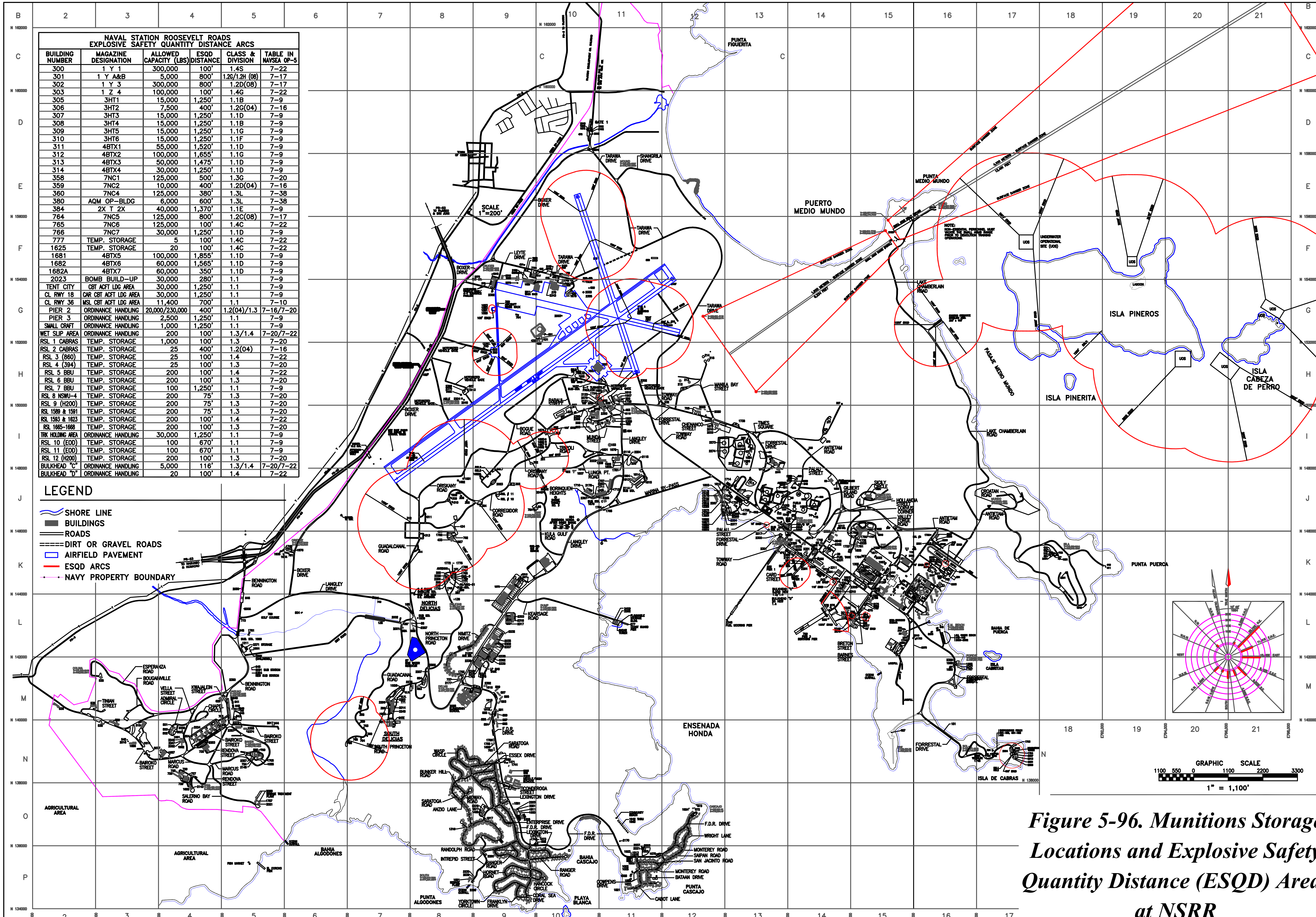


Figure 5-96. Munitions Storage Locations and Explosive Safety Quantity Distance (ESQD) Areas at NSRR

The shoreline of the western half of Piñeros Island is heavily posted (of recent origin) with signs warning of the presence of UXO. The PSI included a significant portion of the island. No UXO was identified. Furthermore, the ECP investigation uncovered no evidence that either Piñeros or Cabeza de Perro islands were ever used as impact areas.

5.11.4 EOD and Open Burning/Open Detonation Activities

A 1958 aerial photo did identify three conical pits consistent with use for munitions disposal or detonation on the Punta Medio Mundo peninsula. While certainly plausible, given disposal practices of the time (1940s-1950s), the ECP investigation could identify no evidence to support this supposition.

There is ample evidence that EOD training occurred at Piñeros Island and anecdotal evidence that some occurred on Cabeza de Perro Island [Note - the PSI identified no evidence of military activity of any kind on Cabeza de Perro Island]. However, it is important to note this was characterized as "training", reportedly using up to 5 pounds of plastic explosives, as opposed to actual EOD operations (where live munitions would be detonated as a means of disposal). While the ECP investigation uncovered no evidence of OB/OD operations (which might deposit UXO in "kick-out" areas), it is possible that the two terms (OB/OD and EOD) are used interchangeable by "old-timer" interviewees. It is certainly possible, though unverifiable from available evidence, that EOD training exercises are the source of the suspicion of the presence of UXO on Piñeros Island. As with other areas discussed above, given the station's proximity to Vieques Island, the site of substantial EOD and OB/OD operations, it is implausible to assume Piñeros Island was used for such activity, at least on a significant scale.

5.11.5 Munitions Storage Magazines

Since establishment of NSRR, munitions storage magazines have been used for the storage of various types of munitions, including bombs, missiles, explosive projectiles, pyrotechnics (e.g., flares), small arms ammunition, and any other ordnance-related items. These munitions storage magazines are located in a secure area south of the Ofstie Airfield.

A magazine close-out inspection was conducted at NSRR by the Naval Ordnance Safety and Security Activity (NOSSA) in February 2004. This inspection confirmed that all magazines were completely cleared of all ordnance-related items, and no explosive residuals or contaminants were present in the magazines.

5.12 LEAD-BASED PAINT

Eight hundred seventy-nine buildings at NSRR were constructed prior to 1978, the year in which lead-based paint (LBP) was banned for consumer use. These buildings, and any other structures built before 1978 are presumed to contain LBP. A comprehensive LBP survey has not been conducted at NSRR, however surveys have been conducted in specific areas at NSRR.

A LBP survey was performed at NSRR in May and June 1995 (Lead Activity Summary, 1998). Areas inspected for LBP as part of this survey include: Capehart Housing, SR 3 & 4 Housing, Turnkey Housing, Flag Housing, Algodones Housing and Playgrounds (3102). The survey consisted of sampling intact paint, paint dust and soils surrounding buildings in order to determine if lead is present and, if so, the level at which it is present. Results for each of the sampling media is as follows:

<u>Lead in Paint</u>

LBP was identified on some components within the Capehart Housing community. The LBP components were identified as intact at the time of inspection. LBP was also identified on equipment located at the Quarters 15 Nimitz playground. These pieces of equipment have since been removed. No LBP was found at the SR 3 & 4 Housing, Turnkey Housing, Flag Housing or Algodones Housing.

<u>Lead in Dust</u>

None of the paint dust samples analyzed for this survey contained lead levels that exceeded the corresponding action limit. However, the presence of LBP within the Capehart Housing areas creates the potential for elevated lead levels in dust if the paint is not properly maintained.

<u>Lead in Soil</u>

One of the soil samples collected at the Algodones Housing area was found to have an elevated level of lead in soil (above the 400-ppm action level). Because only one sample exceeded the action level, the sample is considered an isolated event and not representative of the entire community. The level of lead in the sample, however, was above the 5,000-ppm threshold, above which the EPA recommends soil abatement. Soil samples in all other areas investigated had no detections for lead in soil. No documentation of soil abatement as a result of the elevated lead detection was available.

In August 1998, another LBP survey was conducted at NSRR in Buildings 161, DN2-3 and 1625. One sample, collected from Building DN2-3, was identified as containing LBP. Paint observed during the survey was noted to be in good to fair condition, thereby not representing an immediate threat to health. Air samples collected in each of the three buildings were below the Occupational Safety and Health Administration (OSHA) permitted levels for lead (DMG 1998b).

A LBP inspection and risk assessment of family housing is underway and targeted for completion in late Summer 2005. When published, this report can be consulted for the most up-to-date LBP information.

5.13 WATER AND WASTEWATER

5.13.1 Potable Water

Potable water at NSRR originates as rainfall in the Sierra de Luquillo mountain range 8 miles west of the NSRR water treatment plant. Raw water is collected near the Puerto Rico Authority for Electric Energy Hydroelectric Plant through two intakes, Intake 1 and Intake 2, approximately 11 miles west of the treatment plant. Intake 1 is a stream intake structure along the Rio Blanco River, which winds its way towards NSRR from the Sierra de Luquillo range; Intake 2 is a drop inlet built into the invert of the hydroelectric plant's discharge tailrace, obtaining water supplied by a combination of six (Cubuy, Sabana, Mucaros, Hicaro, Prieto, and Foreday) remote mountain reservoirs. Raw water from the combined intakes continues approximately 50 ft beyond Intake 2, where it enters a reinforced concrete grit chamber at approximately 95 ft above mean sea level (MSL). Degritted water flows from the grit chamber, through a 27-inch-diameter reinforced concrete transmission main, 10.81 miles to a 46.1-million gallon reservoir where water is stored for use by the NSRR water treatment plant at an elevation of approximately 47 ft MSL. The water treatment facility (see photo A-116), reservoir (see photo A-115), transmission main, and intake system were constructed during 1942 and 1943. Figure 5-97 depicts the potable water treatment and distribution system at NSRR.

The reservoir serves as a buffer to dampen out fluctuations in raw water flow, turbidity, and color and to provide 10 days of emergency reserve at design flow (the plant's maximum rated capacity is 4.0 mgd). The reservoir is a concrete-lined basin with a distribution inlet, an overflow, and a discharge structure incorporating two discharge pipes. It has a 5.6-acre surface area, with a 30-foot design depth. The reservoir inlet is a 24-inch-diameter cast-iron pipe; this diameter is reduced from that of the 27-inch diameter transmission main from the intakes. The reservoir overflow is a broad-crested concrete weir that drains to a paved concrete ditch. One discharge pipe is a 24-inch-diameter main extending to the plant building, where two raw water booster pumps are located. Water flows either by gravity or is discharged by the booster pumps into a flash-mixing basin. Another reservoir discharge is a 16-inch-diameter pipe that may be used to drain the reservoir and allow sediment to discharge into the concrete-paved ditch. Three drainage valves control the drain lines that serve the discharge pipe.

The raw water transmission main and intake were repaired during 1991. Work included a new Intake 1 screen, removal of accumulated sediment in the grit tank, replacement of access hatches and goosenecks at the grit tank, and provision of air and vacuum relief valves at certain high points along the raw water transmission main profile between the intakes and the treatment plant.

The water treatment plant is operated as a conventional, rapid sand filter plant. The treatment process consists of gravity feed from the reservoir supplemented with booster pumps if needed, aerated rapid mix chamber, two hydraulic flocculation basins, two sedimentation tanks, four dual media rapid sand filters, and a clearwell. Chemical feed facilities are provided to dose alum, lime, chlorine, and fluoride. There is a control building at the plant that houses the main plant controls, filter consoles, two offices and a laboratory. The laboratory is used for performing water and wastewater quality testing as it relates to plant performance, including testing for changes in turbidity, determining adequate process chemical dosages and monitoring the effluent chemical concentrations.

A major repair of the system was undertaken in 1976 to replace the sand media, filter underdrains, filter control console and valves; surface washers were also added at this time.

During 1977 and 1978, two sludge lagoons (see photo A-66) were constructed to capture and thicken solids generated during the treatment process. During normal operations, solids would be discharged to one of the two lagoons and allowed to settle out; solids could be stored in the lagoon until such time as they could be conveniently removed for ultimate disposal by the Base Operations Service Contractor to the landfill. The clear water that remained after the solids were settled out in the lagoon would be decanted back to the head of the plant for reuse [this clear water is now discharged into the Bundy wastewater system (see Section 5.13.2) for further treatment]. Prior to the 1977 lagoon construction, the water plant solids were simply discharged to an onsite concrete ditch and then to neighboring marshlands. These sludge lagoons were investigated as SWMU 42 under the station's IRP; see Section 5.3.42 for details.

Another major repair program, undertaken in 1986, included improvements of the chemical feed facilities and laboratory in addition to replacement of the flash mix basin aeration piping and blowers. A new emergency generator, finished water pump, backwash pump, piping and valves were also included.

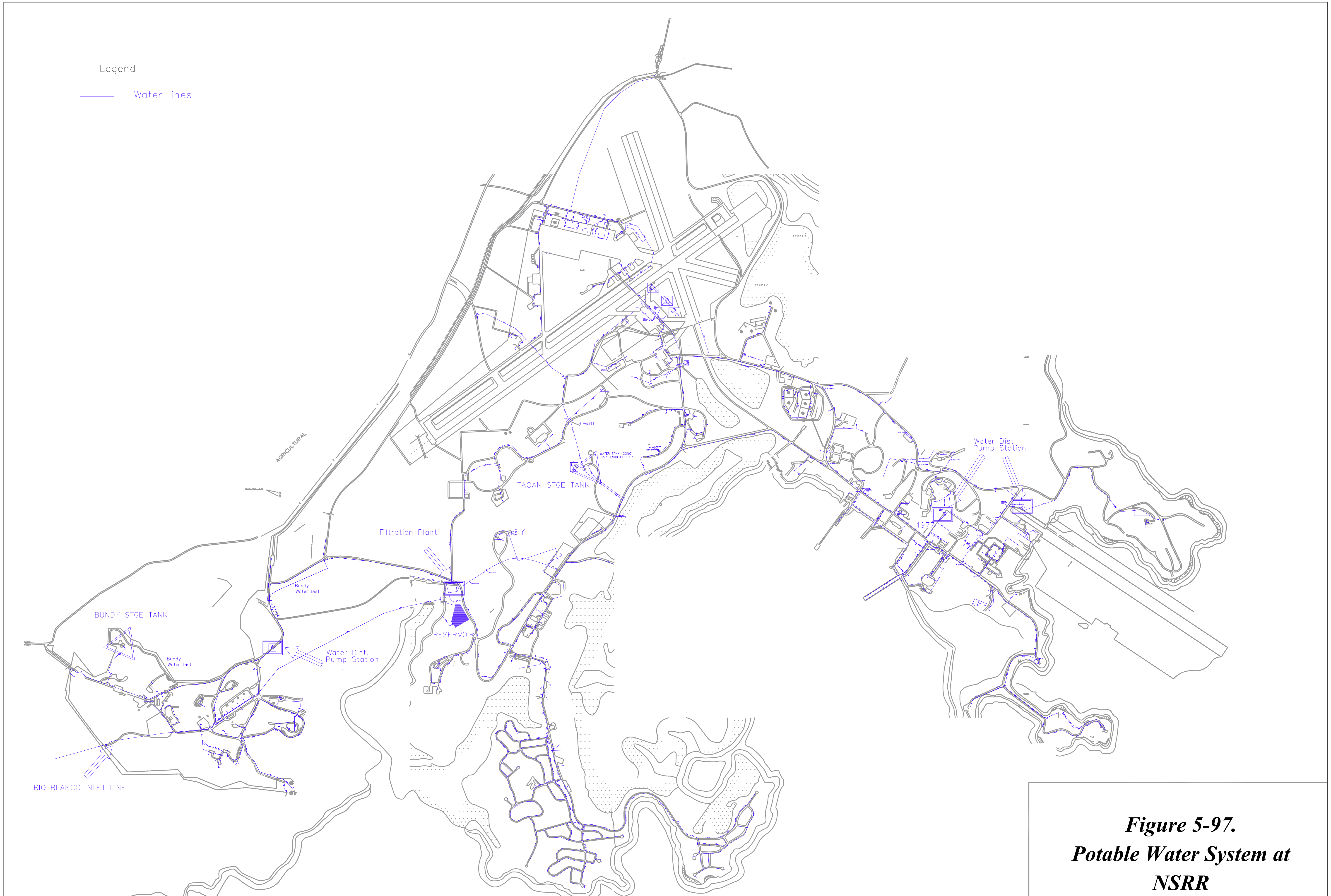


Figure 5-97.
Potable Water System at NSRR

The electrical and electronic controls for the plant were replaced in 1987. Work on this project included replacement of the filter control console, selected value actuators, level sensors, and loss of head sensors. During 1991, selected valves and/or actuators were replaced in the filter pipe gallery. In addition, a radio telemetry system with ultrasonic level sensors was installed at Finished Water Storage Tanks 86, 96, and 535. Finished water pumps were controlled based on levels in Tank 86 (Weston 1993).

In 1995, a repair program for the filtration system was undertaken. Under this contract, the filter media was replaced along with the control valves and filter control consoles. Then, in 2001, the valves and piping in the diversion chamber were replaced, and chemical feed systems and the laboratory were upgraded.

The water distribution system has approximately 68 miles of PVC and cast iron pipe with main lines ranging from 6 to 18 inches in diameter. Potable water is stored in five tanks with total capacity of 2.63 million gallons. An additional 520,000 gallons of water is stored in two tanks for fire suppression. Flow and pressure conditions throughout the system are controlled by three booster pumping stations, four pressure reducing valves, and one check valve.

As of December 2003, the NSRR water treatment system was meeting all applicable regulations for finished water quality as mandated by the Puerto Rico Department of Health (EPA SDWIS, 2004). The available water quality data indicate that the tested parameters on the raw water do not exceed EPA's limits for drinking water. No previous or ongoing violations have been reported for the water treatment system.

The ECP investigation identified no environmental concerns relating to the operation of the water treatment plant or the distribution system.

[Note: NSRR groundwater is not a source of potable water at NSRR (see Section 2.7).]

5.13.2 Wastewater

There are currently three wastewater treatment plants (WWTP) located at NSRR that receive and treat the wastewater that is generated on the station. These plants were originally constructed in the early 1970s. Evidence of the wastewater systems in place prior to the 1970s is fragmented and incomplete. Available evidence (the Fort Bundy 1954 and NSRR 1963 "Existing Conditions" maps) suggests the majority of the wastewater generated in the Bundy area was collected and treated by an Imhoff tank located at the site of the current Bundy WWTP and then discharged into the ocean (see "Septic Tanks" below). An Imhoff tank consists of a chamber that receives and processes sewage. It provides clarification of sewage through simple sedimentation, along with digestion of the extracted sludge. Usage of this treatment process is presumed to have continued until the construction of the Bundy WWTP in the 1970's.

Available evidence [the NSRR 1945, 1949, and 1963 "Existing Conditions" maps (see Appendix E)] also suggests that the majority of the wastewater generated from the rest of the station was originally collected and discharged without treatment into the ocean through an outfall located near Pier 3 (see "Septic Tanks" below). Discharge of the raw sewage into the ocean was discontinued after the Capehart and Forrestal treatment plants were constructed in the 1970's.

The currently operational WWTP are the Bundy WWTP (permitted capacity of 0.655 mgd), the Capehart WWTP (permitted capacity of 1.13 mgd) and the Forrestal WWTP (permitted capacity of 1.01 mgd). The wastewater plants operate under NPDES permit #PR0020010, however this permit expired on January 31, 2003. The permit is under Administrative Continuance.

All of the industrial wastewater and the majority of the domestic wastewater generated on NSRR is collected and transported to the treatment plants through a collection system that consists of approximately 32.5 miles of gravity lines, 9.5 miles of force mains, 28 pump stations, and 6 grinder stations. The gravity mains vary in size from 6 inches to 24 inches in diameter; the system includes approximately 906 manholes. The force mains vary in size from 4 inches to 10 inches in diameter (GFI 2002). Figure 5-98 depicts the existing collection and treatment system at NSRR.

Figure 5-98. Wastewater Collection and Treatment System at NSRR

Only minimal discharges of industrial wastewater are received at the NSRR WWTPs. The industrial wastewater generated at NSRR is a combination of effluent from facilities such as the Ofstie Airfield and its support facilities, a 600-bed hospital, a veterinary clinic, vehicle maintenance garages, auto hobby shops, the Public Works Department, numerous storage facilities, three ship piers (see photos A-110 through A-112), weapons facilities, two pesticide control facilities, two schools and a marina. The only industrial pretreatment systems at NSRR address oil that spills into the collection system. The available pretreatment processes include treatment by one of the oil/water separators or by the oil spill recovery system that is located at the Forrestal WWTP. Any oil that enters the collection system in either the Bundy or Capehart area flows straight into the treatment plants; however, any oil and grease discharges to these WWTPs during historic and current operations were/are minimal, and of an insufficient quantity to cause pass through or interference in the plants' treatment processes. The OWSs are located at points where a mixture of oil and water is generated regularly, usually near fueling facilities or vehicle washracks. The OWS tank prevents the oily wastewater from flowing to the treatment plants by allowing the oil to float to the top and the clean wastewater to settle to the bottom and then flow into the wastewater collection system. Refer to Section 5.5.3 for a detailed discussion of the existing OWSs. The oil spill recovery system at the Forrestal WWTP is addressed in the description of the wastewater plant found below.

Forrestal WWTP: The Forrestal WWTP (see photo A-68) receives the majority of the wastewater from the industrial facilities described above as well as domestic wastewater from the enlisted personnel barracks and the officer's quarters. Raw wastewater enters the treatment plant and immediately flows through a headworks facility that consists of a bar screen followed by a grit chamber. The flow is then metered by a Parshall flume and is pumped to a lagoon that is used for equalization and aeration. The lagoon also contains an oil recovery system that consists of a floating baffle wall to contain the oil from the surface of the wastewater and direct it to an oil skimmer structure to be captured. The effluent wastewater from the lagoon flows to the primary clarifiers and then to splitter boxes. The dosing tanks divide the flow equally and send it to two plastic media trickling filters. The flow from the trickling filters is then pumped by the recirculation pump station to the secondary clarifiers, however portions of the trickling filter effluent are recirculated back to the dosing tanks. Effluent from the final clarifiers is then sent to the tertiary pump station where it is pumped to the upflow denitrification filters, where methanol is added to enhance denitrification. From the denitrification filters, flow passes to the chlorine contact tank where chlorine is added to achieve disinfection. Once adequate disinfection time has been achieved, sulfur dioxide is added to remove any residual chlorine and sodium hydroxide is added for pH adjustment. Effluent from the chlorine contact tank then passes through cascade aeration and into the effluent Parshall flume where final flow metering occurs. The treated wastewater effluent is discharged to the ocean through an outfall.

In the sludge treatment system, sludge from the primary clarifiers is sent to the anaerobic digesters. Sludge from the secondary clarifiers flows to the return sludge pump station where it is pumped to the digesters. In the digesters the secondary clarifier sludge and the primary sludge are mixed and anaerobically digested. After digestion, the digester supernatant is returned into the treatment process immediately upstream of the equalization/pre-aeration lagoon and the digested sludge is sent to sludge drying beds. The filtrate from the sludge drying beds is recycled to the return sludge pump station and the dried sludge is then landfilled (GFI 2002).

Capehart WWTP: The Capehart WWTP receives sewage from the Capehart housing area and several other facilities including an elementary school, a high school, a television studio, and the Station Communication Center. Raw wastewater enters the treatment plant into a headworks facility that contains a bar screen and a grit chamber. As the wastewater leaves the headworks facility, it is metered by a Parshall flume before it flows to the headworks pump station. The flow is then pumped to the aeration tanks, and then to the final clarifiers. Once the flow is treated by the secondary clarifiers, the effluent flows to the tertiary pump station and is pumped to the upflow denitrification filters where methanol is added for denitrification. Effluent from the filters then passes to the chlorine contact tanks where chlorine is added for disinfection. Effluent from the contact tanks is then dosed with sulfur dioxide to remove any residual chlorine and sodium hydroxide to adjust the pH. The flow then passes through cascade aeration and into the Parshall flume for final metering. The treated effluent is discharged into the ocean through an outfall.

The sludge treatment system consists of aerobic digesters that treat waste activated sludge that is sent from the secondary clarifiers. Once the sludge is fully digested, it is sent to sludge drying beds where the percent solids content is increased. Filtrate from the sludge drying beds is collected and is recycled back to head of the treatment plant and the treated and dried sludge is landfilled (GFI 2002).

Bundy WWTP: The Bundy WWTP (see photos A-63 through A-67) receives sewage primarily from the Bundy housing area, officer's quarters, enlisted personnel barracks, and military messes. The treatment process begins when raw wastewater enters into the headworks facility. This facility consists of a bar screen and a grit chamber followed by influent metering with a Parshall flume. From the Parshall flume, the wastewater flows to the primary clarifiers where it undergoes primary treatment before it flows to the dosing tanks. The dosing tanks evenly divide the flow and send it to two plastic media trickling filters. Treated effluent from the trickling filters flows to the recirculation pump station, which pumps the majority of the flow to the secondary clarifiers. That flow which is not sent to the secondary clarifiers is recirculated back to the dosing tanks. Effluent from the secondary clarifiers discharges to the tertiary pump station which pumps the flow to the upflow denitrification filters where methanol is added to enhance denitrification. The flow then passes to the chlorine contact tanks where chlorine is added for disinfection. Sulfur dioxide is then added to remove any residual chlorine and sodium hydroxide is added for pH adjustment as the flow passes to the cascade aeration process. Exiting cascade aeration, the flow goes through final flow metering that is achieved through the use of a Parshall flume and then the treated effluent is discharged into the ocean through an outfall.

Sludge treatment begins by sending sludge from the primary clarifiers to the anaerobic digesters where it is mixed with sludge from the secondary clarifiers is pumped to the digesters by the return sludge pump station. In the digesters, the sludge is anaerobically digested and, once digestion is completed, is sent to the sludge drying beds. The supernatant produced by the digestion process is recycled into the treatment process just upstream of the primary clarifiers. At the sludge drying beds, the filtrate is recycled to the return sludge pump station while the dried sludge is landfilled (GFI 2002).

The ECP investigation did not identify any environmental concerns as a result of the operation of the wastewater treatment plants. There have been no reported spills or releases of any of the chemicals stored onsite or any significant releases of untreated wastewater. Also, each of the wastewater treatment plants contains a backup generator with a 500-gallon diesel fuel tank. No spills have been reported from these systems.

The NSRR below ground sanitary and storm sewer systems were identified as SWMU-38 in the IRP. It was determined that no RFI was required (see Section 5.3.38).

Septic Tanks

Detailed records were not available to fully evaluate the septic tanks that were utilized prior to the construction of the wastewater treatment plants in the 1970s. However, a review of the available information revealed the following:

- The Initial Assessment Study performed in 1984 indicated that until 1973 there were approximately 40 septic tanks in service at NSRR varying in size from 500 to 4,000 gallons. At this time, many operating septic tanks were closed (see discussion below regarding active septic tanks).

- Three septic tanks were identified on the 1954 General Layout map of the Bundy area. These include one tank at the East Gate (Gate 3) and two tanks located in a remote area on the southwest side of the Bundy area. These three tanks would have received a small fraction of the wastewater generated in the Bundy area as they were located in remote parts of the station. A circa 1970s General Development Map depicting the sanitary sewage system as it was constructed at that time calls out an absorption field for the septic tank located at Gate 3. Due to its location, this system probably only accepted municipal waste. No details are available on the operation of the other two septic tanks identified in the Bundy area and none of the three tanks are on the list of currently permitted and active septic tank systems. The majority of the municipal and industrial wastewater in the Bundy is presumed to have been collected through a series of pipes and pumping stations and sent to an Imhoff tank for treatment.

- Two maps of NSRR proper (the station minus the Bundy area), dated 1945 and 1949, depicting the conditions of the station, showed two pumping stations and a line labeled as a sewer and a sewer outfall into the bay near the current location of Pier 3. From this it can be surmised that the majority of the municipal and industrial waste generated on station was collected in this system and discharged as untreated sewage into the bay. No septic tanks are shown on this map but five are called out on an undated General Development Map that depicts the sanitary sewage system as it was constructed in the 1970s. These septic tanks are located at Gate 1, Building 762, Building 1807, and near the marina and at the telemetry building (Building 774). The map also details an absorption field for the septic tank located at Gate 1. Due to this location, this system probably only accepted municipal waste. Only the septic tank located at the telemetry building is on the list of currently permitted and active septic tank systems (see below for more information on active systems). No details are available on the operation of the other three septic tanks.

- The Initial Assessment Study also indicated that the old Pesticide Shop (building 258) was serviced by a 500-gallon septic tank until the early 1980s. It is suspected that this tank received pesticide waste while the shop was still active. Specific details regarding this system are not known but there is the possibility that a drain field may have been part of this system (under the assumption that the building would otherwise have been connected to the station wastewater lines). Building 258 is being investigated as SWMU-13 under the IRP (see Section 5.3.13).

In examining all the historical records for the septic systems, it can be concluded that the majority of the industrial waste generated on station was discharged to the sewer system and not to septic tanks. In addition, it is reasonable to conclude that if site septic systems receiving industrial wastewater had discharged to septic fields, those would have been identified for investigation during the early stages of the IRP. Without having details regarding the specific operation of each septic tank, a definitive conclusion cannot be made regarding the extent of the environmental concerns that may be associated with historic septic tank systems.

With regard to active septic tanks, as of February 2004, there were eight operational septic tanks at NSRR. The eight operational septic tanks are located in remote areas of the station where it was not economically feasible to extend the sewer system. All of the septic tanks are permitted for operation as UIC Class VII systems, which are operated as holding tanks only (i.e., no drain field/discharge). Specific details regarding these tanks, including location and capacity can be found in Table 5-96.

Table 5-96. Active Septic Tanks at NSRR

Descriptor	Location	Permit ID	Capacity (gal)
Site 1	Cabras Island	UIC-95-0017	1,570
Site 2	Flying Club, Bldg. 801	UIC-95-0016	478
Site 4	Tacan, Bldg. 784	UIC-96-0032	1,500
Site 5	Telemetry, Bldg. 774	UIC-96-0034	1,570
Site 6	Brookings Beach, Bldg. 120	UIC-97-0024	1,500
Site 9	Telemetry, Bldg. 1931	UIC-96-19-0049	1,500
Site 10	Tea House, Bldg. 485	UIC-98-0100	1,000
Site 14	Carpenter Shop, Bldg. 2023	UIC-96-0033	710

There have been no reported spills or releases of untreated wastewater from these systems and there are no environmental concerns associated with any of the current septic tank systems.

5.13.3 Storm Water

NSRR has over 80 storm water outfalls located within the station boundary. These outfalls receive flow from a system of storm sewer pipes and storm ditches from both developed (industrial and residential) and undeveloped areas, and sheetflow from both paved and unpaved areas. The vast majority of these outfalls are not regulated under EPA's Multi-Sector General Permit program, due to the fact that they receive storm water from non-industrial activities or via sheetflow from non-industrial areas.

Six outfalls at NSRR are regulated under EPA's Multi-Sector General Permit program. NSRR obtained initial permit coverage in 1995, and re-applied for the permit in 2000, which became effective upon submittal. These six outfalls are regulated due to the Standard Industrial Classification (SIC) code for the type of industrial activity conducted in the area that contributes to the outfall. The six regulated outfalls and their associated SIC code/industrial activities are listed below (AMEC 2002).

- Outfall 001 – SIC Code 45: Air transportation facilities with vehicle maintenance and equipment cleaning activities.

- Outfall 002 – SIC Code 45 (see above) and SIC Code 5093: Scrap and waste material processing and recycling.

- Outfall 011 – SIC Code 44: Water transportation facilities with vehicle/vessel maintenance activities and/or equipment cleaning operations.

- Outfall 013 – SIC Code 40: Motor freight transportation facilities.

- Outfall 016 – SIC Code 4953: Landfills and land application sites.

- Outfall 017 – SIC Code 4953 (see above).

Table 5-97 presents a list of each regulated storm water outfall, the activities and buildings that contribute to them, the area covered by the outfall, the monitoring requirements for the outfall, and the receiving body of water for the outfall.

In addition to the industrial activities identified (and regulated) in Table 5-97, there are various other vehicle/equipment maintenance shops located throughout NSRR that conduct incidental maintenance activities on various types of vehicles. These facilities fall under SIC Codes 7538 and 7699, which are exempted from the Multi-Sector General Permit (AMEC 2002).

Recent inspections conducted under the station's Storm Water Pollution Prevention Plan (SWP3) did not identify any significant sources of potential environmental contamination associated with storm water discharges, outfalls, or storm ditches at NSRR (AMEC 2002).

Historically, storm water discharges from industrial areas were not regulated or controlled. Investigations conducted under the IRP at NSRR, specifically at SWMUs 38, 43, 44, and AOC D, evaluated suspected historical release of hazardous substances to storm water ditches, outfalls, and associated sediments. No significant releases of hazardous substances or subsequent human health risks were identified, and no further investigation was required at these sites (see Section 5.3).

Table 5-97. NSRR Regulated Storm Water Outfall Data

Outfall No.	Direction of Flow	Regulated Activities	Visual Monitoring[1]		Analytical Monitoring			Total Area (Acres)	Impervious Area (Acres)	Receiving Stream
			Frequency	Report	Frequency	Parameters	Report			
001	Storm water runoff from Buildings 379, 826, 1625, 1673, and 1690 is conveyed through the storm drainage system and then to Outfall 001.	SIC Code 45 – Air Transportation Facilities with Vehicle Maintenance and Equipment Cleaning Activities	Quarterly[2]	Maintain records	N/A	N/A	N/A	126.50	30.56	Machos Creek
002	Storm water runoff from Building 200, 827, and 860 is conveyed to either a concrete swale or storm sewer drop inlets and then to Outfall 002.	SIC Code 45 – Air Transportation Facilities with Vehicle Maintenance and Equipment Cleaning Activities	Quarterly[2]	Maintain records	N/A	N/A	N/A	863.06	146.82	Enseñada Honda
002	Storm water runoff from Building 1973 DRMO complex flows southeast into a storm sewer drop inlet, then northwest into a grassy swale along Tarawa Drive.	SIC Code 5093 – Scrap and Waste Material Processing and Recycling	Quarterly[2]	Maintain records	Quarterly[2]	Total Recoverable Copper, Total Recoverable Aluminum, Total Recoverable Iron, Total Recoverable Lead, Total Recoverable Zinc, chemical oxygen demand (COD), and total suspended solids (TSS)	Yes	863.06	146.82	Enseñada Honda
011	Storm water runoff from Building 2300 is collected and conveyed to Outfall 011.	SIC Code 44 – Water Transportation Facilities that have Vehicle Maintenance Shops and/or Cleaning Operations	Quarterly[2]	Maintain records	Quarterly[2]	Total Recoverable Aluminum, Total Recoverable Iron, Total Recoverable Lead, and Total Recoverable Zinc	Yes	0.80	0.07	Enseñada Honda
013	Storm water runoff from Building 2298 is conveyed either to the northwest or southeast into a storm water drainage ditch and then to Outfall 013.	SIC Code 40 – Motor Freight Transportation Facilities	Quarterly[2]	Maintain records	N/A	N/A	N/A	20.09	5.45	Bahia de Puerca

Table 5-97. NSRR Regulated Storm Water Outfall Data (cont.)

Outfall No.	Direction of Flow	Regulated Activities	Visual Monitoring[1]		Analytical Monitoring			Compliance Monitoring			Total Area	Impervious Area	Receiving Stream
			Frequency	Report	Frequency	Parameters	Report	Frequency	Parameters[4] (mg/l)	Report	(Acres)	(Acres)	
016	Storm water runoff of the southern portion of the landfill facility flows northwest into culverts, into a retention pond, then north into a mangrove area.	SIC Code 4953 – Landfills and Land Application Sites	Quarterly[2]	Maintain records	Quarterly[2]	Total Recoverable Iron and TSS	Yes	Annual[3]	Ammonia, Alpha terpineol, Benzoic Acid, p-Cresol, Phenol, Total Zinc, pH, biological oxygen demand (BOD5), and TSS	Yes	(5)	(5)	Enseñada Honda
017	Storm water runoff from the northern portion of the landfill facility flows northwest into either grass swales or storm sewer drop inlets, then continues flowing northwest via the storm sewer system before discharging into a mangrove area.	SIC Code 4953 – Landfills and Land Application Sites	Quarterly[2]	Maintain records	Quarterly[2]	Total Recoverable Iron and TSS	Yes	Annual[3]	Ammonia, Alpha terpineol, Benzoic Acid, p-Cresol, Phenol, Total Zinc, pH, BOD5, and TSS	Yes	(5)	(5)	Enseñada Honda

Notes:

(1) Visual examination involves the examination of a grab sample taken during the first half-hour of runoff to note any color, sheen, odor, suspended solids, or other characteristics.

(2) The first Quarterly sample is required between 1 October 2001 and 30 September 2002 (year two of permit). If any parameters are above their respective cutoff concentrations, additional sampling for those parameters is required between 1 October 2003 and 30 September 2004 (year four of the permit).

(3) The first Annual sample is required between 1 October 2000 and 30 September 2001.

(1) The numbers in parentheses are the numeric limitations for each parameter. The first number is the daily max. concentration in mg/l and the second number is the monthly average maximum in mg/l.

(2) The drainage areas of Outfalls 016 and 017 are not available as they are located within the new landfill and their boundaries have not been delineated on the mapping.

5.14 RADIOACTIVE MATERIALS

Historically to the present, the handling, storage and transportation of radiological materials have been limited to medical and electronic calibration facilities. The x-ray units at the hospital and dental clinic are of the electron-generator type, and therefore, produced no radioactive material. The radiological calibration source, which was stored at the Naval Electronics Engineering Center, was checked and maintained by representatives of the Department of Energy (EEI 1984).

Low-level radioisotopes such as iodine were used in the Naval Hospital laboratories, which were certified to use and dispose of these materials. A small amount of radioactive Uranyl Nitrate was present at the hospital laboratory during the PSIs. Uranyl Nitrate is a low-level radioactive compound formerly used by the hospital laboratory. The Uranyl Nitrate was removed from NSRR on February 10, 2004, and disposed of by New World Technology in accordance with Federal, Commonwealth and Navy regulations. No other radioactive material was encountered during the ECP site inspections.

5.15 SOLID WASTE

As a result of the station closure, and the cessation/downsizing of most station activities, the generation of solid waste has reduced significantly. This section principally describes solid waste practices immediately preceding the referenced cessation/downsizing.

Both station personnel and private contractors have historically handled and transported solid wastes within and from NSRR. Wastes that are recoverable or resalable and oversized waste are collected by the Transportation Division and by various public works shops. Private contractors handle all recoverable wastes such as waste oil, dirtied fuels, batteries, tires and scrap metals. DRMO handles resalable wastes.

Records documenting historic solid waste practices at NSRR are scarce and fragmented. Historic waste disposal practices that led to hazardous releases, or otherwise adversely impacted the environment (e.g., the hospital incinerator at Bldg. 1790 discussed in Section 5.10) are presumed to have been identified and investigated under the Navy's IRP at NSRR (see Section 5.3). Historic disposal of solid waste was accomplished principally through landfilling (see SWMUs 1, 2, and 3 in Section 5.3).

The NSRR 2001 *Final Solid Waste Study*, based on information obtained between 1999 and 2001, estimates the total annual station generation of non-hazardous solid waste, before closure, to have been 13,582 tons. Non-hazardous solid waste is currently disposed of in the NSRR landfill [and an associated composting area], currently being investigated as SWMU-3 (see Section 5.3.3), or recycled through the NSRR recycling program. General solid waste, including paper, cardboard, glass, metal, aluminum cans, wood, plastic, rubber, leather, yard waste, food, textiles, and other non-food wastes, is disposed of at the NSRR landfill (see Section 5.16), unless composted or entered into the recycling program. The only additional non-hazardous solid waste disposed of at the landfill is treated sludge from the sanitary sewage treatment facilities (EnSafe 2001). Yard waste is generally composted and certain recyclable materials are recycled as part of the NSRR recycling program, both discussed below. Recent evaluations by the NSRR Public Works Department estimate non-hazardous solid waste generation for the full calendar year (CY) 2001 to be 10,000 tons and for CY 2002 to be 6,000 tons.

5.15.1 NSRR Recycling Activities

Historically, NSRR, via the Defense Reutilization and Marketing Office (DRMO), recycled a limited amount of solid waste (3% in 1999). Solid recyclables handled principally included wood, plastic, paper, and metals. In 1999, the NSRR Public Works Department built a Material Recovery Facility (MRF, Bldg. 2432) immediately north of the NSRR landfill near the end of Landfill Road. The facility consists of an 11,050-square-foot concrete building that houses solid waste processing equipment, an exterior metal hazardous materials building (225 square feet), and a surrounding asphalt paved area (43,000 square feet) inside a fenced and gated enclosure. This facility is designed to accept mixed and/or pre-sorted municipal solid wastes, and to sort and package the various recycled materials. In addition, the landfill operation includes a large wheel-mounted shredding machine used to produce mulch and compost from vegetative and landscape wastes, and from waste wood.

5.16 LANDFILLS

5.16.1 Closed Landfills

The primary disposal site for NSRR's solid waste from the early 1940's to the early 1960's was the "Army Cremator" garbage landfill/crematory located on the edges of, and encroaching into, the mangrove swamps along the shoreline of the Enseñada Honda bay (see Figure 5-4). This waste area was an unlined waste-pile/landfill now designated as SWMU-1 under the IRP and is comprehensively discussed in Section 5.3.1 (CH2MHill 2003a). Most wastes generated at NSRR and Fort Bundy were disposed of at this landfill during its years of operation. The trash was dumped in mounds at the site and burned every afternoon; the remains were compacted with a bulldozer. No trenches were used and no daily cover was applied. Though no historic records of hazardous waste disposal at this site were identified, it is presumed that the landfill accepted all categories of waste including hazardous waste (EEI 1984).

A secondary site was utilized from 1941 to 1959 for disposal of solid and possibly hazardous wastes. This site was an unlined waste-pile/landfill on the edges of, and protruding into, the mangroves along the shoreline of the Enseñada Honda bay (see Figure 5-5). The site is currently being investigated under the IRP as SWMU-2 and is comprehensively discussed in Section 5.3.2 (CH2MHill 2003a).

In 1972, a garbage boiler operation commenced at Bldg. 1936, just north of the current station landfill; this plant boiled foreign garbage (in compliance with USDA Regulations) from incoming ships prior to disposal in the landfill. Available information indicates that an average of 1,200 pounds of wet garbage were boiled daily between the years 1972 and 1982. Bldg. 1936 and its boiler were demolished in 1997 during the construction of the current landfill buildings. A 1,000 gal diesel UST (Tank 1936) was removed in February 1997, in accordance with EQB Regulations, prior to the demolition of building 1936. The land surrounding and including former Bldg. 1936 is currently being investigated as part of the area affected by the current station landfill under the IRP as SWMU-3 (see Section 5.3.3).

5.16.2 *Operating Landfills*

Since the mid 1960s, non-hazardous municipal solid waste has been disposed of at the NSRR Station Landfill, now being investigated under the IRP as SWMU-3 (see Section 5.3.3), located south of the Forrestal Wastewater Treatment Plant [see Figure 5-99 for most recent (March 2002) groundwater contour map of landfill site]. Until the enactment of RCRA in 1976, it is assumed that this landfill also accepted hazardous waste as evidenced by the discovery of such wastes at the site. The landfill is unlined, covers 85 acres, and accepts wastes in accordance with the EQB Solid Waste Management regulations. The method of disposal was initially of the trench fill type, involving excavation of a trench to a certain depth above the water table, then filling the trench with wastes, followed by covering with soil (CH2MHill 2003). Estimates of quantities of waste disposed of in the past (i.e. pre-1984) range from 40 to 60 tons per day (EEI 1984). In 1985, the landfill was converted to an area fill operation, with wastes being placed on top of the previously filled trenches (TEC 1996). In March 1999, a new vertical cell of ten acres was finished at the Station Landfill; the design of the new cell included a 2-foot clay liner and a run on/off collection pond (CH2MHill 2003).

In 2003 a landfill survey was conducted during a NSRR Landfill Evaluation to determine the total volume of solid waste disposed on the existing installations. Based on the actual disposal and operational conditions, an estimate of the used and available capacities of the landfill was calculated to be 74 months (6.2 years) as of September 2003. Although the new landfill cell was designed to last for 10 years (using an estimate of 40 tons per day plus 1% increases in usage per year), the equivalent of 2 years of design capacity was used within the first year of operation due to inefficient controlling of the cell compaction rate (i.e., the amount of cover material used).

On June 1, 2000 NSRR began the operation of a new solid waste facility consisting of a control building, yard waste composting area, and the new vertical lift (described above) on the existing solid waste landfill. The yard waste composting area accepts grass, brush, wood waste, and wooden pallets. The solid waste landfill accepts non-hazardous solid waste including domestic and commercial trash, treated dried sewage sludge, dirt rubble, and demolition/construction debris (JTI 2001).

The NSRR landfill is currently scheduled for closure. A Draft Landfill Closure Plan prepared by the Navy is currently under regulatory review.

Figure 5-99. Active Landfill at NSRR

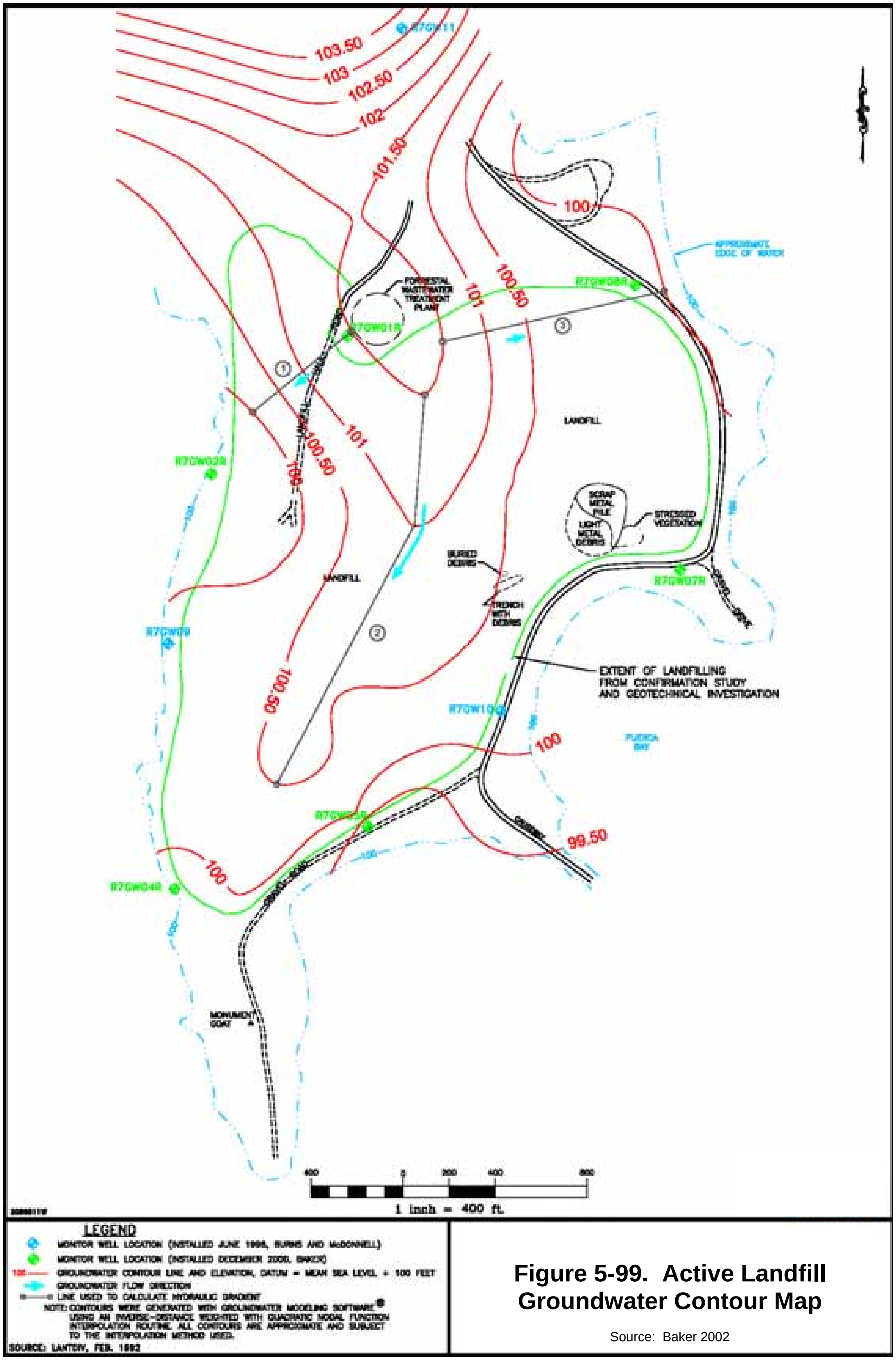


Figure 5-99. Active Landfill Groundwater Contour Map

Source: Baker 2002

6.0 FINDINGS AT ADJACENT PROPERTY

NSRR is bounded by water on the eastern side; therefore, the adjacent areas of interest are properties located along the western, northern, and southern NSRR boundaries.

6.1 RELEVANT FEDERAL AND COMMONWEALTH REGULATORY RECORDS

A search of readily available federal and state databases concerning environmental issues at surrounding properties was conducted by EDR, and was previously discussed in Section 4.2.2. No environmental concerns were identified with respect to adjacent properties.

6.2 HISTORICAL ACTIVITIES

Prior to the Navy's presence in the area, most of the property adjacent to NSRR was used primarily for sugarcane cultivation in lowland areas and for cattle grazing in upland areas. Since the 1950s, the amount of both residential and commercial properties located to the west of NSRR has steadily increased. Review of available documents and photographs, and interviews with former and current station personnel did not identify any historical activities of environmental significance (to NSRR) at property adjacent to NSRR.

6.3 CURRENT FINDINGS

The property adjacent to NSRR was visually inspected in February 2004 to identify areas of environmental concern that could potentially impact NSRR.

Property adjacent to the northern portion of the station consists primarily of residential housing and light commercial/retail facilities. One aggregate plant is located immediately north of the northern NSRR boundary. Visual inspection of this plant did not identify significant quantities of hazardous materials that could present a potential concern to NSRR. The largest commercial facility of interest in the area, the Puerto del Ray Marina, is located over ¼ mile from NSRR, and does not pose an environmental concern to NSRR. In addition, three gas stations were observed in the general vicinity of the northern portion of NSRR, but were not in close enough proximity to be of a concern, and no environmental issues were identified at these gas stations.

Property adjacent to the western NSRR boundary consists of scattered residential housing, State Highway 53, and additional residential, commercial, and industrial facilities to the west of Highway 53. The commercial and industrial areas to the west of Highway 53 are not in close enough proximity to NSRR to present a potential concern. One commercial facility, a solid waste transportation contractor, is located immediately adjacent to NSRR in the vicinity of Gate 3. Although large quantities of solid waste and scrap metal were identified at this facility, visual inspection of this facility did not identify significant quantities of hazardous materials that could present a potential concern to NSRR. A Caribe Service Station is also located immediately adjacent to NSRR in the vicinity of Gate 3. Visual inspection and commercial database reviews (see Section 4.2) of this gas station did not identify any environmental issues or any potential environmental concerns to NSRR.

Property adjacent to the southern NSRR boundary consists of scattered residential homes and undeveloped land. No potential facilities of concern were identified.

Based upon visual inspection, record reviews, and interviews, there is no known reason to suspect that conditions on adjacent property have impacted NSRR.

7.0 CONCLUSIONS

The ECP investigation confirmed that a mature and comprehensive environmental program, focused on areas of historic environmental concern, has been in existence at NSRR for decades.

- NSRR investigative activities under the Navy's Installation Restoration Program (IRP) have been ongoing since the early 1980s.
- The entire station is currently encompassed under a U.S. Environmental Protection Agency (EPA) Corrective Action component of the station's Resource Conservation and Recovery Act (RCRA) permit.
- Under the IRP, and currently pursuant to the EPA RCRA Corrective Action permit, 59 historic sites at NSRR [Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs)] have been investigated (for some, if only to conclude that no further investigation was warranted), are currently under investigation, or are pending further corrective action measures.
- Under the UST program, seven former UST sites and one current AST site are under a Monitored Natural Attenuation (MNA) study in accordance with the monitoring protocols developed by the Underground Storage Tank Management Division (USTMD) of the Puerto Rico Environmental Quality Board (EQB).
- The Phase I/II ECP investigation identified another 23 sites, 17 of which will be further investigated and/or evaluated.

Considering the active, comprehensive, and ongoing IRP and MNA sites, in conjunction with the newly identified ECP sites, it may reasonably be concluded that all areas of significant environmental concern on NSRR have been identified; and all have been, are undergoing, or will be evaluated/investigated.

7.1 INSTALLATION RESTORATION PROGRAM

Until 1993, all environmental investigation and remediation activities, with the exception of USTs, were conducted under the Navy's IRP, which generally followed CERCLA guidelines. In total, 55 SWMUs and 4 AOCs were identified. In 1993, NSRR submitted a RCRA Part B Permit application for the storage of hazardous waste on the Station.   On October 20, 1994, the EPA Region II issued a Final RCRA Part B permit. The corrective action provisions of the permit (addressing sites of known/suspected releases of hazardous waste) currently contain specific requirements for investigation, and potentially, RCRA RFI activities and remediation at 28 SWMUs and 3 AOCs. The remainder of the SWMUs/AOCs identified were determined to require no further investigation, due to the fact that no release or disposal of hazardous waste or materials was identified.

Section 5.3 describes the current regulatory status and current physical and environmental condition of the SWMUs/AOCs in the IRP at NSRR. Table 5-4 provides a brief summary of each SWMU and AOC, including IRP designation (IR Site No.), type of RFI required in the RCRA Part B Permit, operable unit number, current work status, as well as comments on the current status of each unit. The locations of the IRP sites are presented in Figure 5-4.

7.2 MNA SITES

A MNA study of seven former UST sites and one current AST site at NSRR is being performed by the Navy. The Year 4 summary report, dated December 2004, presents the findings of the study along with recommendations based on those findings. These are discussed in Section 5.5.1.1.

7.3 ECP SITES

ECP Sites are areas of potential environmental concern that were identified as a result of the records review, aerial photography analysis, physical site inspections, and interviews conducted as part of the ECP investigation. The ECP Sites had not been previously identified or investigated under existing environmental programs (e.g., IRP, USTs, etc.) at NSRR, although there are a few ECP Sites that border and/or encompass existing IRP sites. The Phase I portion of the ECP investigation identified 23 ECP Sites that required further evaluation. ECP Sites are addressed in Section 5.4. Table 5-5 presents a list of the ECP Sites, and Figure 5-54 presents the overall location of each of the ECP Sites.

The newly identified ECP Sites were then evaluated under the Phase II portion of the ECP investigation (see Appendix F). The Phase II investigation was conducted to determine if a release/disposal actually occurred at newly identified ECP sites and, if so, if any potential risk to human health is present at the sites. The Phase II investigation consisted of field observations, environmental media (e.g., soil, groundwater) sample collection, laboratory analysis, review of analytical data, and a qualitative risk assessment for each site (see Section 4.6). Based on the results of the ECP Phase II Investigation, it was determined that six sites have not been environmentally impacted by past and present operations at NSRR and therefore, require no further investigation:

- ECP Site 4
- ECP Site 9
- ECP Site 10
- ECP Site 11
- ECP Site 12
- ECP Site 18

The Phase II ECP investigation also determined that 14 of the ECP Sites have been impacted by past and recent operations at NSRR and therefore, are being incorporated into the NSRR RCRA Corrective Action Program:

- ECP Site 2
- ECP Site 3
- ECP Site 5
- ECP Site 6
- ECP Site 7
- ECP Site 8
- ECP Site 13
- ECP Site 14
- ECP Site 15
- ECP Site 16
- ECP Site 17
- ECP Site 19
- ECP Site 20
- ECP Site 21

No further ECP investigations will be performed at ECP Sites 1 and 22 because they are being transferred to other federal agencies. ECP Site 23 is being addressed separately under the Navy's Munitions Response Program (MRP).

7.4 ENVIRONMENTAL COMPLIANCE

The ECP investigation identified few areas of concern regarding current environmental compliance. These are discussed in Section 5.1. None is currently significant.

Asbestos Containing Material (ACM). The last large-scale survey to identify FAD ACM on NSRR was performed approximately 20 years ago but no follow-up documentation was located. Since then, specific areas have been surveyed but no station-wide conclusions may be drawn other than the assumption that, given the age of construction of most buildings on NSRR, the presence of some form of ACM should be presumed.

A comprehensive station-wide ACM survey is underway and targeted for completion in late Summer 2005. When published, this report can be consulted for the most up-to-date ACM information.

Lead-Based Paint (LBP). Eight hundred and seventy-nine buildings at NSRR were constructed prior to 1978, the year in which LBP was banned for consumer use. These buildings, and any other structures built before 1978, therefore, are presumed to contain LBP. LBP surveys have been conducted in specific areas at NSRR but no station-wide survey has been conducted at NSRR.

A LBP inspection and risk assessment of family housing is underway and targeted for completion in late Summer 2005. When published, this report can be consulted for the most up-to-date LBP information.

7.5 PROPERTY CATEGORIZATION

In accordance with CERFA procedures, this ECP Report divides all property at NSRR into "parcels", and classifies them into one of the three following categories (see Section 1.1 for a description and explanation as to the derivation of these categories):

- **Category 1** – Areas where no known or documented releases, or disposal of hazardous substances or petroleum products or their derivatives has occurred, including no migration of these substances from adjacent areas.

- **Category 2** – Areas where the release, disposal, or migration, or some combination thereof, of hazardous substances, or petroleum products or their derivatives has occurred, but at concentrations that do not require a removal or remedial action, or all remedial actions necessary to protect human health and the environment have been taken.

- **Category 3** – Areas where a confirmed or suspected release, disposal, or migration, or some combination thereof, of hazardous substances, or petroleum products or their derivatives has occurred, but required investigation and/or response actions have not yet been initiated or are ongoing.

Table 7-1 presents a listing of all Category 2 and 3 sites identified during the Phase I/II ECP investigation at NSRR, as well as a list of all IRP, MNA, and ECP sites investigated and determined to be Category 1 sites. Figure 7-1 is a map of the station with all station property divided into parcels and categorized into one of the above-referenced categories.

[Note: In addition to the designated IRP, MNA, and ECP sites, the end of Table 7-1 and Figure 7-1 depict four areas of known contamination that are not easily categorized into one of the existing environmental programs at NSRR. All four of these areas are considered Category 2 (see definition above). With the exception of the JP-4 fuel spill area, historical operations in these areas were industrial in nature, and included routine minor maintenance and storage activities that resulted in small (i.e., at concentrations that do not require a removal or remedial action) releases of POL and/or hazardous substances. Furthermore, specific areas of significant environmental contamination have been identified within these three areas through the IRP, MNA, and ECP investigations, and are being addressed under these programs. The JP-4 fuel spill area has been remediated and evaluated under the Natural Resources Damage Assement (NRDA) program (see Section 5.2.4).]

[Note: Figure 7-1 should be viewed as a general categorization of NSRR property. Given the available data, it is not possible to spatially identify the precise boundaries of all SWMUs, AOCs, MNA sites, and ECP sites.

Figure 7-1 must be interpreted in conjunction with this ECP Report, as well as all relevant IRP documents and other documents that provide currently available data on all sites of environmental concern. The imprecision with regard to parcel boundaries is attributable to the fact that:

- *ECP sites require further investigation under the IRP/RCRA Corrective Action program to determine their full extent of contamination.*
- *MNA sites are undergoing continuing characterization.*
- *For some historic spills, the available information provides only an estimation as to the extent of impact.*
- *Some areas are not amenable to spatial depiction (for example SWMU 38: "below ground sanitary/storm sewers").*
- *Some areas are defined not only by hard data, but also by a common knowledge of historic operations. The best example would be hangar aprons at the airfield. Specific apron areas have been previously identified for investigation but common knowledge suggests the entire apron was most likely a source of minor spills/releases/unconfined maintenance in the 1940s-50s.]*

All Category 3 sites will continue to be evaluated, investigated and, if warranted, remediated under the IRP/RCRA Corrective Action program or the MNA program.

Table 7-1. Description and Status of all SWMUs, AOCs, MNA Sites, and ECP Sites at NSRR, PR

Site	Site Name	Status[1]	Status Comments/Details	Recommended Action	Potential Site Transfer Condition	ECP Category[2]
SWMU 1	Former Army Cremator Disposal Site	5, 6, 7	Corrective Measures Study (CMS) initiated. An Ecological Risk Assessment (ERA) through Step 3a was completed and indicates that there will be a need to proceed to Step 3b - Baseline ERA.	Continue with ERA (Step 3b).	To be determined following completion of CMS report.	3
SWMU 2	Langley Drive Disposal Area	5, 6, 7	CMS initiated. An ERA through Step 3a was completed and indicates that there will be a need to proceed to Step 3b - Baseline ERA.	Continue with ERA (Step 3b).	To be determined following completion of CMS report.	3
SWMU 3	Station Landfill	3	Remedial Feasibility Investigation (RFI) completed. Semi-annual groundwater monitoring in accordance with Puerto Rico Environmental Quality Board (EQB) Solid Waste Management Regulations Park IV-D is required.	Prepare a Landfill Closure Plan for inactive 50 acres.	Proposed Landfill Cap Installation by future owner w/ Deed Restrictions (Residential or Industrial development: Soil and Groundwater usage)	3
SWMU 4	Drone Fuel Oil/Water Separator	1	No knowledge or evidence of systematic and routine releases of hazardous wastes or constituents from these units; RFI not required.	None	NA	1
SWMU 5	Dumpsters (basewide)	1	No knowledge or evidence of systematic and routine releases of hazardous wastes or constituents from these units; RFI not required.	None	NA	1
SWMU 6	Building 145	4, 9	CMS Final Report submitted recommending no further action (NFA). NFA proposed in RCRA Part B permit renewal.	NFA - Awaiting Part B Permit renewal / modification from EPA for final determination.	Proposed for NFA w/ No Restrictions	2
SWMU 7	Tow Way Fuel Farm	8, 12	Free product removal performed on monthly basis as an Interim Corrective Measure. CMS Final Report will determine proposed remedial action. Part B Permit modification by EPA will be required before the implementation of the proposed remedy.	Prepare a Corrective Measures Implementation (CMI) Design Package.	To be determined following completion of CMS report.	3
SWMU 8	Tow Way Road Fuel Farm Sludge Disposal Pits	8, 12	Combined with SWMU 7 into one unit.	Site is part of SWMU 7	NA	3
SWMU 9	Tanks 212-217 Sludge Burial Pits	6, 7	Potential non-carcinogenic human health risk exists at Areas A and C and a potential ecological risk exists at Areas A&B for lead. Additional Data Collection Investigation Report recommended Step 3b of ERA. Awaiting EPA review.	Continue with ERA (Step 3b)	To be determined following completion of CMS report.	3

Table 7-1. Description and Status of all SWMUs, AOCs, MNA Sites, and ECP Sites at NSRR, PR (cont.)

Site	Site Name	Status[1]	Status Comments/Details	Recommended Action	Potential Site Transfer Condition	ECP Category[2]
SWMU 10	Substation 2/Building 90	4, 9, 12	CMS initiated and completed. NFA recommended in RCRA Part B permit renewal, however contamination level is greater than residential risk based concentration (RBC) value requiring a deed restriction.	NFA - Awaiting Part B Permit renewal / modification for final determination.	Proposed NFA w/ Deed Restrictions (Residential Developments: Soil - PCBs)	2
SWMU 11	Old Power Plant/Building 38	3	Building 38 interior was recharacterized and because engineering controls have been placed on the building, there is no risk to human health or environment. NFA recommended; awaiting EPA review.	Prepare a streamlined CMS for a Land Use Control to maintain existing engineering and institutional controls	Proposed NFA w/ Deed Restrictions (Interior of Building: PCBs)	3
SWMU 12	Fire Training Pit Oil/Water Separator	4	No contaminants of concern (COCs) identified during the RFI. NFA proposed in RCRA Part B permit renewal.	NFA - Awaiting Part B Permit renewal / modification for final determination.	Proposed NFA w/ No Restrictions	1
SWMU 13	Old Pest Control Shop/Building 258	9, 10	CMI Work Plan Design Package submitted and EPA approved. EPA is to modify permit with the proposed CMI.	Continue Corrective Measures Implementation - Awaiting Part B Permit renewal/modification	Proposed Corrective Action w/ No Restrictions	3
SWMU 14	Fire Training Pit Area	13	Further action is deferred until site is closed.	Perform RFI (FY05).	To Be Determined	3
SWMU 15	Station Hospital Incinerator	1	No knowledge or evidence of systematic and routine releases of hazardous wastes or constituents from this unit; RFI not required. Incinerator removed from this site in the fall of 1999.	None	NA	1
SWMU 16	Waste Explosives Storage Building 1666	1	No evidence of releases from this building was observed, and no knowledge or evidence of systematic and routine releases of hazardous wastes or constituents from this unit; RFI not required.	None	NA	1
SWMU 17	Building 1973 - Non-Flammable Hazardous Waste Storage	1	Former main non-flammable hazardous waste container storage facility for the base. No knowledge or evidence of systematic and routine releases of hazardous waste or constituents from this unit; RFI not required.	None	NA	1
SWMU 18	Building 2009 - Ignitable Hazardous Waste Storage	1	Former container storage building for ignitable hazardous wastes. No knowledge or evidence of systematic and routine releases of hazardous waste or constituents from this unit; RFI not required.	None	NA	1

Table 7-1. Description and Status of all SWMUs, AOCs, MNA Sites, and ECP Sites at NSRR, PR (cont.)

Site	Site Name	Status[1]	Status Comments/Details	Recommended Action	Potential Site Transfer Condition	ECP Category[2]
SWMU 19	Building 121 - Pesticide Storage	1, 11C	RCRA closure submitted in June 1994 and approved by USEPA.	None	NFA w/ No Restrictions	2
SWMU 20	Tank Truck/Concrete Storage Pad near Building 860	1	Formerly used to temporarily store waste oil, fuels, and solvents generated at the drone refurbishing area. No visual evidence of releases was observed during inspections; RFI not required.	None	NA	1
SWMU 21	Mobile Floating Tanks	1	Not a unit in which hazardous waste is stored, therefore, not considered a SWMU.	None	NA	1
SWMU 22	Mobile Barges/SWOBS	1	Not a unit in which hazardous waste is stored, therefore, not considered a SWMU.	None	NA	1
SWMU 23	Oil Spill Oil/Water Separator Tanks	4	NFA proposed in the RCRA Part B permit renewal. Contamination to be addressed through deed restrictions.	NFA - Awaiting Part B Permit renewal / modification for final determination.	Proposed NFA w/ Deed Restrictions (Residential Development: Soil - benzo(a) pyrene, TPH)	2
SWMU 24	Oil Spill Oil/Water Separator and Adjoining Pad (VC-8 Bldg. 1625)	4	NFA proposed in the RCRA Part B permit renewal.	NFA - Awaiting Part B Permit renewal / modification for final determination.	Proposed for NFA w/ No Restrictions	2
SWMU 25	DRMO Storage Yard	13	Further investigations being completed under the RCRA operating permit closure.	Closure in accordance with RCRA TSD permit.	Proposed for NFA w/ No Restrictions	3
SWMU 26	Building 544 Area	4	NFA proposed in the RCRA Part B permit renewal.	NFA - Awaiting Part B Permit renewal / modification for final determination.	Proposed for NFA w/ No Restrictions	2
SWMU 27	Domestic Sewage Treatment Plant (Capehart Area)	1	Unit does not manage or generate RCRA hazardous wastes or constituents. No knowledge or evidence of systematic and routine releases of hazardous wastes or constituents from this unit; RFI not required.	None	NA	1
SWMU 28	Domestic Sewage Treatment Plant (Bundy Area)	1	Unit does not manage or generate RCRA hazardous wastes or constituents. No knowledge or evidence of systematic and routine releases of hazardous wastes or constituents from this unit; RFI not required.	None	NA	1

Table 7-1. Description and Status of all SWMUs, AOCs, MNA Sites, and ECP Sites at NSRR, PR (cont.)

Site	Site Name	Status[1]	Status Comments/Details	Recommended Action	Potential Site Transfer Condition	ECP Category[2]
SWMU 29	Wastewater Treatment Plant (Industrial Area)	1	Unit does not manage or generate RCRA hazardous wastes or constituents. No knowledge or evidence of systematic and routine releases of hazardous wastes or constituents from this unit; RFI not required.	None	NA	1
SWMU 30	Former Incinerator Area (near SWMU 3)	4	NFA proposed in the RCRA Part B permit renewal. A deed restriction is necessary to prevent groundwater usage.	NFA - Awaiting Part B Permit renewal / modification for final determination.	Proposed NFA w/ Deed Restrictions (Groundwater usage: antimony and zinc)	2
SWMU 31	Waste Oil Collection Area/Building 31 and 2022	9, 10	Final CMI Work Plan Design Package submitted, EPA approved and awaiting public comment. A deed restriction is anticipated.	Continue CMI - Awaiting Part B Permit renewal/modification	Proposed Corrective Action w/ Deed Restrictions (Residential development: Soil - dioxin and furans)	3
SWMU 32	PWD Storage Yard/Battery Collection Area	9, 10	Final CMI Work Plan Design Package submitted, EPA approved and awaiting public comment. A deed restriction is anticipated.	Continue CMI - Awaiting Part B Permit renewal/modification	Proposed Corrective Action w/ Deed Restrictions (Residential development: Soil - dioxin and furans)	3
SWMU 33	Storage Pad Area/Building 379	1	Used for temporary storage of various wastes generated during aircraft maintenance. A new storage area was constructed to take place of the old area (SWMU 33). The new area has been designated SWMU 51. A RFI was not required at this SWMU.	None	NA	2
SWMU 34	Temporary Storage Area Fleet Squadron Eight Airfield	1	Used for temporary storage of waste fuels and paints. No knowledge or evidence of systematic and routine releases of hazardous wastes or constituents from this unit; RFI not required.	None	NA	1
SWMU 35	Oil/Water Separator Building 396	1	Unit does not manage or generate RCRA hazardous wastes or constituents. No knowledge or evidence of systematic and routine releases of hazardous wastes or constituents from this unit; RFI not required.	None	NA	1
SWMU 36	Oil/Water Separator Berthing Pier	1	Unit does not manage or generate RCRA hazardous wastes or constituents. No knowledge or evidence of systematic and routine releases of hazardous wastes or constituents from this unit; RFI not required.	None	NA	1

Table 7-1. Description and Status of all SWMUs, AOCs, MNA Sites, and ECP Sites at NSRR, PR (cont.)

Site	Site Name	Status[1]	Status Comments/Details	Recommended Action	Potential Site Transfer Condition	ECP Category[2]
SWMU 37	Waste Oil Storage Area/Hangar 200	4	Replaced by another similar facility. NFA proposed in the RCRA Part B permit renewal. A deed restriction is required due to contamination	NFA - Awaiting Part B Permit renewal / modification for final determination.	Proposed NFA w/ Deed Restrictions (Residential Development: Soil - SVOCs and PCBs)	2
SWMU 38	Below Ground Sanitary/Storm Sewers	1	Below ground sanitary and storm sewer systems. No knowledge or evidence of systematic and routine releases of hazardous wastes or constituents from this unit; RFI not required.	None	NA	1
SWMU 39	Building 3158/Former Battery Drain Area	4	NFA proposed in the RCRA Part B permit renewal. A deed restriction is required to prevent unrestricted site usage.	NFA - Awaiting Part B Permit renewal / modification for final determination.	Proposed NFA w/ Deed Restrictions (Residential Development: Soil - arsenic (3.5mg/kg))	2
SWMU 40	Alpha Company Maintenance Yard Mobile Oil Tank	1	Mobile 300-gallon tank that was used as a temporary collection and storage point for waste oils. No knowledge or evidence of systematic and routine releases of hazardous wastes or constituents from this unit; RFI not required.	None	NA	1
SWMU 41	Building 3152 Wash Pad	1	Former open air, curbed, concrete pad used as a wash-pad to rinse off pesticide control equipment. The discharge point for the wash waters collected in the sump passes through a permitted outfall.	None	NA	2
SWMU 42	Water Purification Plant Lagoons	1	Used for disposal of sludges from the water purifications plant. No knowledge or evidence of systematic and routine releases of hazardous wastes or constituents from this unit; RFI not required.	None	NA	1
SWMU 43	Target Drone Drainage Ditch/Building 860	1	Former location of discarded fuel and oil from recovered target drones. Sampling did not identify hazardous constituents above action levels. An RFI was not required.	None	NA	2
SWMU 44	Aerial Target Systems Yard Drainage Ditch	1	Drainage ditch down-gradient from SWMU 43. As discussed in SWMU 43, the EPA is satisfied that this unit has been adequately investigated, and a RFI was not required.	None	NA	2

Table 7-1. Description and Status of all SWMUs, AOCs, MNA Sites, and ECP Sites at NSRR, PR (cont.)

Site	Site Name	Status[1]	Status Comments/Details	Recommended Action	Potential Site Transfer Condition	ECP Category[2]
SWMU 45	PCB Spill Area/Old Power Plant	5, 6, 7, 12C	CMS initiated. An ERA through Step 3a was completed and indicates a need for Step 3b-Baseline ERA.	Continue with Baseline ERA (Step 3b).	To be determined following completion of CMS report.	3
SWMU 46	Pole Storage Yard Covered Pad	9, 10	CMI Work Plan Design Package submitted and EPA approved. EPA is to modify permit with the proposed CMI.	Continue CMI - Awaiting Part B Permit renewal/modification	Proposed Corrective Action w/ No Restrictions	3
SWMU 47	Satellite Disposal Areas	1	Former Satellite Accumulation Points throughout the base. No knowledge or evidence of systematic and routine releases of hazardous wastes or constituents from this unit; RFI not required.	None	NA	1
SWMU 48	Mobile Container Storage Rack/Building 3102	1	Formerly utilized as a temporary (less than 90 days) storage facility for waste oils and oil contaminated soils. No knowledge or evidence of systematic and routine releases of hazardous wastes or constituents from this unit; RFI not required.	None	NA	1
SWMU 49	500 Gallon Waste Oil Tank/Building 3188	1	No knowledge or evidence of systematic and routine releases of hazardous wastes or constituents from this unit; RFI not required.	None	NA	1
SWMU 50	Drum Storage Area/Building 3166	1	No knowledge or evidence of systematic and routine releases of hazardous wastes or constituents from this unit; RFI not required.	None	NA	1
SWMU 51	New AIMD Storage Pad/Building 379	4	Former hazardous substance storage pad. NFA proposed in the RCRA Part B permit renewal. A deed restriction is required to prevent unrestricted site usage.	NFA - Awaiting Part B Permit renewal / modification for final determination.	Proposed NFA w/ Deed Restrictions (Residential Development: Soil - SVOCs)	2
SWMU 52	Storage Pad near Building 3158	1	No knowledge or evidence of systematic and routine releases of hazardous wastes or constituents from this unit; RFI not required.	None	NA	1
SWMU 53	Building 64 - Malaria Control Building	9	CMS Final Report submitted and approved by the EPA. CMI is currently being developed to demolish the building and remove the soils.	Continue CMI - Awaiting Part B Permit renewal/modification	Proposed Corrective Action w/ No Restrictions	3
SWMU 54	Building 1914 - Former NEX Repair/Maintenance Shop	7	RFI Report submitted and EPA approved. CMS is pending to address TCE in groundwater.	Prepare CMS report.	To be determined following completion of CMS report.	3

Table 7-1. Description and Status of all SWMUs, AOCs, MNA Sites, and ECP Sites at NSRR, PR (cont.)

Site	Site Name	Status[1]	Status Comments/Details	Recommended Action	Potential Site Transfer Condition	ECP Category[2]
SWMU 55	Potential Source Area and Associated TCE Plume at Tow Way Fuel Farm	7	New SWMU added from SWMU 7 and 8. CMS needs to be performed to address TCE in groundwater.	Prepare CMS report.	To be determined following completion of CMS report.	3
AOC A	Torpedo Shop	1	No knowledge or evidence of systematic and routine releases of hazardous wastes or constituents from this unit; RFI not required.	None	NA	1
AOC B	Former Building 25 Area	4, 9	CMS Final Report submitted which recommended NFA. Awaiting EPA review.	NFA - Awaiting Part B Permit renewal / modification for final determination.	Proposed for NFA w/ No Restrictions	2
AOC C	Transformer Storage Pads near Building 2042	9, 10	CMI Work Plan Design Package submitted and EPA approved. Awaiting EPA to submit Part B Permit renewal/modification.	Continue CMI - Awaiting Part B Permit renewal/modification	Proposed Corrective Action w/ No Restrictions	3
AOC D	Sediments	4	NFA proposed in RCRA Part B permit renewal. Sediment investigation conducted with associated SWMUs.	NFA - Awaiting Part B Permit renewal / modification for final determination.	Proposed for NFA w/ No Restrictions	2
MNA 124	Four USTs at Bldg. 124	14	Soil contamination at MNA 124 has decreased to undetectable limits and one more annual soil monitoring event is scheduled to be conducted; also, due to persisting groundwater contamination, groundwater monitoring will continue to be conducted at monitoring wells MW2 and MW5.	Continue groundwater monitoring.	Proposed for NFA w/ No Restrictions	3
MNA 520	Four USTs at Bldg. 520	14	Due to persistent groundwater contamination, the original MNA 520 groundwater monitoring protocol is continuing.	Continue groundwater monitoring.	Proposed NFA w/ Deed Restrictions (Groundwater usage)	3
MNA 731	UST at Bachelor's Enlisted Quarters (BEQ) Bldg. 731	14	Due to persistent TPH soil contamination, the original MNA 731 soil and groundwater monitoring protocols are continuing for TPH only.	Continue groundwater monitoring.	Proposed NFA w/ Deed Restrictions (Groundwater usage)	3
MNA 734	UST at BEQ Bldg. 734	14	Due to persistent groundwater contamination, the original MNA 1738 groundwater monitoring protocol is continuing.	Continue groundwater monitoring.	Proposed NFA w/ Deed Restrictions (Groundwater usage)	3
MNA 735	UST at BEQ Bldg. 735	14	Due to persistent TPH groundwater contamination, the original MNA 735 annual groundwater monitoring protocols are continuing for TPH only.	Continue groundwater monitoring.	Proposed NFA w/ Deed Restrictions (Groundwater usage)	3

Table 7-1. Description and Status of all SWMUs, AOCs, MNA Sites, and ECP Sites at NSRR, PR (cont.)

Site	Site Name	Status[1]	Status Comments/Details	Recommended Action	Potential Site Transfer Condition	ECP Category[2]
MNA 1995	AST West of Tow Way Fuel Farm	14	Due to persistent groundwater contamination, the original MNA 1995 groundwater monitoring protocol is continuing.	Continue groundwater monitoring.	Proposed NFA w/ Deed Restrictions (Groundwater usage)	3
MNA 1738	Three USTs at Bldg. 1738	14	Due to persistent groundwater contamination, the original MNA 1738 groundwater monitoring protocol is continuing.	Continue groundwater monitoring.	Proposed NFA w/ Deed Restrictions (Groundwater usage)	3
MNA 2842B	UST at Bldg. 2842	14	Due to the existence of free product contaminating the groundwater at the site, monitoring is continuing at MW1 and MW5 on a quarterly basis.	Continue groundwater monitoring.	Proposed NFA w/ Deed Restrictions (Groundwater usage)	3
ECP 1	Active Small Arms Range	13	Further action is deferred until site is closed.	None	Proposed transfer to Federal agency	3
ECP 2	Hangar 200 Apron	7, 12A	ECP Phase 1&2 indicates that this site may pose a potential health risk for lead contamination in drainage ditch sediments.	Continue with streamlined CMS (soil removal) or Interim Corrective Measure	To be determined	3
ECP 3	Facility No. 278 POL Drum Storage Area	5	ECP Phase 1&2 indicates that site soils/GW may pose a potential risk.	Complete RCRA Facility Investigation	To be determined	3
ECP 4	Rifle Range at Punta Puerca	1	ECP Phase 1&2 did not find any indication of a release at this site.	NFA – Awaiting Part B Permit renewal / modification for final determination.	Proposed for NFA w/ No Restrictions	1
ECP 5	Former Vehicle Maintenance and Refueling Area	7, 12A	ECP Phase 1&2 indicates that this site may pose a potential health risk for lead contamination in site soils	Continue with streamlined CMS (soil removal) or Interim Corrective Measure	To be determined	3
ECP 6	Former Landfill at the Marina	5	ECP Phase 1&2 indicates that site soils/groundwater may pose a potential risk.	Complete RCRA Facility Investigation	To be determined	3
ECP 7	Former Bundy Area Maintenance Facility	7, 12A	ECP Phase 1&2 indicates that site soils may pose a potential risk.	Continue with streamlined CMS (soil removal) or Interim Corrective Measure	To be determined	3
ECP 8	Former Bundy Disposal Area	5	ECP Phase 1&2 indicates that site soils may pose a potential risk.	Complete RCRA Facility Investigation	To be determined	3
ECP 9	Former Pistol Range at BEQ	1	ECP Phase 1&2 did not find any indication of a release at this site.	NFA - Awaiting Part B Permit renewal / modification for final determination.	Proposed for NFA w/ No Restrictions	1
ECP 10	Former Skeet Range at Ofstie Airfield	1	ECP Phase 1&2 did not find any indication of a release at this site.	NFA - Awaiting Part B Permit renewal / modification for final determination.	Proposed for NFA w/ No Restrictions	1

Table 7-1. Description and Status of all SWMUs, AOCs, MNA Sites, and ECP Sites at NSRR, PR (cont.)

Site	Site Name	Status[1]	Status Comments/Details	Recommended Action	Potential Site Transfer Condition	ECP Category[2]
ECP 11	Former UST No. 208	1	ECP Phase 1&2 did not find any indication of a release at this site.	NFA - Awaiting Part B Permit renewal / modification for final determination.	Proposed for NFA w/ No Restrictions	1
ECP 12	Former UST No. 289	1	ECP Phase 1&2 did not find any indication of a release at this site.	NFA - Awaiting Part B Permit renewal / modification for final determination.	Proposed for NFA w/ No Restrictions	1
ECP 13	Former Gas Station	5	ECP Phase 1&2 indicates that site soils/groundwater may pose a potential risk.	Complete RCRA Facility Investigation	To be determined	3
ECP 14	Former Southern Fire Training Area	5	ECP Phase 1&2 indicates that site soils may pose a potential risk.	Complete RCRA Facility Investigation	To be determined	3
ECP 15	Aircraft Parking Area	7, 12A	ECP Phase 1&2 indicates that site soils may pose a potential health risk for lead contamination.	Continue with streamlined CMS (soil removal) or Interim Corrective Measure	To be determined	3
ECP 16	Disposal Area Northwest of Landfill	5	ECP Phase 1&2 indicates that site soils/groundwater may pose a potential risk.	Complete RCRA Facility Investigation	To be determined	3
ECP 17	Quarry Disposal Site	5	ECP Phase 1&2 indicates that site soils/groundwater may pose a potential risk.	Complete RCRA Facility Investigation	To be determined	3
ECP 18	Building 31 - Public Works Department	1	ECP Phase 1&2 did not find any indication of a release at this site.	NFA - Awaiting Part B Permit renewal / modification for final determination.	Proposed NFA w/ Deed Restrictions (Groundwater usage: barium and vanadium)	1
ECP 19	DRMO Scrap Metal Recycling Yard	7, 12A	ECP Phase 1&2 indicates that this site soils/groundwater may pose a potential risk.	Continue with streamlined CMS (soil removal) or Interim Corrective Measure	To be determined	3
ECP 20	Fuel Pipelines and Hydrant Pits	5	ECP Phase 1&2 indicates that site soils/groundwater may pose a potential risk.	Complete RCRA Facility Investigation	To be determined	3
ECP 21	Building 803	5	ECP Phase 1&2 indicates that this site may pose a potential risk.	Complete RCRA Facility Investigation	To be determined	3
ECP 22	Building 2300	5	Navy indicates that this site will continue to be utilized for its current function through a Fed-to-Fed transfer to the Dept. of Army.	Complete RCRA Facility Investigation	To be determined	3
ECP 23	Pineros and Cabeza de Perro Islands	2	Potential for MEC due to historic training activities.	None	Proposed NFA w/ Deed Restrictions (wildlife refuge; no human usage)	3

Table 7-1. Description and Status of all SWMUs, AOCs, MNA Sites, and ECP Sites at NSRR, PR (cont.)

Site	Site Name	Status[1]	Status Comments/Details	Recommended Action	Potential Site Transfer Condition	ECP Category[2]
Apron Parcel	Ofstie Airfield Airplane Aprons	1	Miscellaneous historic minor releases of hazardous substances and petroleum products.	None	NA	2
Waterfront Parcel	Waterfront Area south of Forrestal Dr. between Pier 1 and Breton St.	1	Miscellaneous historic minor releases of hazardous substances and petroleum products.	None	NA	2
Moscrip Parcel	Camp Moscrip Area	1	Miscellaneous historic minor releases of hazardous substances and petroleum products.	None	NA	2
Spill Parcel	1999 JP-5 Fuel Spill Impact Area	1	Natural Resources Damage Assessment conducted; no long-term impacts anticipated.	NFA	NA	2

[1]**Status Codes**

1 No work required
2 Investigations pending
3 Under Investigation
4 Removal from Permit pending
5 Additional Investigations required
6 Ecological Risk Assessment
7 Corrective Measures Study pending
8 Corrective Measures Study underway
9 Corrective Measures Study completed
10 Remedial Design
11 Corrective Measure Implementation
12 Interim Corrective Measure
  A - Planned
  B - Underway
  C - Completed
13 Further action deferred
14 Under Long-term Monitoring; No Further Action anticipated

[2]**ECP Category Codes**

1. Areas where no known or documented releases, or disposal of hazardous substances or petroleum products or their derivatives has occurred, including no migration of these substances from adjacent areas.
2. Areas where the release, disposal, or migration, or some combination thereof, of hazardous substances, or petroleum products or their derivatives has occurred, but at concentrations that do not require a removal or remedial action, or all remedial actions necessary to protect human health and the environment have been taken.
3. Areas where a confirmed or suspected release, disposal, or migration, or some combination thereof, of hazardous substances, or petroleum products or their derivatives has occurred, but required investigation and/or response actions have not yet been initiated or are ongoing.

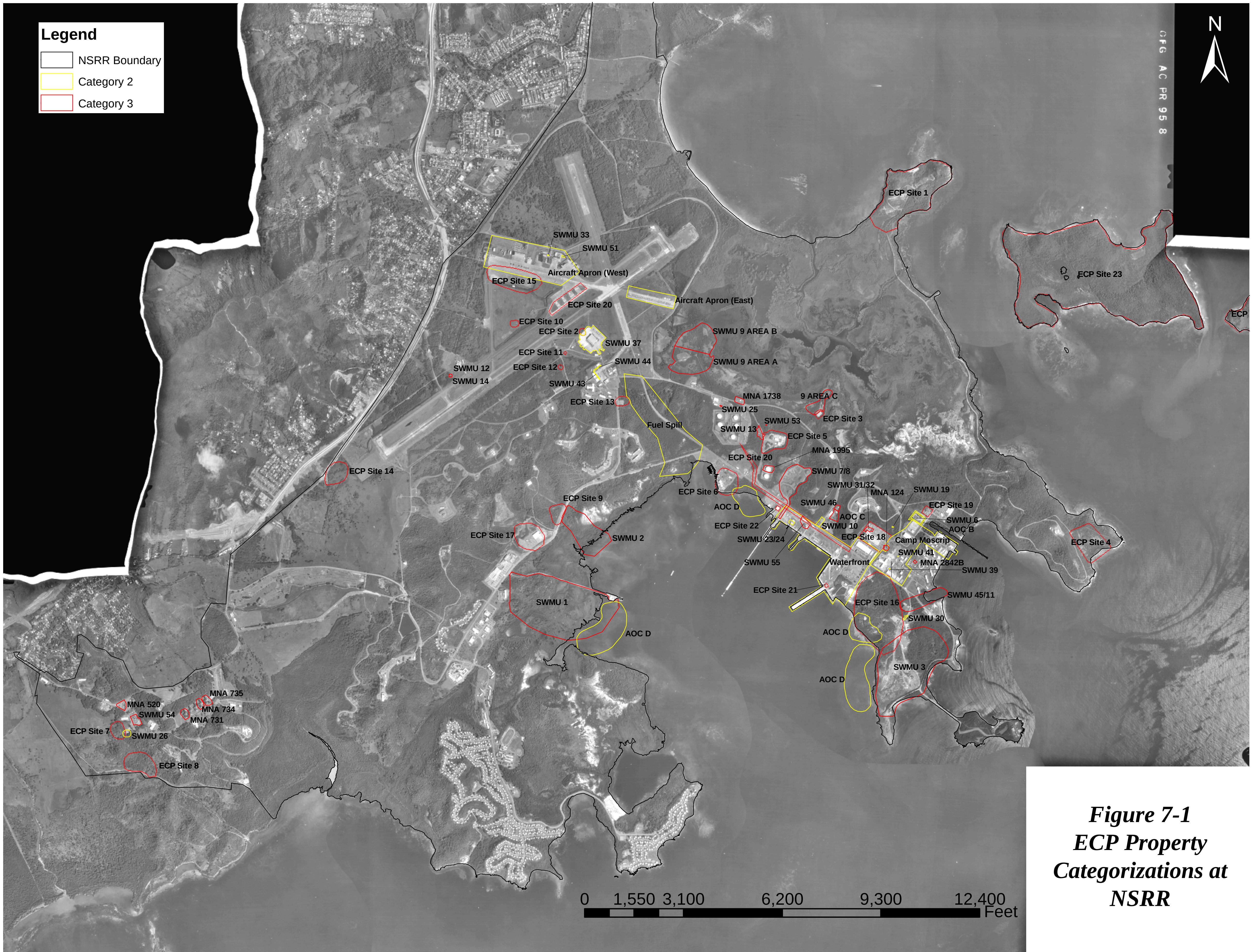


Figure 7-1
ECP Property Categorizations at NSRR

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Appendix A

ECP Photographs

Appendix B

Real Property Records

Appendix C

Commercial Regulatory Database Search Report

Appendix D

Aerial Photography Analysis

Appendix E

Historic NSRR Maps

Appendix F

Phase II ECP Investigation