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NASD VIEQUES
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PROPOSED REMEDIAL ACTION PLAN AREA OF CONCERN I (AOC I) ATLANTIC FLEET
WEAPONS TRAINING AREA FORMER NAVAL AMMUNITION SUPPORT DETACHMENT
(ENGLISH VERSION) VIEQUES ISLAND PUERTO RICO

11/01/2013
CH2M HILL

Proposed Remedial Action Plan

Area of Concern I

Atlantic Fleet Weapons Training Area - Vieques
 Former Naval Ammunition Support Detachment

Vieques, Puerto Rico

November 2013

1. Introduction

This **Proposed Plan** identifies the preferred alternative and associated rationale for Area of Concern (AOC) I, located at the Former Naval Ammunition Support Detachment (NASD) in Vieques, Puerto Rico. AOC I is also designated as Operable Unit (OU) 04 in the **U.S. Environmental Protection Agency (USEPA)** Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database. The Proposed Plan summarizes the site history, the results of previous environmental investigations, and the preferred alternative, and it facilitates the public review and comment on the preferred alternative. AOC I (OU 04) is approximately 1 acre in size and the site of a former asphalt plant that operated from the 1960s through around 1999.

This document is issued by the U.S. Department of the Navy (Navy), Naval Facilities Engineering Command (NAVFAC) Atlantic Division, and (USEPA) Region 2, in consultation with the **Puerto Rico Environmental Quality Board (PREQB)**. The Proposed Plan fulfills the public participation requirements in Section 117(a) of the **Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)** and in Section 300.430(f)(2) of the **National Oil and Hazardous Substances Pollution Contingency Plan (NCP)**.

The preferred alternative for AOC I (OU 04) is **no further action (NFA)**, based on current site conditions, future anticipated land and resource uses, and the results of environmental investigations and a **pilot study** to treat contaminated **groundwater**. The Navy and USEPA, in consultation with PREQB, will make the final decision on the NFA alternative for AOC I (OU 04) after reviewing and considering all information submitted during the 45-day **public comment period**. If warranted based on public comments and/or new information, an alternate remedy may be considered. Therefore, it is important to the remedy selection process that the public provide input on the proposed alternative.

This Proposed Plan summarizes information that can be found in greater detail in the Remedial Investigation Report (CH2M HILL, 2008) and the In-Situ Remediation Pilot Study Report (CH2M HILL, 2013), and other documents contained in the **Administrative Record** for AOC I (OU 04). A glossary of key terms used in this document is attached; these key terms are identified in bold print the first time they appear in the text.

Mark Your Calendar for the Public Comment Period



November 4 – December 19, 2013

Submit Written Comments

The Navy, USEPA, and PREQB will accept written comments on the Proposed Plan during the public comment period. To submit comments or obtain further information, please refer to the comment page located at the end of this Proposed Plan.

Attend the Public Meeting



November 14, 2013 at 6:00 p.m.

Ice House

Carr. 200, Km 3, hm 2

Barrio Martineau, Vieques, PR

The Navy will hold a public meeting to present and discuss the preferred alternative. Verbal and written comments will also be accepted at this meeting.

Location of Administrative Record File:



Biblioteca Electronica

Benítez Guzmán Street, Corner with

Baldorioty de Castro Street

Isabel Segunda

Vieques, PR 00765

(787) 741-2114

Hours of Operation: Monday – Friday,

10:00 a.m. – 6:00 p.m.

2. Site Background

2.1 Facility Description and History

Vieques is located in the Caribbean Sea, approximately 7 miles southeast of the eastern tip of the island of Puerto Rico (Figure 1), and is part of the Commonwealth of Puerto Rico. It is approximately 20 miles long and 4.5 miles wide, and has an area of approximately 33,088 acres (51 square miles).

The Navy purchased portions of Vieques in the early 1940s to conduct activities related to military training. Site operations within the Former NASD (Figure 1), the western third of Vieques where AOC I (OU 04) is located, consisted mainly of ammunition loading and storage, vehicle and facility maintenance, and some training. The Navy ceased operations on the Former NASD on April 30, 2001, in accordance with the Presidential Directive to the Secretary of Defense dated January 30, 2000. At that time the land containing AOC I (OU 04) was transferred to the Municipality of Vieques (MOV) as part of a Quitclaim Deed that transferred Former NASD property to the MOV, Department of Interior (DOI), and the Puerto Rico Conservation Trust.

On February 11, 2005, the Atlantic Fleet Weapons Training Area-Vieques was placed on USEPA's National Priorities List (NPL), which required all subsequent environmental restoration activities for Navy Installation

Restoration (IR) sites on Vieques to be conducted under CERCLA. On September 7, 2007, the Navy, DOI, USEPA, and PREQB finalized a Federal Facilities Agreement (FFA) that established the procedural framework and schedule for implementing the CERCLA activities for Vieques. Although the property containing AOC I (OU 04) is owned by the MOV, the Navy retained the responsibility for conducting the environmental investigations and, as warranted, remedial action of that property.

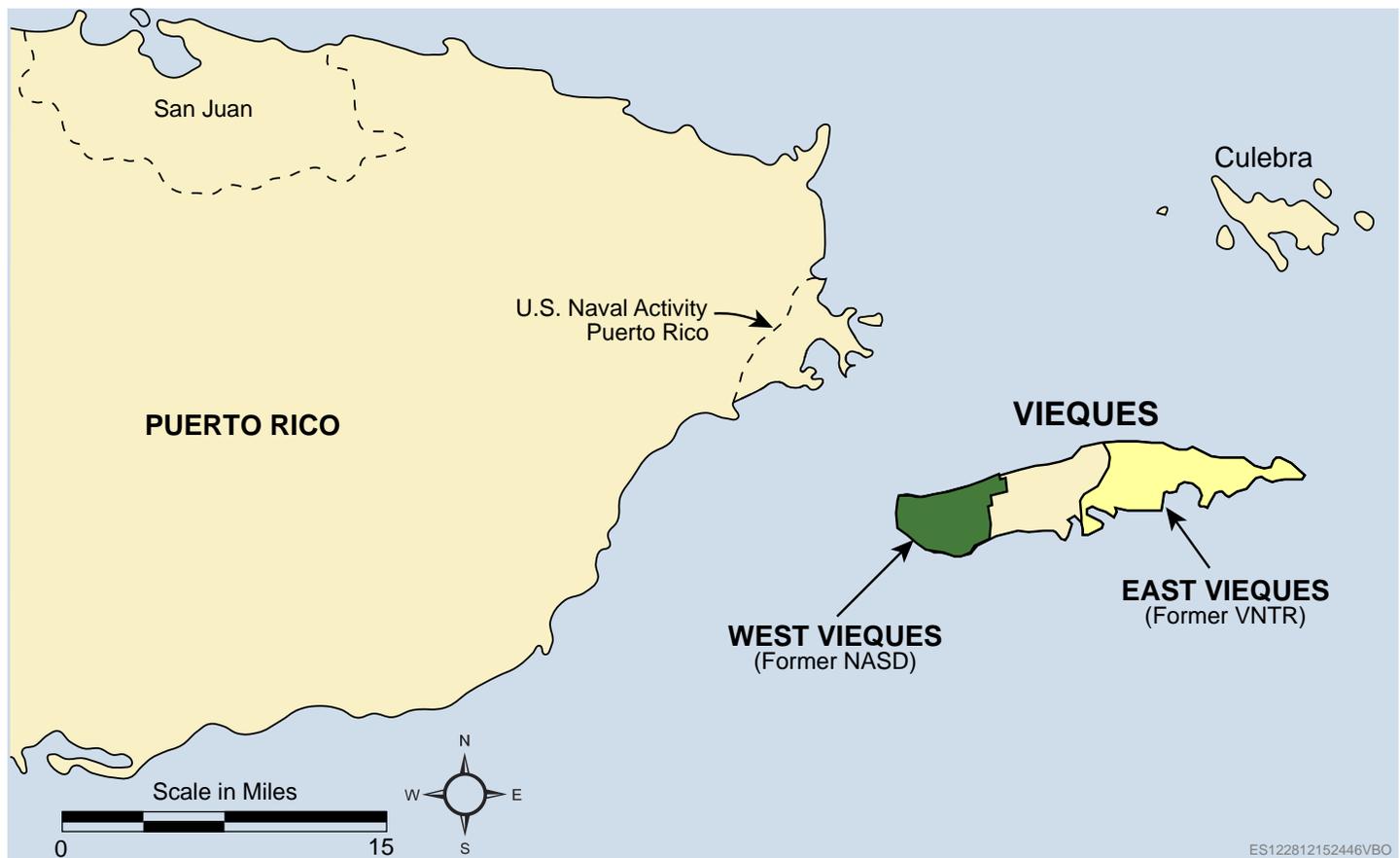
Site Description

AOC I (OU 04) is a former asphalt plant, located approximately 900 feet southwest of Mosquito Pier, adjacent to an active rock quarry within the Former NASD and MOV property (Figures 2 and 3). The asphalt plant was in operation from the 1960s through around 1999. The former asphalt plant comprised a large concrete pad, asphalt mixing drum, earthen ramp, two concrete-paved containment areas, and an area where two diesel fuel aboveground storage tanks (ASTs) were located (Figure 3).

2.2 Summary of Previous Investigations and Pilot Study

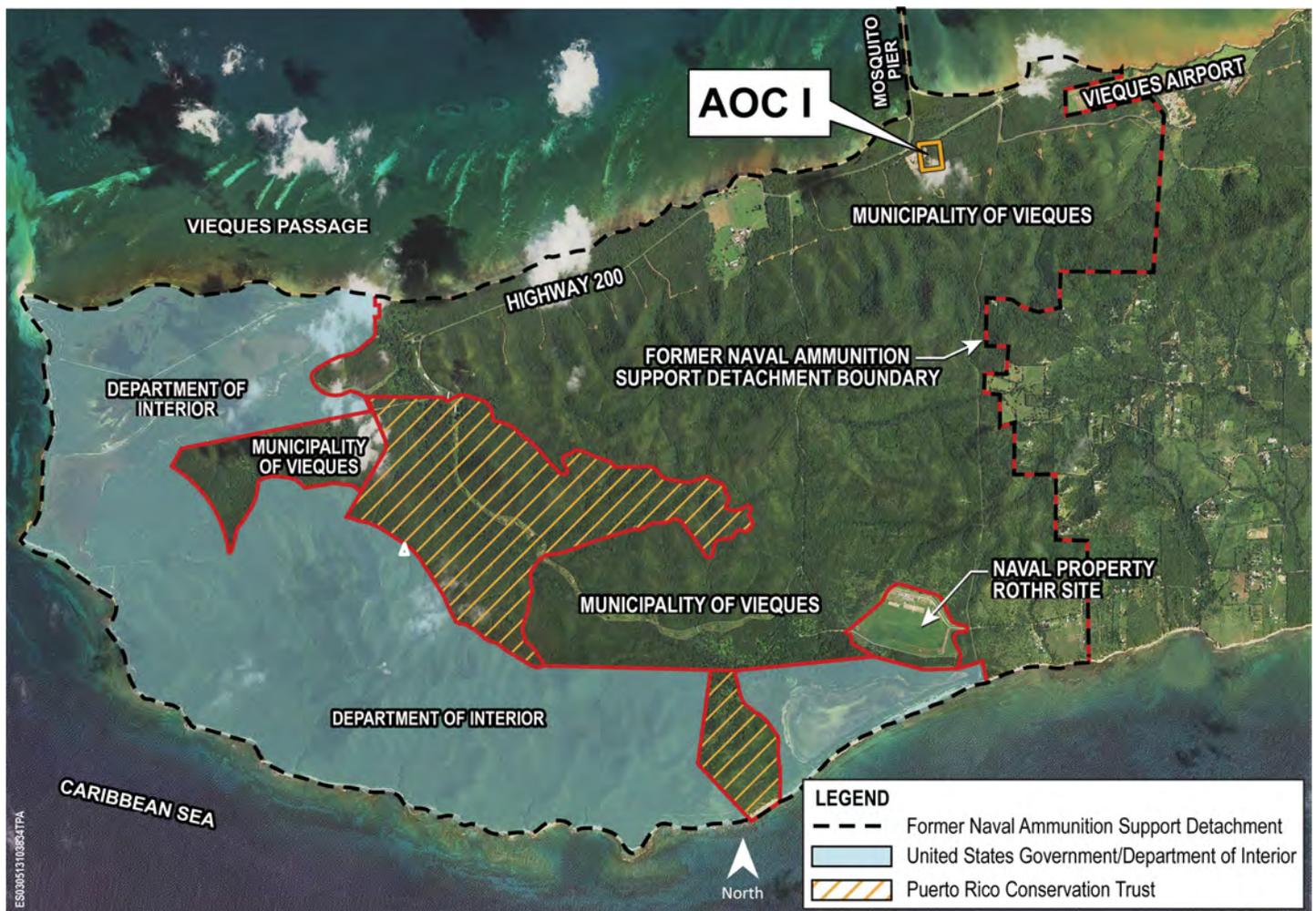
Previous environmental investigations and a groundwater treatment pilot study were conducted at AOC I (OU 04), beginning in 2000. The following subsections briefly summarize the purpose, scope, and results of the activities completed to date.

Figure 1 – Regional Location Map



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Figure 2 – Former NASD and AOC I Location Map



Expanded Preliminary Assessment/Site Investigation (2000)

An Expanded Preliminary Assessment (PA)/Site Investigation (SI) was conducted at AOC I (OU 04) in 2000 that consisted of an ecological survey and co-located surface and subsurface soil sampling from 26 locations to determine whether a release had occurred. The Expanded PA/SI recommended that the site be further investigated in a **Remedial Investigation (RI)** to delineate the extent of surface soil impacts at the site and conduct a risk assessment (CH2M HILL, 2002).

Remedial Investigation and Post-Remedial Investigation Sampling (2004 - 2006 and 2008)

RI activities were conducted in 2004, 2005, and 2006 that included surface soil sampling at 18 locations, subsurface soil sampling at 7 locations, and installing and sampling 9 monitoring wells (CH2M HILL, 2005; 2008). Based on the historical activities and extent of contamination identified, releases to soil and groundwater occurred during past asphalt plant operations, likely in the form of minor drips and spills.

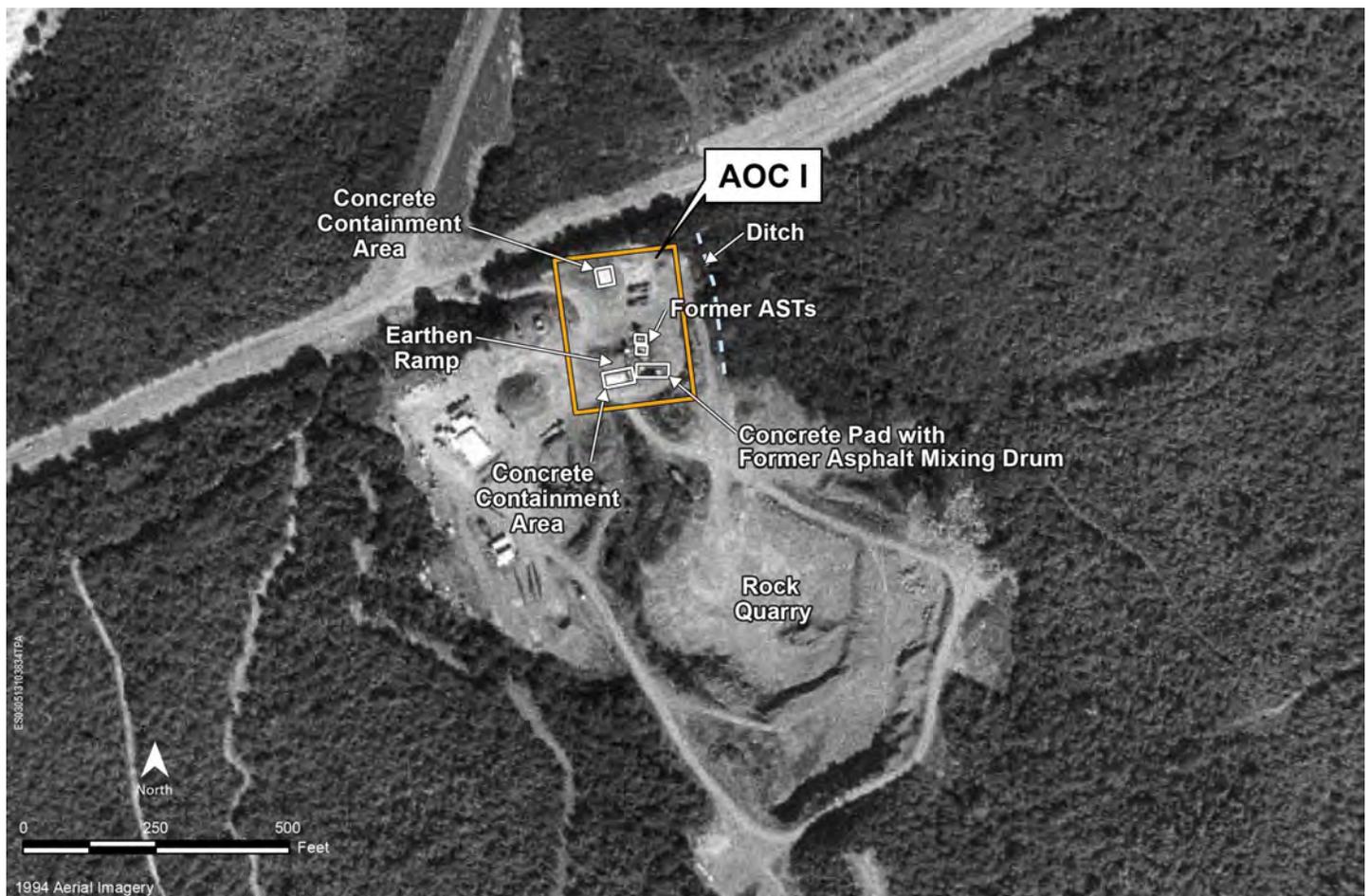
Risk screening conducted during the RI identified several chemicals of potential concern (COPCs) in soil and groundwater to include in quantitative risk assessments. The quantitative risk assessments identified six **chemicals of concern (COCs)** in groundwater: benzene, bis(2-ethylhexyl)phthalate, 1,2-dichloroethane, 1,2-dichloropropane, 2-methylnaphthalene, and naphthalene; no COCs were identified in soil (CH2M HILL, 2008).

To evaluate changes in COC concentrations and help determine the appropriate path forward for the AOC I (OU 04), a post-RI round of groundwater samples wells was collected in 2008. The data showed COC concentrations in groundwater were limited to a relatively small area, demonstrated a declining trend over multiple years, and were relatively low.

In-Situ Groundwater Remediation Pilot Study (2010 - 2012)

An in-situ groundwater remediation pilot study was implemented from 2010 to 2012 to determine if accelerated achievement of acceptable COC concentrations was possible (CH2M HILL, 2013). Pilot Study Preliminary Remediation Goals (PRGs) were developed based upon the USEPA

Figure 3 – Site Layout Map



Maximum Contaminant Levels (MCLs), or other standards for constituents without MCLs. The pilot study was implemented in a two-step approach using **In-Situ Chemical Oxidation (ISCO)** followed by **Enhanced In-Situ Bioremediation (EISB)** to initially oxidize the chemical organics and then stimulate an increase in the natural biodegradation rates of COCs in groundwater. The ISCO step included the injection of sodium persulfate and the EISB step included placing oxygen releasing compound (ORC) “socks” in wells.

The baseline groundwater monitoring and ISCO injection were initiated in March 2010, followed by a post-injection monitoring event, application of EISB, and then three additional post-injection performance monitoring events, with the last monitoring event completed in November 2012. The pilot study technologies coupled with natural processes effectively reduced the groundwater COC concentrations site-wide to acceptable levels (i.e., Federal, Commonwealth, or risk-based standards) within 26-months with no rebound.

3. Physical Characteristics

3.1 Physical Characteristics

AOC I (OU 04) is generally flat with only slight changes in elevation from a high of approximately 30 ft above mean sea level (amsl) in the southern portion of the site to a low of

approximately 27 ft amsl toward the northern end. There are no surface water features on site.

Ecological habitat at the former asphalt plant is minimal, consisting primarily of scrub grass, brush, and small trees growing in and around the former asphalt plant structures and through the gravel-covered terrain. Currently there is no continuous human presence or use of the site other than potentially as a passageway for trucks to/from the rock quarry from Highway 200. The area that includes the site is fenced to discourage trespassing.

Groundwater at AOC I (OU 04) is within **andesite bedrock**, overlain by gravel fill interspersed with silty clay and sand, with a relatively thin soil zone consisting of well-graded gravel with sand below the fill. Groundwater occurs at depths ranging from approximately 14 to 22 ft below ground surface (bgs) and flows generally northwest toward the Vieques Passage at approximately 3 to 16 ft per year, with higher seepage velocity observed in the southern and central portion of AOC I (OU 04).

3.2 Nature and Extent of Contamination

Analytical data collected during the RI and pilot study monitoring provide the basis for evaluating the nature and extent of contamination in soil and groundwater. Constituents detected during the RI above screening criteria are summarized in

Table 1 - Soil and Groundwater Exceedances for AOC I (OU 04)

| Environmental Media | COPC | Maximum Concentration Detected Above Screening Criteria and Background | Background Value | Screening Criteria ^{1,2} | | |
|---------------------|--|--|------------------|-----------------------------------|----------------|--------------------------------------|
| | | | | Vieques HHRA SO | Vieques Eco SO | |
| Soil | Semivolatile Organic Compounds (µg/kg) | | | | | |
| | Benzo(a)pyrene | 145 J | -- | 62 | 100 | |
| | Total Inorganics (mg/kg) | | | | | |
| | Aluminum | 32,600 | 29,000 | 7,600 | -- | |
| | Arsenic | 2.6 | 2.2 | 0.39 | 18 | |
| | Iron | 62,500 | 39,000 | 2,300 | -- | |
| | Thallium | 0.93 J | 0.67 | 0.52 | 1 | |
| | Vanadium | 188 | 130 | 7.8 | 2 | |
| Environmental Media | COPC | Maximum Concentration Detected Above Screening Criteria and Background | Background Value | Screening Criteria ^{1,2} | | |
| | | | | Vieques HHRA GW | MCL - GW | PREQB UST Corrective Action Criteria |
| Groundwater | Volatile Organic Compounds (µg/L) | | | | | |
| | 1,2-Dichloroethane | 1.6 | -- | 0.12 | 5 | -- |
| | 1,2-Dichloropropane | 0.33 J | -- | 0.16 | 5 | -- |
| | 1,4-Dichlorobenzene | 0.52 | -- | 0.5 | 75 | -- |
| | Benzene | 59.3 | -- | 0.35 | 5 | 5 |
| | Trichloroethene | 1.4 | -- | 0.028 | 5 | -- |
| | Semivolatile Organic Compounds (µg/L) | | | | | |
| | 2-Methylnaphthalene | 110 | -- | 2.4 | -- | -- |
| | Dibenzofuran | 5.5 | -- | 1.2 | -- | -- |
| | Naphthalene | 96 | -- | 0.62 | -- | -- |
| | bis(2-ethylhexyl)phthalate | 9.6 J | -- | 4.8 | 6 | -- |
| | Total Inorganics (µg/L) | | | | | |
| | Arsenic | 18.7 | 15.6 J | 0.045 | 10 | -- |
| | Cadmium | 8.72 | 6.35 | 1.8 | 5 | -- |
| | Iron | 1,840 | 210 J | 1,100 | -- | -- |
| | Manganese | 1,930 | 13.3 J | 88 | -- | -- |
| Vanadium | 46.9 J | 37.1 J | 3.6 | -- | -- | |

Notes:

¹ Shading indicates screening criterion exceeded. COPCs in soil selected based on exceedance of HHRA SO and/or Eco SO values. COPCs in groundwater selected based on exceedances of HHRA GW.

² The human health and ecological screening criteria were those listed in the Master Standard Operating Procedures, Protocols, and Plans (CH2M HILL, 2007).

- COPC = Chemical of Potential Concern
- HHRA = Human Health Risk Assessment
- Eco = Ecological
- SO = Soil
- GW = Groundwater
- MCL = Maximum Contaminant Level
- PREQB = Puerto Rico Environmental Quality Board
- UST = Underground Storage Tank

Figure 4 – AOC I (OU 04) Pre-Pilot Study Groundwater Analytical Results for COCs

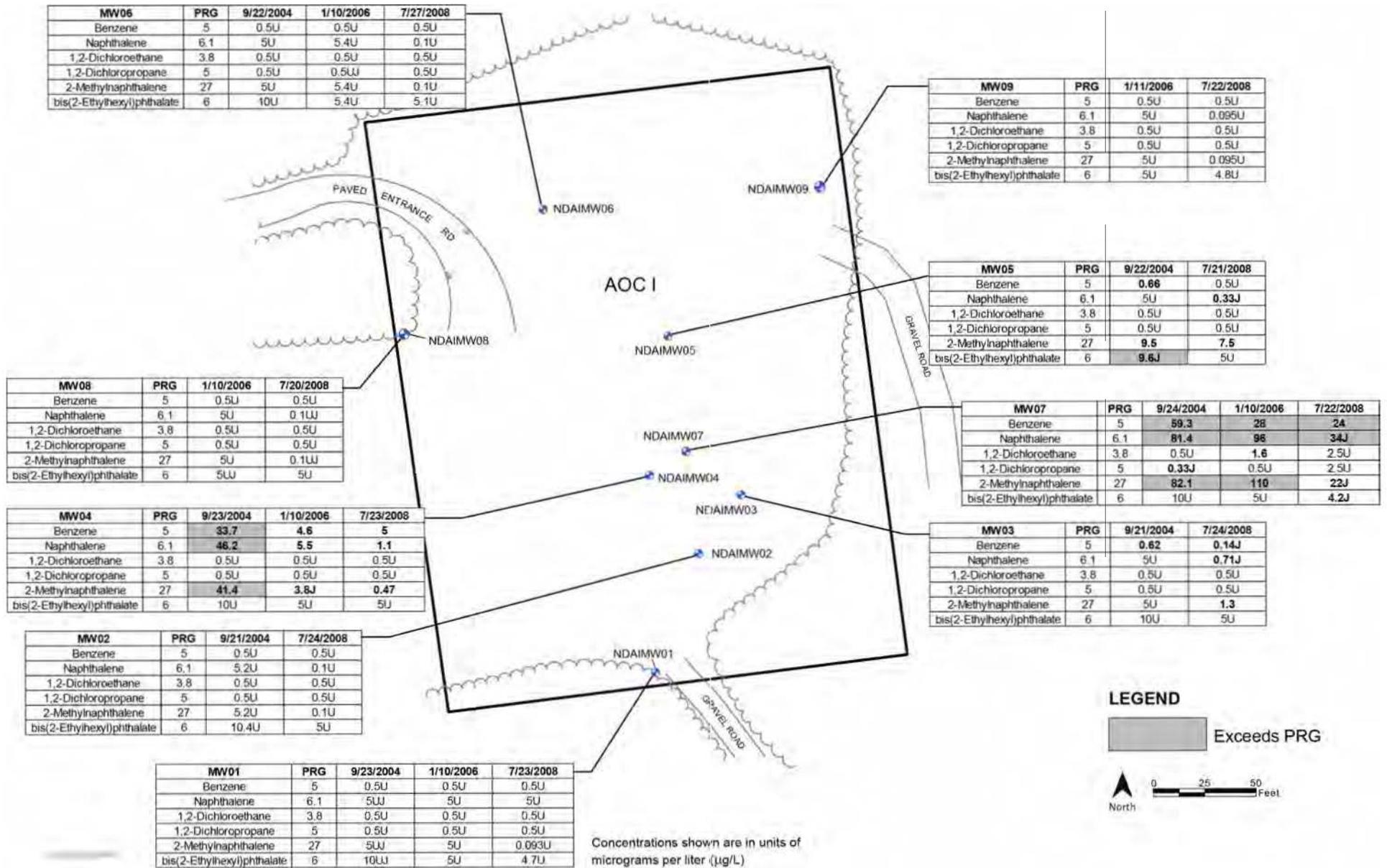


Table 1. The RI results suggest the distribution of constituents and the relatively low associated concentrations in surface and subsurface soil are not indicative of a substantial release, but appear to be more representative of minor drips and spills likely associated with asphalt plant operations. Further, the RI groundwater concentrations were relatively low with respect to **regulatory standards**, which also indicates no substantial release occurred. Contaminants detected in groundwater were limited to the area immediately underlying the main operational activities of the former asphalt plant (**Figure 4**).

The groundwater data collected after implementation of the in-situ remedial technologies represent the current groundwater conditions at AOC I (OU 04). The data show that groundwater COC concentrations are below regulatory standards as a result of activities conducted during the in-situ remediation pilot study (**Table 2**).

4. Summary of Site Risks

A summary of the **Human Health Risk Assessment (HHRA)** and **Ecological Risk Assessment (ERA)** conducted for AOC I (OU 04) during the RI is included in the following subsections. The HHRA included in the RI Report and the residual human health risk evaluation performed following the pilot study provide more detailed analysis and evaluation, and are available in the Administrative Record File.

4.1 RI Human Health Risk Assessment and Post-Pilot Study Human Health Risk Evaluation

The RI HHRA was conducted to evaluate potential human health risks associated with exposure to soil and groundwater at AOC I (OU 04). Health risks are based on a health-protective estimate of the potential **cancer risk** and the potential non-cancer hazard, which is expressed as a **hazard index (HI)**.

The potential **receptors** at AOC I (OU 04) evaluated in the HHRA consisted of maintenance workers, industrial workers, construction workers, recreational users (adult, youth, and child) and residents (adult and child). **Exposure pathways** comprised ingestion, dermal contact, and/or inhalation of chemicals in soil and groundwater. It is important to note that some of these exposure scenarios are not likely to occur, but they are assumed in the risk assessment process as a health-protective measure to ensure that appropriate decisions are made with respect to the need for remediation.

As shown in **Table 3**, no **unacceptable risk** and, therefore, no COCs were identified in soil. However, potentially unacceptable risk was identified (based on groundwater data collected during the RI) for a hypothetical resident exposed to groundwater at AOC I (cumulative **excess lifetime cancer risk (ELCR)** greater than 1×10^{-4} and an HI > 1). As noted previously, six COCs were identified in groundwater: benzene, bis(2-ethylhexyl)phthalate, 1,2-dichloroethane, 1,2-dichloropropane, 2-methylnaphthalene, and naphthalene. However, the in-situ pilot study reduced the COC concentrations below regulatory standards (i.e., to acceptable levels) (**Table 3**). Therefore, based on current groundwater conditions, there is no unacceptable risk and, therefore, no COCs, associated with exposure to groundwater at AOC I (OU 04).

4.2 Ecological Risk Assessment

An ERA was conducted to evaluate potential risks to terrestrial ecological receptors exposed to contaminants detected in soil at AOC I (OU 04). A screening ecological risk assessment (SERA), constituting Steps 1 and 2 of the ERA process and the first step (Step 3A) of a baseline ecological risk assessment (BERA) were conducted for AOC I (OU 04). The screening problem formulation for the ERA includes the selection of

Table 2 - Pilot Study COC Concentrations for AOC I (OU 04)

| Environmental Media | Chemical of Concern (COC) | Pre-injection (Baseline) Monitoring | Post-injection Monitoring | | | | Preliminary Remediation Goal (PRG) ¹ |
|---------------------|---------------------------------------|---|--|--|---|--|---|
| | | Maximum Concentration Detected March 2010 | Maximum Concentration Detected November 2010 | Maximum Concentration Detected November 2011 | Maximum Concentration Detected May 2012 | Maximum Concentration Detected November 2012 | |
| Groundwater | Volatile Organic Compounds (µg/L) | | | | | | |
| | 1,2-Dichloroethane | ND | ND | ND | ND | ND | 3.8 |
| | 1,2-Dichloropropane | ND | ND | ND | ND | ND | 5 |
| | Benzene | 14 | 10 | 5.3 | 2.9 J | 2.2 J | 5 |
| | Semivolatile Organic Compounds (µg/L) | | | | | | |
| | 2-Methylnaphthalene | 17 | 20 | 11 | 11 | 11 | 27 |
| | Naphthalene | 21 | 10 | 12 | 3.3 | 1.6 J | 0.14 - 14 |
| | bis(2-ethylhexyl)phthalate | 1.4 J | 1.4 J | 1.3 J | ND | ND | 6 |

Notes:

ND - Not detected

¹ The Pilot Study Preliminary Remediation Goals (PRGs) were developed based upon USEPA Maximum Contaminant Levels (MCLs), or other standards for constituents without MCLs. For benzene, bis(2-ethylhexyl)phthalate, and 1,2-dichloropropane the PRG is the MCL; for 1,2-dichloroethane the PRG is the Puerto Rico Water Quality Standard (PRWQS); for 2-methylnaphthalene the PRG is the USEPA tap water Regional Screening Level (RSL) based on a Hazard Index (HI) of 1; for naphthalene the PRG is the range of tap water RSLs based on the acceptable carcinogenic risk range of 10^{-4} to 10^{-6} .

ecological assessment endpoints, risk hypotheses, and the toxicological properties and fate and transport behavior of the chemicals present at AOC I (OU 04), which are based upon the preliminary conceptual site model. An assessment endpoint is an expression of the environmental component or value that is protected.

No unacceptable risk and, therefore, no COCs were identified for soil, as shown in Table 3, similarly, no unacceptable risk, and therefore, no COCs were identified for food web exposure (i.e., food chain) at AOC I (OU 04).

5. Scope and Role of Response Action

In cooperation with USEPA and PREQB, and in accordance with the FFA and applicable guidance, the Navy performed investigations at AOC I (OU 04) to evaluate the nature and extent of contamination associated with past releases, and to assess the potential risks to human health and the environment posed by that contamination. Based on those assessments, the Navy performed a pilot study to address groundwater contaminant concentrations above regulatory standards. Based on the RI soil data and the pilot study groundwater data, the current conditions at AOC I (OU 04)

do not pose an unacceptable risk to human health or the environment for unrestricted and unlimited land use and site conditions are compliant with **applicable or relevant and appropriate requirements (ARARs)** and **to-be-considered (TBC)** criteria. The response action does not include or affect any other sites at the facility under the CERCLA process.

6. Preferred Alternative

The Navy and USEPA, in consultation with PREQB, agree that the preferred alternative for AOC I (OU 04) is no further action. The preferred alternative meets the statutory requirements of CERCLA for protection of human health and the environment. The environmental investigation findings, including human health and ecological risk assessments conducted during the RI and an additional human health risk evaluation conducted post-pilot study, conclude that there are no unacceptable risks associated with unlimited and unrestricted exposure to media at the site. Therefore, no alternative other than the no further action alternative requires evaluation. Under this alternative, no additional response action will be performed at AOC I (OU 04) and no restrictions on land use or exposure are necessary. The Navy and USEPA, in consultation with

Table 3 - AOC I (OU 04) Risk Assessment Results

| Media | Human Health Risk | | | | |
|-----------------------|---|--|--|---|--|
| | Future Maintenance Workers | Future Industrial Workers | Future Construction Workers | Future Recreational Users | Future Residents |
| Surface Soil (0-2 ft) | ELCR = 2×10^{-7} and HI = 0.03 | No exposure pathway | No exposure pathway | Adult: ELCR = 7×10^{-7} and HI = 0.01 Youth: ELCR = 9×10^{-7} and HI = 0.02 Child: ELCR = 3×10^{-6} and HI = 0.7 | Adult: ELCR = no COPCs and HI = 0.3 Child: ELCR = no COPCs and HI = 3* Adult/Child: ELCR = 2×10^{-5} and HI = no COPCs |
| Total Soil (0-6 ft) | No exposure pathway | ELCR = 1×10^{-6} and HI = 0.2 | ELCR = 1×10^{-7} and HI = 0.2 | No exposure pathway | |
| Groundwater | No exposure pathway | <u>Pre-Pilot Study</u> ELCR = 8×10^{-5} and HI = 1.4 | No exposure pathway | No exposure pathway | <u>Pre-Pilot Study</u> Adult: ELCR = no COPCs and HI = 4.1 Child: ELCR = no COPCs and HI = 43 Adult/Child: ELCR = 4×10^{-4} and HI = no COPCs <u>Post-Pilot Study</u> Adult: ELCR = no COPCs and HI = 0.5* Child: ELCR = no COPCs and HI = 0.5* Adult/Child: ELCR = 3×10^{-5} and HI = no COPCs |

ELCR - excess lifetime cancer risk; unacceptable ELCR > 1×10^{-4}

HI - hazard index; unacceptable HI > 1

* Inorganic COPCs (aluminum, antimony, arsenic, cadmium, iron, manganese, thallium, and vanadium) that are wholly or primarily attributable to background were not identified as COCs.

| Media | Ecological Risk |
|-------------|---------------------|
| | All Receptors |
| Soil | Acceptable |
| Groundwater | No exposure pathway |

What is Human Health Risk and How is it Calculated?

A Human Health Risk Assessment (HHRA) estimates the likelihood of health problems occurring if no cleanup action were taken at a site.

This is also referred to as “baseline risk.” HHRA’s are conducted using a stepped process (as outlined in Navy and USEPA HHRA policy and guidance). To estimate baseline risk at a site, the Navy performs the following four-step process:

Step 1: Data Collection and Evaluation

Step 2: Exposure Assessment

Step 3: Toxicity Assessment

Step 4: Risk Characterization

During Data Collection and Evaluation (**Step 1**), the concentrations of chemicals detected at a site are evaluated, including:

- Identifying and evaluating area(s) where site-related chemicals may be found (source areas) and at what concentrations.
- Evaluating potential movement (transport) of chemicals in the environment.
- Comparing site concentrations to risk-based screening levels to determine which chemicals may pose the greatest threat to human health (called “chemicals of potential concern” [COPCs]). Constituents are not excluded from the risk assessment process if they are within the range of background.

In **Step 2**, the Exposure Assessment, potential exposures to the COPCs identified in Step 1 are evaluated. This step includes:

- Identifying possible exposure media (for example, soil, air, groundwater, surface water, and/or sediment).
- Evaluating if/how people may be exposed (exposure pathways).
- Evaluating routes of exposure (for example, ingestion).
- Identifying the concentrations of COPCs to which people might be exposed.
- Identifying the potential frequency and length of exposure.
- Calculating a “reasonable maximum exposure” (RME) dose that portrays the highest level of human exposure that could reasonably be expected to occur.

In the Toxicity Assessment (**Step 3**), both cancer and non-cancer toxicity values are identified for oral, dermal, and inhalation exposures to the COPCs. The toxicity values are identified using the hierarchy of toxicity value sources approved by USEPA.

Step 4 is Risk Characterization, where the information developed in Steps 1-3 is used to estimate potential risk to people. The following approach is used:

- Two types of risk are considered: cancer risk and non-cancer hazard.
- The likelihood of developing cancer as a result of site exposure is expressed as an upper-bound probability; for example, a “1 in 10,000 chance.” In other words, for every 10,000 people that might be exposed under the conditions identified in Step 2, one additional case of cancer may occur as a result of site exposure. Unacceptable risk exists when the ELCR of 1×10^{-4} is exceeded.
- For non-cancer health effects, a “hazard index” (HI) is calculated. The HI represents the ratio between

What is Ecological Risk and How is it Calculated?

An ecological risk assessment (ERA) is conceptually similar to a human health risk assessment except that it evaluates the potential risks and impacts to ecological receptors (plants, animals other than humans and domesticated species, habitats [such as wetlands], and communities [groups of interacting plant and animal species]). ERAs are conducted using a tiered, step-wise process (as outlined in Navy and USEPA ERA policy and/or guidance) and are punctuated with Scientific Management Decision Points (SMDPs). SMDPs represent points in the ERA process where agreement among stakeholders on conclusions, actions, or methodologies is needed so that the ERA process can continue (or terminate) in a technically defensible manner. The results of the ERA at a particular SMDP are used to determine how the ERA process should proceed, for example, to the next step in the process or directly to a later step. The process continues until a final decision has been reached (i.e., remedial action if unacceptable risks are identified, or no further action if risks are acceptable). The process can also be iterative if data needs are identified at any step; the needed data are collected and the process starts again at the point appropriate to the type of data collected.

An ERA has three principal components:

1. Problem Formulation - Establishes the goals, scope, and focus of the ERA and includes:

- Compiling and reviewing existing information on the habitats, plants, and animals that are present on or near the site
- Identifying and evaluating area(s) where site-related chemicals may be found (source areas) and at what concentrations
- Evaluating potential movement (transport) of chemicals in the environment
- Identifying possible exposure media (soil, air, water, sediment)
- Evaluating if/how the plants and animals may be exposed (exposure pathways)
- Evaluating routes of exposure (for example, ingestion)
- Identifying specific receptors (plants and animals) that could be exposed
- Specifying how the risk will be measured (assessment and measurement endpoints) for all complete exposure pathways

2. Risk Analysis, which includes:

- Exposure Estimate - An estimate of potential exposures (concentrations of chemicals in applicable media) to plants and animals (receptors). This includes direct exposures of chemicals in site media (such as soil) to lower trophic level receptors (organisms low on the food chain such as plants and insects) and upper trophic level receptors (organisms higher on the food chain such as birds and mammals). This also includes the estimated chemicals dose to upper trophic level receptors via consumption of chemicals accumulated in lower food chain organisms.
- Effects Assessment - The concentrations of chemicals at which an adverse effect may occur are determined.

The three principal components of an ERA are implemented as an 8-step, 3-tier process as follows:

1. **Screening-Level ERA (Steps 1-2; Tier 1)** – The Screening Level ERA (SLERA) conducts an assessment of ecological risk using the three steps described above and very conservative assumptions (such as using maximum chemical concentrations).
2. **Baseline ERA (Steps 3-7; Tier 2)** – If potential risks are identified in the SLERA, a Baseline ERA (BERA) is typically conducted. The BERA is a reiteration of the three steps described above but uses more site-specific and realistic exposure assumptions, as well as additional methods not included in the SLERA, such as consideration of background concentrations. The BERA may also include the collection of site-specific data (such as measuring the concentrations of chemicals in the tissues of organisms, for example, fish) to address key risk issues identified in the SLERA.
3. **Risk Management (Step 8; Tier 3)** – Step 8 develops recommendations on ways to address any unacceptable ecological risks that are identified in the BERA and may also include other activities, such as evaluating remedial alternatives.

PREQB, may reconsider no further action as the preferred alternative or select another alternative upon completion of the public comment period, if additional data indicate that another alternative warrants consideration or selection.

7. Community Participation

A community relations program has been ongoing for the Vieques environmental restoration program since 2001. The community relations program fosters two-way communication of investigation and remediation activities between the stakeholder agencies (Navy, USEPA, PREQB, **United States Fish and Wildlife Service [USFWS]**) and the public. A Restoration Advisory Board (RAB) was formed in 2004 to provide for expanded community participation. Regular meetings are held to provide an information exchange among community members and stakeholder agencies. These meetings are open to the public and are held approximately every 3 months.

Public input is a key element in the decision-making process. Nearby residents and other interested parties are strongly encouraged to use the comment period to relay any questions and comments about the preferred alternative at AOC I (OU 04). The Navy will summarize and respond to substantive comments in a Responsiveness Summary, which will become part of the official **Record of Decision (ROD)** for AOC I (OU 04).

This Proposed Plan fulfills the public participation requirements of CERCLA Section 117(a), which specifies that the lead agency (the Navy) must publish a plan outlining any remedial alternatives evaluated for a site and identify the preferred alternative. All documentation pertaining to the investigation of AOC I and the development of the preferred alternative presented in this Proposed Plan is available for public review in the Administrative Record at the Information Repository.

The public comment period for the Proposed Plan provides an opportunity for input regarding the preferred alternative for AOC I (OU 04). The public comment period will be from November 4 through December 19, 2013, and a public meeting will be held on November 14, 2013 at 6:00 pm at the Ice House. All interested

parties are encouraged to attend the public meeting to learn more about the preferred alternative for AOC I (OU 04). The meeting will provide an additional opportunity to submit comments on the Proposed Plan to the Navy.

Comments on the preferred alternative, or this Proposed Plan, must be postmarked no later than December 19, 2013. On the basis of comments or new information, the Navy and USEPA, in consultation with PREQB, may modify the preferred alternative or choose another alternative. The comment page included as part of this Proposed Plan may be used to provide comments to the Navy.

The Community Involvement Plan and technical reports supporting the preferred alternative for AOC I (OU 04) are available to the public in the Information Repository, which is located at:

Biblioteca Electrónica
Benítez Guzmán Street,
Corner with Baldorioty de Castro Street
Isabel Segunda
Vieques, PR 00765
(787) 741-2114
Hours of Operation:
Monday – Friday, 10:00 a.m. – 6:00 p.m.

During the comment period, interested parties may submit written comments to the following address:

Kevin Cloe
Remedial Project Manager
NAVFAC Atlantic
(Attn: Code EV31)
6506 Hampton Blvd.
Norfolk, VA 23508-1278
kevin.cloe@navy.mil

Julio Vazquez
Remedial Project Manager
USEPA Region 2
290 Broadway, 18th Fl
New York, NY 10007
vazquez.julio@epa.gov

Wilmarie Rivera
Federal Facilities Coordinator
Puerto Rico Environmental Quality Board
Edificio de Agencias Ambientales Cruz A. Matos
Urbanización San José Industrial Park
Avenida Ponce de León 1375
San Juan, PR 00929-2604
wilmarierivera@jca.pr.gov

Or online at: <http://public.lantops-ir.org/sites/public/vieques/default.aspx>

Questions or comments can be submitted to any of the individuals listed in the box below during the public comment period.

Note: This summary is presented in English and Spanish for the convenience of the reader. Every effort has been made for the translations to be as accurate as reasonably possible. However, readers should be aware that the English version of the Proposed Plan is the official version.

8. Glossary

Acceptable Risk: USEPA's acceptable risk range for Superfund hazardous waste sites is 1×10^{-4} to 1×10^{-6} , meaning there is 1 additional chance in 10,000 (1×10^{-4}) to 1 additional chance in 1 million (1×10^{-6}) that a person will develop cancer if exposed to contaminants at a site that is not remediated.

Administrative Record: A compilation of documents and information for CERCLA sites that is made available to the public for review.

Andesite: A fine grained volcanic rock, is commonly found in the Kv geologic zone.

Applicable or Relevant and Appropriate Requirements (ARARs): CERCLA Section 121 (d)(2)(A) requires that remedial actions meet any federal standards, requirements, criteria, or limitations that are determined to be legally applicable or relevant and appropriate.

Background: Substances or locations that are not influenced by the releases from a site and are usually described as naturally occurring or anthropogenic.

Bedrock: Solid rock underlying loose deposits such as soil or alluvium.

Cancer Risk: Cancer risks are expressed as a number reflecting the increased chance that a person will develop cancer if exposed to chemicals or substances, as described in the Human Health Risk Assessment.

Chemical of Concern (COC): A contaminant that contributes risk or hazard above acceptable levels to a receptor.

Chemical of Potential Concern (COPC): A contaminant that potentially contributes risk to a receptor.

Comprehensive Environmental Response,

Compensation and Liability Act (CERCLA): A Federal law passed in 1980 (United States Code Title 42, Chapter 103), commonly referred to as the "Superfund" Program, that provides for cleanup and emergency response in connection with numerous existing, inactive hazardous substance disposal sites that endanger public health and safety or the environment. CERCLA was amended by the Superfund Amendments and Reauthorization Act (SARA) in 1986.

Department of Interior (DOI): Land owner of the National Wildlife Refuge and Wilderness Area.

Ecological Risk Assessment (ERA): An evaluation of the risk posed to ecological receptors (i.e., plants and animals) if remedial activities are not performed at the site.

Enhanced In-Situ Bioremediation (EISB): Treatment of contaminated material at a site using biological agents (e.g., fungi, bacteria, and other microbes) or nutrients (e.g., oxygen, nitrates) to accelerate the natural biodegradation process.

Excess Lifetime Cancer Risk (ELCR): Potential carcinogenic effects that are characterized by estimating the probability of cancer incidence in a population of individuals for a specific lifetime from projected intakes (and exposures) and chemical-specific dose-response data.

Exposure Pathway: The route a substance takes from its source (where it began) to its end point (where it ends), and how people can come into contact with (or get exposed to) it. An exposure pathway has five parts: a source of contamination (such as an abandoned business); an environmental media and transport mechanism (such as movement through groundwater); a point of exposure (such as a private well); a route of exposure (eating, drinking, breathing, or touching), and a receptor population (people potentially or actually exposed). When all five parts are present, the exposure pathway is termed a completed exposure pathway.

Groundwater: The supply of water beneath the Earth's surface that occurs in the pore spaces between soil grains or within fractures in geologic formations that are fully saturated.

Hazard Index: The sum of the hazard quotients for substances that affect the same target organ or organ system. Because different pollutants may cause similar adverse health effects, it is often appropriate to combine hazard quotients associated with different substances.

Human Health Risk Assessment (HHRA): A qualitative and quantitative evaluation of the risk posed to human health by the presence of specific pollutants. Elements include: identification of the hazardous substances present in the environmental media; assessment of exposure and exposure pathways; assessment of the toxicity of the site's hazardous substances; and characterization of human health risks.

In-Situ Chemical Oxidation (ISCO): A remediation technique which involves the introduction of a chemical oxidant into the subsurface for the purpose of transforming contaminants in groundwater or soil into less harmful species.

Media (singular, Medium): Soil, groundwater, surface water or sediment at the site.

Municipality of Vieques (MOV): Property owner of Vieques.

National Oil and Hazardous Substances Pollution Contingency Plan (NCP): The Federal regulations (Code of Federal Regulations [CFR], Volume 40, Page 300 [40 CFR 300]) that guide determination of the sites to be corrected under both the Superfund (CERCLA) program

and the program to prevent or control spills into surface waters or elsewhere.

National Priorities List (NPL): A list developed by USEPA of uncontrolled hazardous substance release sites in the United States that are considered priorities for long-term remedial evaluation and response.

No Further Action (NFA): Cleanup actions are not necessary to be protective of human health and the environment.

Pilot Study: A small scale preliminary study designed to test the feasibility of applying a remediation strategy to a particular site using specific equipment and/or methods prior to applying the strategy on a larger scale.

Preferred Alternative: With respect to the nine criteria specified in the NCP for evaluating remedial alternatives, the Preferred Alternative is the proposed remedy that meets the threshold criteria and is deemed to provide the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria.

Proposed Plan: A document that presents the preferred remedial alternative and requests public input regarding its proposed selection.

Public Comment Period: The time allowed for the members of a potentially affected community to express views and concerns regarding an action proposed to be taken at a site, such as a rulemaking, permit, or remedy selection.

Puerto Rico Environmental Quality Board (PREQB): The agency responsible for administration and enforcement of environmental regulations for Puerto Rico.

Receptors: Humans, animals, or plants that may be exposed to contaminants from a given site.

Record of Decision (ROD): A legal document that describes the cleanup action or remedy selected for a site, the basis for choosing that remedy, and reflects the public comments that were considered regarding the selected remedy.

Regulatory Standards: Limits or benchmarks established or adopted by regulatory agencies to help enforce or guide provisions of legislation. Examples of regulatory standards include Maximum Contaminant Levels (MCLs) and Regional Screening Levels (RSLs).

Remedial Investigation (RI): A study in support of the selection of a remedy at a site where hazardous substances have been released. The RI identifies the nature and extent of contamination and assesses human health and ecological risk associated with the contamination.

To-be-considered (TBC) criteria: Non-promulgated regulatory criteria, advisories, guidance, and proposed standards that have been issued by the Federal or State government that are not legally binding and do not have the legal status of ARARs. However, TBC criteria may be useful for developing remedial alternatives and for determining

the necessary level of cleanup for the protection of human health and the environment.

Unacceptable Risk (human health): Risk that exceeds USEPA's acceptable risk range for Superfund hazardous waste sites of 1×10^{-4} to 1×10^{-6} .

United States Environmental Protection Agency (USEPA): The Federal agency responsible for administration and enforcement of CERCLA (and other Federal environmental statutes and regulations).

United States Fish and Wildlife Service (USFWS): The Federal agency responsible for the operation and management of the Department of Interior owned land.

Mark Your Calendar for the Public Comment Period

Public Comment Period

November 4 – December 19, 2013

Submit Written Comments

The Navy will accept written comments on this Proposed Plan during the public comment period. To submit comments or obtain further information, please refer to the names and contact information included at the end of Section 7. A blank sheet has been added at the end of this document to be used for writing comments



Attend the Public Meeting

November 14, 2013 at 6:00 p.m.

Ice House
Carr. 200, Km 3, hm 2
Barrio Martineau, Vieques, PR

Isabel Segunda, Vieques, PR The Navy will hold a public meeting to explain the Proposed Plan. Verbal and written comments will be accepted at this meeting.



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Place
stamp
here

NAVFAC Atlantic
Attention: Code EV31/Mr. Kevin Cloe
6506 Hampton Blvd.
Norfolk, VA 23508-1278

SIGNATURE PAGE

Final

Proposed Remedial Action Plan Area of Concern I

Atlantic Fleet Weapons Training Area – Vieques
Former Naval Ammunition Support Detachment
Vieques, Puerto Rico

Contract Task Order 113

10/26/13

Prepared for

Department of the Navy
Naval Facilities Engineering Command
Atlantic

Under the

NAVFAC CLEAN 1000 Program
Contract N62470-08-D-1000 Prepared by



VBO

Approved by (Signature/Date):

Bill Hannah

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Senior Technical Consultant

John Swenfurth

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Activity Manager