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

11/01/2013

CH2M HILL

ES122812152446VBO

NAVFAC Naval Facilities Engineering Command
NAVFAC ATLANTIC

Proposed Remedial Action Plan

Area of Concern E
Atlantic Fleet Weapons Training Area - Vieques
Former Naval Ammunition Support Detachment
Vieques, Puerto Rico
November 2013

1. Introduction

This **Proposed Plan** identifies the rationale and **preferred remedial alternative** for Area of Concern (AOC) E, located at the Former Naval Ammunition Support Detachment (NASD) in Vieques, Puerto Rico. AOC E is also known as Operable Unit (OU) 2 in the Comprehensive Environmental Response, Compensation, and Liability Act Information System (CERCLIS), which is a database maintained by the **United States Environmental Protection Agency** (USEPA) to track the progress at hazardous substance sites. The Proposed Plan summarizes the site history, the results of previous environmental investigations, and the proposed remedial alternative, and it facilitates the public review and comment on the preferred remedial alternative.

AOC E (OU 2) is the site of a former 500-gallon underground storage tank (UST) and former 500-gallon aboveground storage tank (AST) that stored used oil from vehicle maintenance activities. The site is located within the main operational area of the former NASD, which is now part of the Municipality of Vieques (MOV) Public Works facility. The UST was used from about 1970 until its removal and replacement in 1996 by the AST, which was subsequently removed in 2001. Leaks from the former UST resulted in localized soil and **groundwater** contamination.

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)**.

Subsequent to the removal of the UST and associated contaminated soil in 1996 and the AST in 2001, a pilot study was conducted in 2002 to remove free-phase contamination from groundwater. In 2010 and 2011, a second **pilot study** was performed to treat contamination in soil and groundwater at the site. The results of both pilot studies indicate contaminant concentrations have been reduced to levels below Federal and Commonwealth standards, but that persulfate, the chemical used to treat the groundwater contaminants, remains in groundwater. The residual persulfate may continue to actively reduce any residual contaminants that may partition or diffuse from soil into groundwater. Based on the pilot

Mark Your Calendar for the Public Comment Period

Public Comment Period

November 4 through 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 remedial 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.

study information, the current and future anticipated land use, and the results of previous investigations, the preferred remedial alternative for AOC E is Groundwater Monitoring and **Institutional Controls (ICs)**.

The Navy and USEPA, in consultation with PREQB, will make the final decision on the remedial action for AOC E (OU 2) after reviewing and considering all information submitted during the 45-day **public comment period**. If warranted based on public comments and/or new information, the Preferred Alternative may be modified or an alternate remedy may be considered. Therefore, it is important to the remedy selection process that the public provide input.

This Proposed Plan summarizes information that can be found in greater detail in the Final **Remedial Investigation** Report (CH2M HILL, 2008) and the Final Focused **Feasibility Study (FFS)** Report (CH2M HILL, 2012), and other documents contained in the **Administrative Record** for AOC E (OU 2). 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.

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). Vieques is the largest offshore island 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 military training activities. Operations within the Former Vieques Naval Training Range (VNTR; eastern one-half of Vieques) comprised various aspects of naval gunfire training, including air-to-ground ordnance delivery and amphibious landings, as well as housing the main base of operations for these activities at Camp García. Operations within the Former NASD, the western third of Vieques where AOC E (OU 2) is located, consisted mainly of ammunition loading and storage, vehicle and facility maintenance, and general support activities. Figure 2 shows the location of AOC E within the former NASD.

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 E was transferred to the MOV as part of a Quitclaim Deed that transferred the 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 (AFWTA-Vieques), which contains the Former NASD, was placed on USEPA's **National Priorities List (NPL)**. This required all subsequent environmental restoration activities for Navy Installation Restoration (IR) sites on

Figure 1 – Regional Location Map

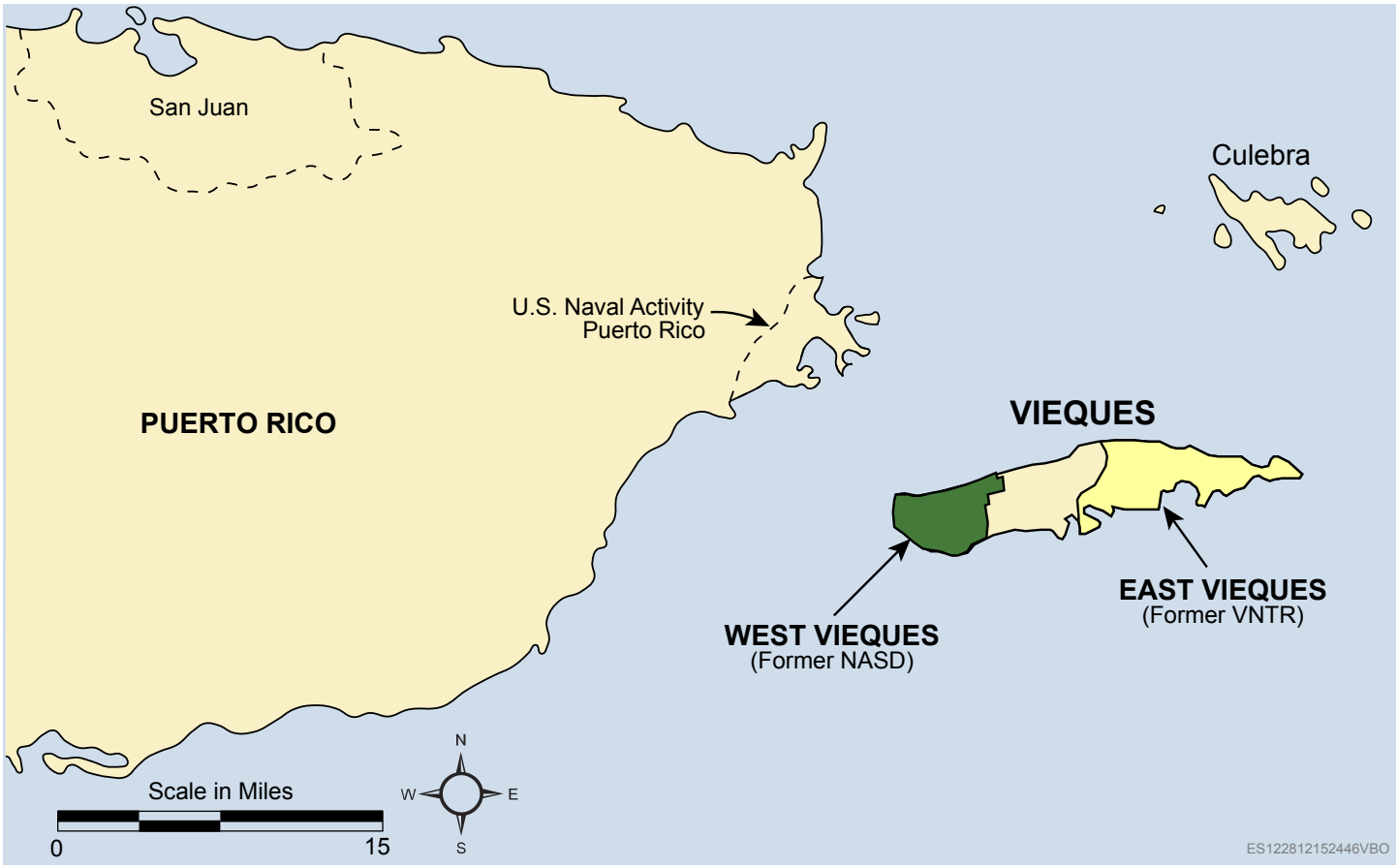
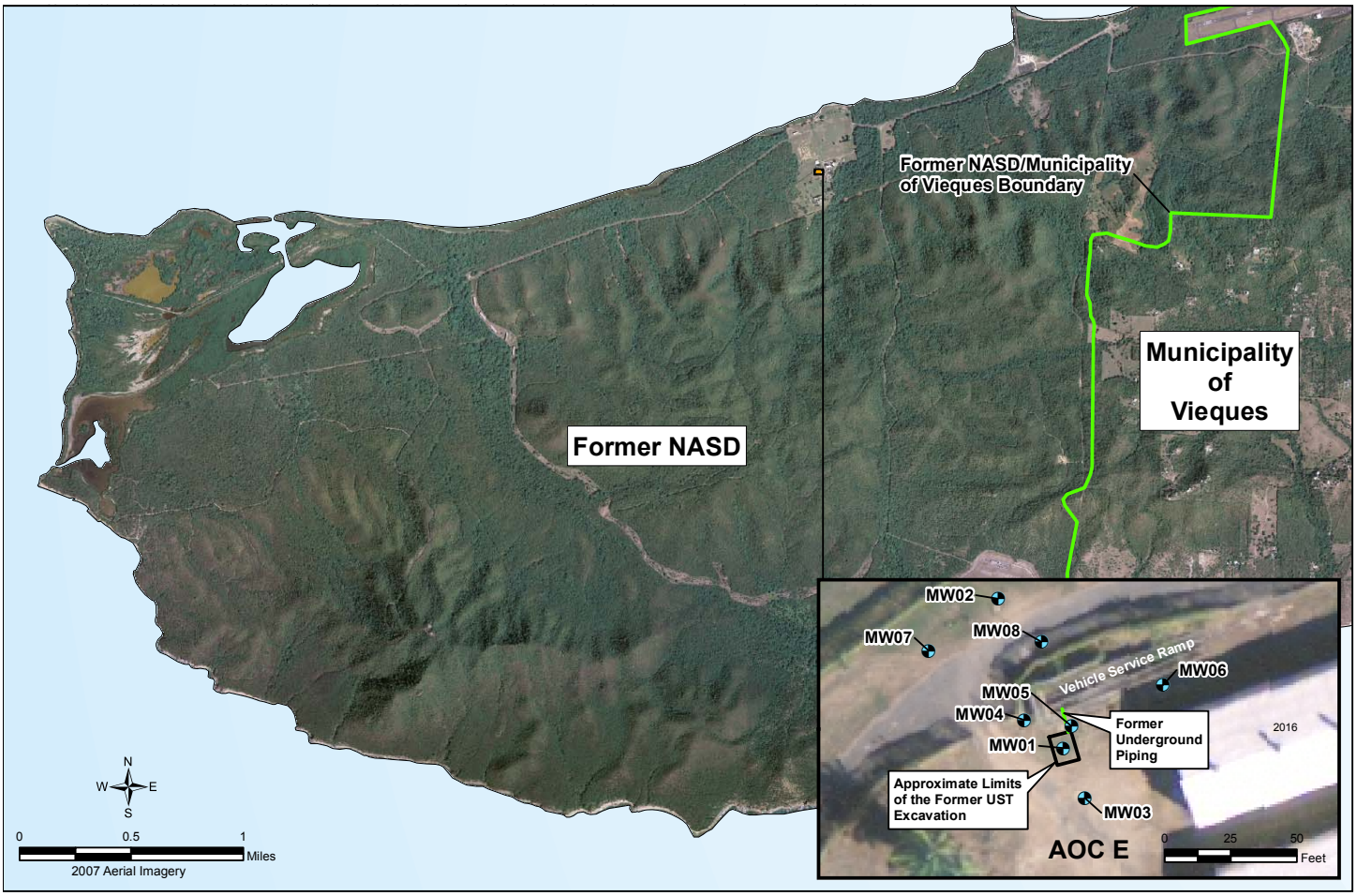


Figure 2 – Former NASD and AOC E Location Map



Vieques to be conducted under CERCLA. On September 7, 2007, the Navy, U.S. Department of Interior (DOI), USEPA, and PREQB finalized a Federal Facilities Agreement (FFA) that establishes the procedural framework and schedule for implementing the CERCLA activities for Vieques. Although the property containing AOC E is owned by the MOV, the Navy retained the responsibility for conducting the environmental investigations and cleanup of the site.

2.2 Site Description

AOC E (OU 2) is less than one-tenth of an acre and is located within the main operational area (i.e., the current Public Works facility) of the Former NASD (Figure 2). The primary source of contamination at the site was a former 500-gallon UST used between about 1970 and 1996 to store used oil generated from vehicle maintenance activities (Figure 3). Specifically, oil removed from vehicles on the vehicle service platform was drained to the UST via an underground pipe between the platform and the UST. In 1996, the UST was removed and replaced with a 500-gallon AST that, in turn, was removed in 2001.

2.3 Summary of Previous Removals, Investigations, and Pilot Studies

Previous removals, environmental investigations, and pilot studies have been conducted at AOC E, beginning in 1996. The following subsections briefly summarize the purpose, scope, and results of the activities completed to date.

UST and AST Removals (1996 and 2001)

The UST and approximately 110 cubic yards of contaminated soil adjacent to the UST were removed in 1996 (Reliable Mechanical, Inc., 1997). At that time, the UST was replaced with an AST, which was subsequently removed in 2001 when Navy operations ceased. There were no documented releases from the AST.

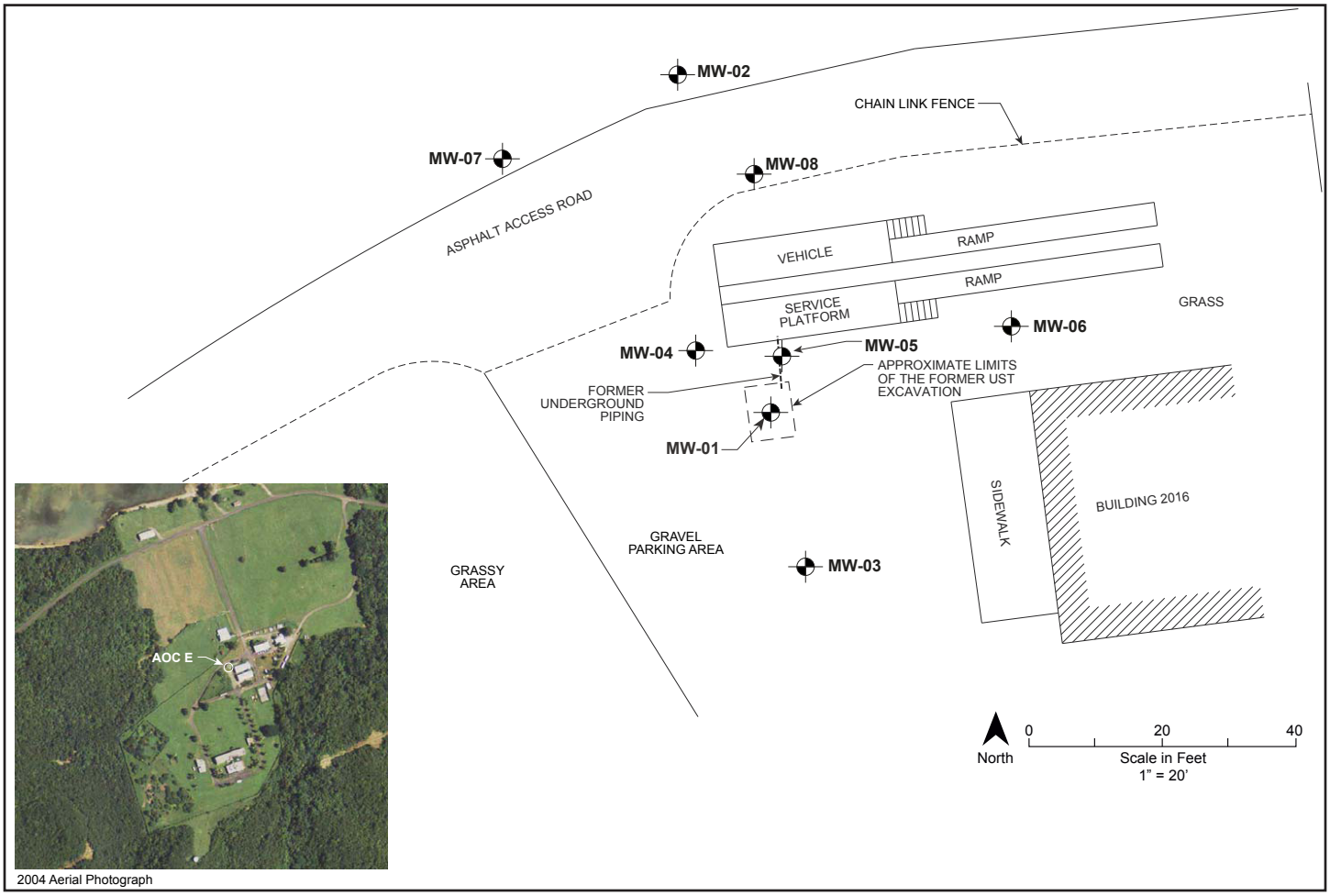
Site Characterization (1998)

Site characterization included collecting eight soil samples and installing and sampling three monitoring wells. Laboratory analytical data showed exceedances of **regulatory standards** for several soil and groundwater samples (CH2M HILL, 1999).

Expanded Preliminary Assessment/Site Investigation (2000)

The Expanded Preliminary Assessment/Site Inspection (PA/SI) assessed impacts to site groundwater from releases from the former UST. It included installing and sampling three monitoring wells and sampling two existing monitoring wells. The PA/SI indicated that there had been a release of petroleum hydrocarbons to groundwater and recommended a Remedial Investigation/Feasibility Study (RI/FS) (CH2M HILL, 2000).

Figure 3 – Site Layout Map



Initial Remedial Investigation (2002, 2003)

Based on recommendation of the Expanded PA/SI, an initial RI was conducted in 2002 and 2003. The RI field work included collecting 20 soil samples to help characterize the horizontal and vertical extent of soil contamination. In addition, two additional monitoring wells were installed and sampled and four existing monitoring wells were sampled (CH2M HILL, 2008). Maximum concentrations of constituents detected in soil and groundwater during the RI are shown in Table 1 and further discussed in Section 3.2.

Multiphase Extraction Pilot Study (2002)

A Multiphase Extraction (MPE) pilot study was conducted to evaluate the effectiveness of this technology in removing **free-phase** contamination. A total of approximately 11,000 gallons of free-phase product and groundwater were recovered at a cost of approximately $113,000 (CH2M HILL, 2008). The pilot study was shown to be successful because no appreciable free-phase product has been observed in site wells since that time.

Supplemental Remedial Investigation (2004, 2005)

During a Supplemental RI performed in 2004-2005, groundwater samples were collected from all eight monitoring wells, and additional soil samples were collected (CH2M HILL, 2008). The Supplemental RI also included conducting human health and ecological risk assessments, which are summarized in Section 4.

Soil Denitrification-Based Bioremediation Pilot Study (2010, 2011)

It was concluded based on the RI that there was no unacceptable risk associated with exposure to AOC E soil; therefore, no **chemicals of concern** (COCs) were identified (CH2M HILL, 2008). However, a soil denitrification-based bioremediation (DBB) pilot study was conducted to address potential soil–to-groundwater leaching. The pilot study consisted of injecting calcium nitrate into the soil (at a cost of approximately $70,000) to ensure that the concentrations of petroleum hydrocarbons in the **unsaturated zone** remained below levels representing a soil-to-groundwater leaching concern (see Table 2).

Groundwater In-Situ Chemical Oxidation Pilot Study (2010, 2011)

A groundwater in-situ chemical oxidation (ISCO) pilot study using persulfate was conducted to evaluate whether the technology could reduce contaminant concentrations in groundwater to below regulatory standards and reduce the time required to achieve those levels relative to the time it would take under natural conditions. Pilot Study Preliminary Remediation Goals (PRGs) were developed based upon the

Table 1 - Remedial Investigation Soil and Groundwater Exceedances for AOC E (OU 2)

Environmental Media	COPC	Maximum Concentration Detected Above Screening Criteria and Background	Background Value	Screening Criteria[2,3]		
				Vieques HHRA SO	Vieques Eco SO	PREQB UST Corrective Action Criteria
Soil	**Volatile Organic Compounds (µg/kg)**					
	Benzene	4,150 J	--	640	-- [1]	5,000
	Ethylbenzene	14,200	--	190,000	-- [1]	10,000
	Xylene, total	90,600	--	27,000	-- [1]	10,000
	Total Inorganics (mg/kg)					
	Iron	43,000	39,000	2,300	-- [1]	--
	Lead	52.1 J	6.9	400	120	50
	Total Petroleum Hydrocarbons (mg/kg)					
	Oil and Grease	19,300	--	--	--	100
	TPH-diesel range	490 J	--	--	--	100
	TPH-gas range	42,000	--	--	--	100
	TPH-oil range	2,800 J	--	--	--	100
	Total Petroleum Hydrocarbons, C10-C28	3,780 J	--	--	--	100
	Total Petroleum Hydrocarbons, C6-C10	2,150 J	--	--	--	100
	Total recoverable TPH	36,000	--	--	--	100

Environmental Media	COPC	Maximum Concentration Detected Above Screening Criteria and Background	Background Value	Screening Criteria		
				Vieques HHRA GW	MCL - GW	PREQB UST Corrective Action Criteria
Groundwater	**Volatile Organic Compounds (µg/L)**					
	1,2-Dichloroethane	32	--	0.12	5	--
	Benzene	17	--	0.35	5	5
	Chloroform	1.4	--	0.17	80	--
	Methyl-tert-butyl ether (MTBE)	1,220	--	11	--	--
	Semivolatile Organic Compounds (µg/L)					
	2-Methylnaphthalene	14	--	2.4	--	--
	Naphthalene	15	--	0.62	--	--
	Pesticide/Polychlorinated Biphenyls (µg/L)					
	Dieldrin	0.11	--	0.0042	--	--
	Total Inorganics (µg/L)					
	Aluminum	106,000	45.8 J	3,600	--	--
	Antimony	5.6 J	--	1.5	6	--
	Arsenic	15.2	1.3 J	0.045	10	--
	Barium	826	118 J	730	2,000	--
	Cadmium	7.2	5.51	1.8	5	--
	Chromium	141	2 J	11	100	--
	Cobalt	118	0.93 J	73	--	--
	Copper	247	3.31 J	150	1,300	--
	Iron	180,000	48.6 J	1,100	--	--
	Manganese	6,490	33.8	88	--	--
	Nickel	87.7	18.9 J	73	--	--
	Thallium	6.6 J	4.6 J	0.24	2	--
	Vanadium	489	11.7 J	3.6	--	--

Notes:

[1] Maximum concentration was detected in subsurface soil; the Vieques Eco SO screening criteria do not apply to subsurface soil

[2] 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.

[3] 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

Table 2 - Denitrification-based Bioremediation (DBB) Pilot Study Soil COC Concentrations for AOC E (OU 2)

Environmental Media	COC	Pre-injection (Baseline) Monitoring	Post-injection Monitoring	Soil PAL[1]
		Maximum Concentration Detected July 2008	Maximum Concentration Detected November 2011	
Soil	**Volatile Organic Compounds (µg/kg)**			
	1,2-Dichloroethane	ND	ND	--
	Benzene	390	2,200	--
	Methyl-tert-butyl ether (MTBE)	1.3 J	370	--
	Xylene, total	72,000	150,000	--
	SPLP Volatile Organic Compounds (µg/L)			
	1,2-Dichloroethane, SPLP	ND	ND	10.5
	Benzene, SPLP	ND	ND	10.5
	Methyl-tert-butyl ether (MTBE), SPLP	ND	ND	252
	Xylene, total, SPLP	180	580	21,000
	Semivolatile Organic Compounds (µg/kg)			
	2-Methylnaphthalene	14,000	14,000	--
	Naphthalene	7,600	7,900	--
	SPLP Semivolatile Organic Compounds (µg/L)			
	2-Methylnaphthalene, SPLP	52	71 J	315
	Naphthalene, SPLP	80	89	210

Notes:
ND - Not detected
SPLP - Synthetic Precipitation Leaching Procedure

[1] The Chemicals of Concern (COCs) Soil Project Action Levels (PALs) were established for protection of soil to groundwater leaching during the Enhanced In-situ Bioremediation (EISB) pilot study, which were groundwater pilot study Preliminary Remediation Goals (PRGs) adjusted by dilution factor of 2.1.

USEPA **Maximum Contaminant Levels (MCLs)**, or other standards for constituents without MCLs. The ISCO pilot test, covering the entire affected area at a cost of approximately $400,000, has shown ISCO to be effective in reducing the concentration of contaminants in groundwater below regulatory standards. However, as noted previously, because of the residual persulfate presence, performance monitoring will need to be conducted for a period beyond the timeframe that residual persulfate persists in groundwater to verify that contaminants remain below the regulatory cleanup standards.

Focused Feasibility Study (2012)

Because of the presence of residual persulfate levels, an FFS was conducted to evaluate groundwater remedial alternatives at AOC E (OU 2). A more detailed description of the FFS is presented in Section 7.

3. Site Characteristic

3.1 Physical Characteristics

AOC E (OU 2) is approximately 43 feet (ft) above mean sea level and relatively flat. No surface water bodies are located at or immediately adjacent to AOC E (OU 2). The site is covered primarily with grass, weeds, and scrub brush, and the grounds are maintained by MOV Public Works personnel. The building onsite is not occupied and the site is fenced to discourage trespassing. Because it is developed and periodically maintained, the site has no significant ecological habitat.

Groundwater at AOC E (OU 2) is within weathered granodiorite bedrock (**saprolite**), overlain by silty/clayey sand alluvium. Groundwater occurs at depths ranging from approximately 28 to 43 ft below ground surface (bgs) and flows generally north-northwest at approximately 1 ft per year.

3.2 Nature and Extent of Contamination

Analytical data collected during the RI, Supplemental 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. The soil and groundwater data collected immediately before and after implementation of the in-situ remedial technologies are shown in Tables 2 and 3, with the post-treatment data representing current conditions.

Contaminants detected in soil primarily occurred directly below the former UST, but at concentrations that pose no unacceptable human health or ecological risk (Section 4) and are no longer expected to leach to groundwater and cause exceedances of regulatory standards, as demonstrated by the DBB pilot study. As shown in Table 3, concentrations of measured COCs (i.e., benzene and naphthalene) declined to non-detect levels during the pilot study.

4. Summary of Site Risks

A **Human Health Risk Assessment (HHRA) and Ecological Risk Assessment (ERA)** were conducted for AOC E (OU 2) during the Supplemental RI; a summary is included in the following subsections and in Table 4. The complete HHRA and ERA are provided in the RI Report (CH2M HILL, 2008), which is available in the Administrative Record File.

Table 3 - In-situ Chemical Oxidation (ISCO) Pilot Study Groundwater COC Concentrations for AOC E (OU 2)

Environmental Media	COC	Pre-injection (Baseline) Monitoring	Post-injection Monitoring		Remediation Goal
		Maximum Concentration Detected March 2010	Maximum Concentration Detected January 2011	Maximum Concentration Detected May 2011	
Groundwater	**Volatile Organic Compounds (µg/L)**				
	1,2-Dichloroethane	ND	NA	NA	3.8
	Benzene	6.4	40	ND	5
	Methyl-tert-butyl ether (MTBE)	520	NA	NA	120
	Xylene, total	ND	NA	NA	10,000
	Semivolatile Organic Compounds (µg/L)				
	2-Methylnaphthalene	8	NA	NA	27
	Naphthalene	13	590	ND	6.1

Notes:
NA - Not analyzed
ND - Not detected

[1] Samples were not analyzed for 1,2-Dichloroethane, MTBE, total xylene, or 2-Methylnaphthalene because residual persulfate concentrations remained high following the injections. Samples were analyzed by the persulfate manufacturer (FMC Corporation) for benzene and naphthalene only using gas chromatography (GC)/mass spectrometry (MS).

4.1 Human Health Risk Assessment

The HHRA was conducted to evaluate potential human health risks associated with exposure to soil and groundwater at AOC E (OU 2). 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 only current potential receptor at AOC E (OU 2) is a hypothetical maintenance worker, who may conduct grounds maintenance at the site. However, as a conservative approach, potential **receptors** evaluated in the HHRA comprised maintenance workers, industrial workers, construction workers, recreational users, and residents. Exposure pathways comprised ingestion, dermal contact, and/or inhalation of chemicals in soil and groundwater.

As shown in Table 4, the only **unacceptable risk** identified by the HHRA was for a hypothetical resident exposed to groundwater at AOC E (OU 2). Based on the results of the HHRA, five COCs were identified in groundwater: 1,2-dichloroethane (1,2-DCA), 2-methylnaphthalene, methyl tert butyl ether (MTBE), naphthalene, and xylenes. Benzene was subsequently added as a COC because its concentration in groundwater exceeded the federal MCL. However, as noted previously, the ISCO pilot study conducted subsequent to the RI reduced the COC concentrations below regulatory standards (i.e., to acceptable levels).

4.2 Ecological Risk Assessment

The ERA was conducted to evaluate potential risks to terrestrial ecological receptors exposed to contaminants detected in soil. As shown in Table 5, no unacceptable risks to plants and animals and other wildlife potentially feeding on those plants and animals were identified. Detailed information is provided in the RI Report (CH2M HILL, 2008).

5. Scope and Role of Response Action

In cooperation with USEPA, and PREQB, and in accordance with applicable guidance, the Navy performed investigations at AOC E (OU 2) to evaluate the nature and extent of contamination associated with past releases, to assess the potential risks to human health and the environment posed by that contamination, and to evaluate technologies for their ability to reduce contaminant concentrations to acceptable levels. Although recent groundwater data show that the pilot study resulted in COC concentrations below regulatory standards, residual persulfate may continue to actively reduce contaminants that partition or diffuse from soil into groundwater. Therefore, the Navy evaluated remedial alternatives for addressing the residual persulfate and the potential for "rebound" of COCs above regulatory standards once the persulfate levels return to normal. The preferred alternative presented in this Proposed Plan is intended to

Table 4 - AOC E (OU 2) Human Health Risk Assessment Results

Media	Human Health Risk				
	Maintenance Workers	Recreational Users[1]	Construction Workers	Industrial Workers[1]	Residents[1]
Surface Soil (0-2 ft)	No COPCs	ELCR = $3x10^{-7}$ and HI = 0.2	No COPCs	No COPCs	ELCR = $1x10^{-6}$ and HI = 0.7
Total Soil (0-6 ft)	No exposure pathway	No exposure pathway	No COPCs	No COPCs	ELCR = $1x10^{-6}$ and HI = 0.7
Groundwater	No exposure pathway	No exposure pathway	No exposure pathway	ELCR = $6x10^{-5}$ and HI = 1	ELCR = $3x10^{-4}$ and HI = 7

Notes:
COPC - **chemical of potential concern**
ELCR - **excess lifetime cancer risk**; unacceptable ELCR > 1 x 10^{-4}
HI - hazard index; unacceptable HI >1

[1] - ELCR and HI values based on pre-ISCO pilot study data; all COC concentrations reduced to below regulatory standards during subsequent ISCO pilot study.

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." HHRAs 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 the "reference dose," which is the dose at which no adverse health effects are expected to occur, and the RME dose for a person contacting COPCs at the site. The key concept here is that a "threshold level" (measured as a HI of 1) exists below which no non-cancer health effects are expected to occur. The potential risks from the individual COPCs and exposure pathways are summed and a total site risk is calculated for each receptor. The uncertainties associated with the risk estimates are presented and their effects on the conclusions of the HHRA are discussed.

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.
3. **Risk Calculation or Characterization:**
   - The information developed in the first two steps is used to estimate the potential risk to plants and/or animals b comparing the exposure estimates with the effects threshold.
   - Also included is an evaluation of the uncertainties (that is, potential degree of error) associated with the predicted risk estimate and their effects on ERA conclusions.

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.

ensure COC levels remain below regulatory standards while persulfate levels decline and that groundwater within the site boundaries is not used as a potable source during that time. The response action is intended to be the final remedy for AOC E (OU 2) and does not include or affect any other sites at the facility under the CERCLA process.

Table 5 – AOC E (OU 2) Ecological Risk Assessment Results

Ecological Risk	
Media	**All Receptors**
Soil	Acceptable

6. Remedial Action Objective

A **Remedial Action Objective (RAO)** is a statement that defines the extent to which sites require cleanup to protect human health and the environment. The RAO for AOC E (OU 2) is:

- Prevent exposure to COCs in groundwater at concentrations above drinking water standards or, in the absence of a drinking water standard, above USEPA's **acceptable risk** range, $1x10^{-4}$ to $1x10^{-6}$ (cumulative **excess lifetime cancer risk** of 1×10^{-4} or less), or above USEPA's target HI of 1.

7. Summary of Remedial Alternatives

Remedial alternatives were developed based on site-specific considerations related to the nature of the COCs and their current (post pilot-study) concentrations, site hydrogeologic conditions, and the successful implementation of the ISCO pilot study as detailed in the FFS Report (CH2M HILL, 2012). Because the pilot study satisfied its objectives, remedial alternatives evaluated were:

- Alternative 1 - No Action
- Alternative 2 - Groundwater Monitoring and ICs, with contingency plans associated with residual persulfate concentrations and potential COC rebound.

Each remedial alternative is summarized in Table 6.

The NCP outlines the approach for comparing remedial alternatives. Evaluation of the alternatives uses nine evaluation criteria, which consist of "threshold," "primary balancing," and "modifying" criteria (Table 7). To be considered for selection as the preferred alternative, a remedial alternative must first meet the two threshold criteria. The primary balancing criteria, which are technical criteria based on environmental protection, cost, and engineering feasibility, are then considered to determine which alternative provides the best combination of attributes. Finally, upon receipt of public comments on this Proposed Plan, the preferred alternative is evaluated further against the two modifying criteria.

The two remedial alternatives presented in Section 7 were evaluated against the first seven of the nine criteria identified in the NCP. The two remaining criteria will be considered after the public comment period for this Proposed Plan.

The comparative analysis of alternatives with respect to the first seven evaluation criteria is summarized below and in Table 8. The AOC E FFS Report (CH2M HILL, 2012) provides a more-detailed discussion of the evaluation.

Threshold Criteria

Overall Protection of Human Health and the Environment. There is presently insufficient data available to conclude that Alternative 1 would achieve the RAO. Alternative 2, including the contingency plans, is protective because the estimated timeframe to meet the RAO for Alternative 2 ranges from 6 to 9 years, and potential potable use of groundwater would be prevented by groundwater use restrictions until the RAO was met.

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs). Alternative 1 does not verify whether the chemical-specific **ARAR**s are met. Alternative 2 is designed to attain all ARARs. A complete list of the ARARs is included in the AOC E FFS Report (CH2M HILL, 2012).

Primary Balancing Criteria

Long-Term Effectiveness and Permanence. The long-term effectiveness would be unknown for Alternative 1 since groundwater monitoring would not be performed. Alternative 2 provides adequate and reliable long-term protection because it utilizes groundwater monitoring to ensure that rebound does not occur to levels that are above drinking water standards or pose an unacceptable risk. In addition, Alternative 2 includes contingency ISCO injections in case COC levels rebound as well as contingency injections to reduce residual persulfate levels if desired.

Reduction in Toxicity, Mobility, or Volume through Treatment. Reduction of toxicity, mobility, and volume was achieved by the pilot study; however, Alternative 1 would not verify potential rebound and achieve further reduction,

Table 6 – Remedial Alternatives Summary

Alternative	Components	Details	Cost*
1. **No Action** No action and no restriction on activities	- N/A	- No groundwater sampling would be performed to monitor concentrations of COCs or residual persulfate - No institutional controls would be implemented - Five-year reviews (for an estimated 30 years) would be required.	**Total Present-Worth Cost: $109,000** Discount Rate: 4% Assumed timeframe: 30 years
2. **Groundwater Monitoring and Institutional Controls**	- Annual groundwater monitoring - ICs	- Groundwater monitoring to ensure persulfate concentrations decline - Annual groundwater monitoring for COCs for 3 years after persulfate levels decline to ensure contaminant rebound does not occur - Implementing ICs to restrict potable groundwater use until the RAO is met - Five-year reviews until the RAO is met to evaluate the effectiveness of the selected remedy	Capital Cost: $66,000 Present Value of Future Annual Operations and Maintenance (O&M) Costs: $194,000 **Total Present-Worth Cost: $260,000** Discount Rate: 4% Assumed timeframe: 6 years
2a. Contingency Plan 1 (CP-1)	ISCO injection using catalyzed hydrogen peroxide propagations (CHP) to address persistent persulfate	**Triggering Events** - If residual persulfate (above 500 mg/L) does not demonstrate an overall decline after three successive annual monitoring events, a hydrogen peroxide solution would be injected to accelerate the persulfate decline. - If COC rebound above acceptable levels is observed and is persistent after three successive annual monitoring events, proceed to contingency plan CP-2.	Capital Cost: $66,000+$126,000=$192,000 Present Value of Future Annual O&M Costs: $194,000+$87,000=$281,000 **Total Present-Worth Cost: $473,000** Discount Rate: 4% Assumed timeframe: 9 years
2b Contingency Plan 2 (CP-2)	ISCO injection using persulfate	**Triggering Event** - If COC rebound above acceptable levels is observed and is persistent after three successive annual monitoring events, hydrogen peroxide activated sodium persulfate would be injected in wells in which rebound is observed.	Capital Cost: $66,000+$117,000=$183,000 Present Value of Future Annual O&M Costs: $194,000+$77,000=$271,000 **Total Present-Worth Cost: $454,000** Discount Rate: 4% Assumed timeframe: 9 years

*The MPE, DBB and ISCO pilot studies had a combined cost of approximately $583,000.

Table 7 – Evaluation Criteria for Comparative Analysis of Alternatives

CERCLA Criteria	Definition
Threshold Criteria	
Protection of human health and the environment	Addresses whether a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through mitigation, engineering controls, or institutional controls.
Compliance with **Applicable Relevant and Appropriate Requirements (ARARs)** and "**To-Be-Considered**" criteria	Addresses whether a remedy will meet all of the ARARs of other Federal and Commonwealth/State environmental requirements and/or justifies a waiver of the requirements.
Primary Balancing Criteria	
Long-term effectiveness and permanence	Addresses the expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once clean-up goals have been met.
Reduction in toxicity, mobility, or volume through treatment	Discusses the anticipated performance of the treatment technologies a remedy may employ.
Short-term effectiveness	Considers the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period, until clean-up goals are achieved.
Implementability	Evaluates the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement an option.
Present-worth cost	Compares the estimated initial, operations and maintenance, and present-worth costs.
Modifying Criteria	
Commonwealth/State acceptance	Considers the Commonwealth/State support agency comments on the Proposed Plan.
Community acceptance	Provides the public's general response to the preferred remedial alternative described in the Proposed Plan. The specific responses to substantive public comments are addressed in the "Responsiveness Summary" section of the Record of Decision (ROD).

Table 8 – Comparative Analysis of Remedial Alternatives

Criterion	Alternative 1 No Action	Alternative 2 Groundwater Monitoring and ICs with contingency plans 1 (persulfate persistence) and 2 (contaminant rebound)
Threshold Criterion		
Overall protection of human health and the environment	○	●
Compliance with ARARs	○	●
Compliance with Chemical-Specific ARARs	○	●
Compliance with Action-Specific ARARs	●	●
Compliance with Location-Specific ARARs	○	●
Balancing Criterion		
Long-term effectiveness and permanence	○	●
Magnitude of Residual Risk	○	●
Adequacy and Reliability of Controls	○	●
Reduction of toxicity, mobility, or volume through treatment	○	◔
Treatment Process Used and Materials Treated	○	●
Amount of Hazardous Materials Destroyed or Treated	Not Applicable	◔
Degree of Expected Reductions in Toxicity, Mobility, and Volume	Not Applicable	◔
Degree to Which Treatment is Irreversible	Not Applicable	●
Type and Quantity of Residual Remaining After Treatment	Not Applicable	◔
Short-term effectiveness	◔	◔
Protection of Community During Remedial Actions	●	●
Protection of Workers During Remedial Actions	●	◔
Environmental Impacts	●	◔
Time Until Remedial Action Objectives are Achieved	○	●
Implementability	◔	◔
Technical Feasibility	●	◔
Administrative Feasibility	○	●
Availability of Services, Equipment, and Materials	●	●
Cost (Total Present Value)	**$109,000 (5-yr reviews only)**	**$260,000 (with contingency plan 1: $473,000); (with contingency plan 2: $454,000)**

Individual criterion scores: ○ not met ◔ poor ◒ satisfactory ◔ good ● excellent

if necessary, due to lack of groundwater monitoring or additional treatment. For Alternative 2, long-term monitoring and, if necessary, implementing the contingency plans would ensure the reduction of toxicity, mobility, and volume of COC concentrations is maintained.

Short-Term Effectiveness. Alternative 1 has no short-term construction impacts and the lowest environmental footprint since there would be no remedial construction activities. Alternative 2 short term impacts would be negligible and primarily associated with equipment and personnel transport to the site during groundwater sampling activities, site inspections, and injection activities should implementation of a contingency be necessary. The estimated timeframe to meet the RAO for Alternative 2 ranges from 6 to 9 years, depending on whether contingency plans are needed. The contingencies would also enhance short-term effectiveness by providing a means of addressing persistent elevated persulfate concentrations or COC rebound above acceptable levels (Table 9).

As part of the short-term effectiveness evaluation, a sustainability analysis was conducted for each of the two remedial alternatives. Sustainability is focused on energy conservation, reduction of green house gases, waste minimization, and re-use and recycling of materials. While, as mentioned above, Alternative 1 has no short-term construction impacts, the environmental footprint of Alternative 2 is also not significant because of the relatively negligible energy use and land disturbance.

Implementability. Alternative 2 is technically and administratively feasible because previous groundwater monitoring and ISCO injections have been successfully demonstrated at the site.

Cost. Alternative 1 would be the most cost effective if it could be conclusively determined that the RAOs have been

attained, which is not the case. The only costs associated with Alternative 1 are associated with 5-year reviews. Alternative 2 has a **present-worth cost** of $260,000 if the contingency treatments are not necessary, with an increase in cost to $473,000 or $454,000 if contingencies 2a or 2b, respectively, are required.

Modifying Criteria

Commonwealth Acceptance. Commonwealth involvement has been continual throughout the CERCLA process for AOC E (OU 2), and PREQB supports the preferred alternative. However, their final concurrence will be provided following the review of comments received during the public comment period.

Community Acceptance. Community acceptance will be evaluated after the public comment period for the Proposed Plan, and substantive public comments will be addressed and documented in the forthcoming **Record of Decision (ROD)** for AOC E (OU 2).

8. Preferred Alternative

The Navy and USEPA, in consultation with PREQB, agree that the preferred alternative for AOC E (OU 2) is Alternative 2, Groundwater Monitoring and Institutional Controls with Contingency Plans 2a and 2b. Based on the evaluation of the data, information currently available, and the comparative analysis, the preferred alternative meets the statutory requirements of CERCLA for protection of human health and the environment under current and projected future unrestricted land use.

Key elements that make Alternative 2 the preferred alternative are:

- The pilot study data show leaching to groundwater is not currently a concern
- Concentrations of COCs measured during the pilot study declined to below regulatory levels (i.e., were non-detect)
- Groundwater performance monitoring will be conducted for a period beyond the timeframe that residual persulfate persists in groundwater to verify that contaminants will remain below the regulatory cleanup standards (i.e., do not rebound in the future in the absence of persulfate)
- Institutional controls will be in place to prevent potable groundwater use, and thereby risk of exposure to contaminants or residual persulfate, until the RAO is met
- Clear triggers for implementing the contingency plan(s), as shown in Table 6

9. 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, and **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 for AOC E (OU 2). The Navy will summarize and respond to substantive comments in a Responsiveness Summary, which will become part of the official ROD for AOC E (OU 2).

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 E (OU 2) and the development of the preferred alternative presented in this Proposed Plan is

Table 9 - Summary of Remediation Goals for Groundwater Chemicals of Concern

COCs	Remediation Goal (µg/L)	Remediation Goal Basis
Benzene	5	MCL
1,2-Dichloroethane	3.8	PRWQS
2-Methylnaphthalene	27	RSL[1]
MTBE	120	RSL[2]
Naphthalene	6.1	RSL[3]
Total Xylenes	10,000	MCL

Notes:

MCL – Federal Maximum Contaminant Level (EPA, 2009)

PRWQS – Puerto Rico Water Quality Standards (March 2010; for groundwater – class SG)

RSL – EPA **Regional Screening Level** (EPA, 2012) for tap water; lowest of the cancer-based and non-cancer based levels (based on ELCR of $1x10^{-6}$ and HI of 1).

[1] HI of 1; not a potential carcinogen (EPA, 2012)
[2] ELCR of $1X10^{-5}$ and HI of 0.02 (EPA, 2012)
[3] ELCR of $4X10^{-5}$ and HI of 1 (EPA, 2012)

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 remedy selection process for AOC E (OU 2). 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 E (OU 2). 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 E (OU 2) 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.

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.

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

Note: This Proposed Plan 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.

10. Glossary of Terms

Acceptable Risk (human health): 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.

Anerobic Biodegredation: The degredation of compounds by microorganisms in the absence of oxygen.

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 Concentration: Concentrations of naturally occurring and anthropogenic (due to mankind) constituents, such as inorganic constituents, found in groundwater, soil, sediment, and surface water at levels not influenced by site-specific releases. Background concentrations of some inorganics and other constituents are often at levels that may pose a risk to human health or the environment. However, background concentrations of site chemicals are factored into risk management determinations to ensure remedial actions are not implemented for constituents whose concentrations are attributable to background conditions and not indicative of a site-related release.

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.

Department of Interior (DOI): Land owner of the Vieques National Wildlife Refuge. AOC E is not located on DOI property.

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.

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.

Feasibility Study: A study undertaken to develop and evaluate options for remedial action. The FS emphasizes data analysis and is generally performed concurrently with the RI. The data from the RI is used to define the objectives of the response action, to develop remedial action alternatives, and to undertake an initial screening and detailed analysis of the alternatives.

Free-phase: A term commonly used to refer to a liquid that does not readily mix with groundwater and, therefore, tends to form a separate layer from groundwater. Free-phase liquids are also referred as non-aqueous-phase liquids, which can be further subdivided into light non-aqueous-phase liquids, such as gasoline or oil, and dense non-aqueous-phase liquids, such as many types of solvents.

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.

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.

Institutional Controls (IC): Physical, legal, or administrative methods that limit the potential exposure to hazardous substances at a site.

Maximum Contaminant Level (MCL): The standard that is set by the United States Environmental Protection Agency for drinking water quality.

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

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.

Pilot Study: A preliminary study designed to test the feasibility of applying a remediation strategy to particular site using specific equipment, methods, and/or technology.

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.

Present-Worth Cost: Total present day cost to complete the proposed remedy.

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 Action: A cleanup method or specified action to address contaminants at a site.

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.

Regional Screening Level (RSL): Chemical-specific concentration goals for specific media (e.g. soil, sediment, water, and air) and land use combinations that serve as a target to use during the initial development, analysis, and selection of cleanup alternatives.

Restoration Advisory Board (RAB): A stakeholder group that meets on a regular basis to exchange information regarding environmental restoration with members of the Navy, regulatory agencies, and community.

Saprolite: Decomposed and porous rock, often rich in clay, formed in place by chemical weathering of igneous, metamorphic, or sedimentary rocks.

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.

Unsaturated Zone: The zone between the ground surface and the water table.

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

Unsaturated Zone: The zone between the ground surface and the water table.

Please print or type your comments here

Please print or type your comments here

Please print or type your comments here

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

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 E

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-1000Prepared by

VBO

Approved by (Signature/Date):

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