Proposed Remedial Action Plan

Solid Waste Management Unit 4

Atlantic Fleet Weapons Training Area - Vieques

Former Naval Ammunition Support Detachment
Vieques, Puerto Rico

July 2012

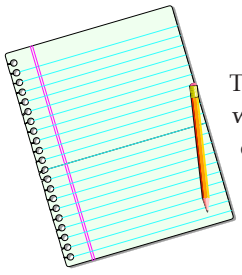
1 Introduction

This **Proposed Plan** identifies the rationale and preferred alternative for Solid Waste Management Unit (SWMU) 4, located at the Former Naval Ammunition Support Detachment (NASD), Vieques, Puerto Rico. SWMU 4 is also designated as Operable Unit (OU) 07 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 investigations and removal actions that focused on **munitions and explosives of concern** (MEC) and chemical contaminants and the **preferred alternative**, and it provides the public an opportunity to review and comment on the preferred alternative. SWMU 4 (OU-07), the former Open Burn/Open Detonation (OB/OD) Site, was used for the thermal destruction of retrograde and surplus munitions, fuels, and propellants from 1969 through 1979 and may have been periodically used as early as the late 1940s.

This document is issued by the U.S. Department of the Navy (Navy), Naval Facilities Engineering Command (NAVFAC) Atlantic Division, and the USEPA Region 2, in consultation with the **Puerto Rico Environmental Quality Board** (EQB). 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)**.

Based on current site conditions, future anticipated land and resource uses, and the results of MEC and environmental investigations at the Site, the preferred alternatives for SWMU 4 (OU-07) include alternatives that focus on MEC, groundwater, and lagoon biota (fish and aquatic crab): Alternative M-3 – *Surface and Subsurface MEC Removal from Planned Parking and Picnic Area, OB/OD Pits, and Lagoon Perimeter; Land Use Controls (LUCs) and Institutional Controls (ICs)*; Alternative G-2 – *Long-Term Monitoring (LTM) and ICs*; and Alternative B-2 – *Re-opening Ocean Access to the Lagoon and Long-term Biota Sampling with LUCs/ICs*. In order to minimize potential use of the adjacent waters, public access to all beach areas inside the SWMU 4 (OU-07) explosive safety quantity distance (ESQD) arc will be restricted pending final determination of the underwater area that is part of Underwater Munitions Site UXO-16 (OU-17).

Mark Your Calendar for the Public Comment Period



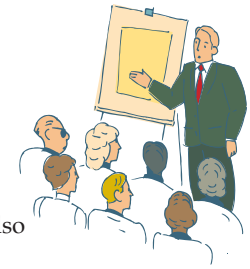
Public Comment Period
July 23 to September 5, 2012

Submit Written Comments
The Navy and USEPA will accept written comments on the Proposed Plan during the 45-day public comment period. To submit comments or obtain further information, please refer to page 35.

Attend the Public Meeting
August 9, 2012 at 6:00 pm

Vieques Multiple Use Center
Calle Antonio Mellado – (across from Plaza)
Isabel Segunda, Vieques, PR

The Navy will hold a public meeting to present the rationale for the proposed remedial action alternatives. Verbal and written comments will also be accepted at this meeting.



Location of Information Repository

Biblioteca Electrónica
Benítez Guzmán Street, Corner with Baldorioty de Castro Street
Isabel Segunda
Vieques, PR 00765
(787) 741-5000
Hours of Operation: Monday – Friday, 8:00 a.m. – 4:00 p.m.

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 text is the official version.

The Navy and USEPA, in consultation with EQB, will make the final decision on the remedial approach for SWMU 4 (OU-07) after reviewing and considering information submitted during the 45-day **public comment period**. If warranted based on public comments and/or new information, the preferred alternatives may be modified or other alternatives may be considered. Therefore, it is important to the remedy selection process that the public provide input on all preferred alternatives and their rationales.

This Proposed Plan summarizes information that can be found in greater detail in the **Remedial Investigation (RI)/ Feasibility Study (FS)** Report (CH2M HILL, 2012), and other documents contained in the **Administrative Record** for SWMU 4 (OU-07). 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 an 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 large portions of Vieques in the early 1940s to conduct activities related to military training. Site operations within the Former NASD consisted mainly of ammunition loading and storage, vehicle and facility maintenance, and some training. The Navy ceased facility-wide operations on the Former NASD on April 30, 2001, in accordance with Presidential Directive to the Secretary of Defense of January 30, 2000. On April 30, 2001 the land was transferred to three entities: the **Department of Interior** (DOI), to be managed by the **U.S. Fish and Wildlife Service** (USFWS) as a National Wildlife Refuge, the Municipality of Vieques (MOV), and the Puerto Rico Conservation Trust.

On February 11, 2005, the Atlantic Fleet Weapons Training Area - Vieques was placed on the **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 executed a Federal Facility Agreement (FFA) that establishes the procedural framework and schedule for implementing the CERCLA response actions for Vieques. Although the DOI is directed to protect and conserve its portion of the transferred land as a wildlife refuge, the Navy retains the responsibility for conducting environmental investigations and cleanup of that property to the extent required.

Figure 1. Regional Location Map

2.2 Site Description

SWMU 4 (OU-07) is approximately 400 acres in size and located in the southwest corner of Vieques within the boundaries of the Former NASD, near the western shore of Vieques **(Figure 2)**. The site is located on property owned by the DOI that has been designated as a wildlife refuge.

SWMU 4 (OU-07) was used for the thermal destruction of retrograde and surplus munitions, fuels, and propellants from 1969 through 1979 and may have periodically been used for this purpose as far back as the late 1940s. The OB/OD operations were conducted in 16 man-made earthen bermed pits that have since become overgrown with vegetation. Fuels, propellants, and explosives waste material were burned and/or detonated in the pits.

2.3 Summary of Previous Investigations and Removal Actions

Previous environmental investigations and an interim removal action have been conducted at SWMU 4 (OU-07), beginning in 1984. The following subsections briefly summarize the purpose and scope of investigations and removal activities completed to date.

Initial Assessment Study (1984)

An Initial Assessment Study (IAS) was conducted in 1984 to identify and assess sites posing potential threats to human health or to the environment. The Site was designated as Site 19, West Explosive Ordnance Disposal (EOD) Range, Vieques (Greenleaf/Telesca, 1984).

Phase II RCRA Facility Assessment (1988)

A Phase II Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) was conducted in

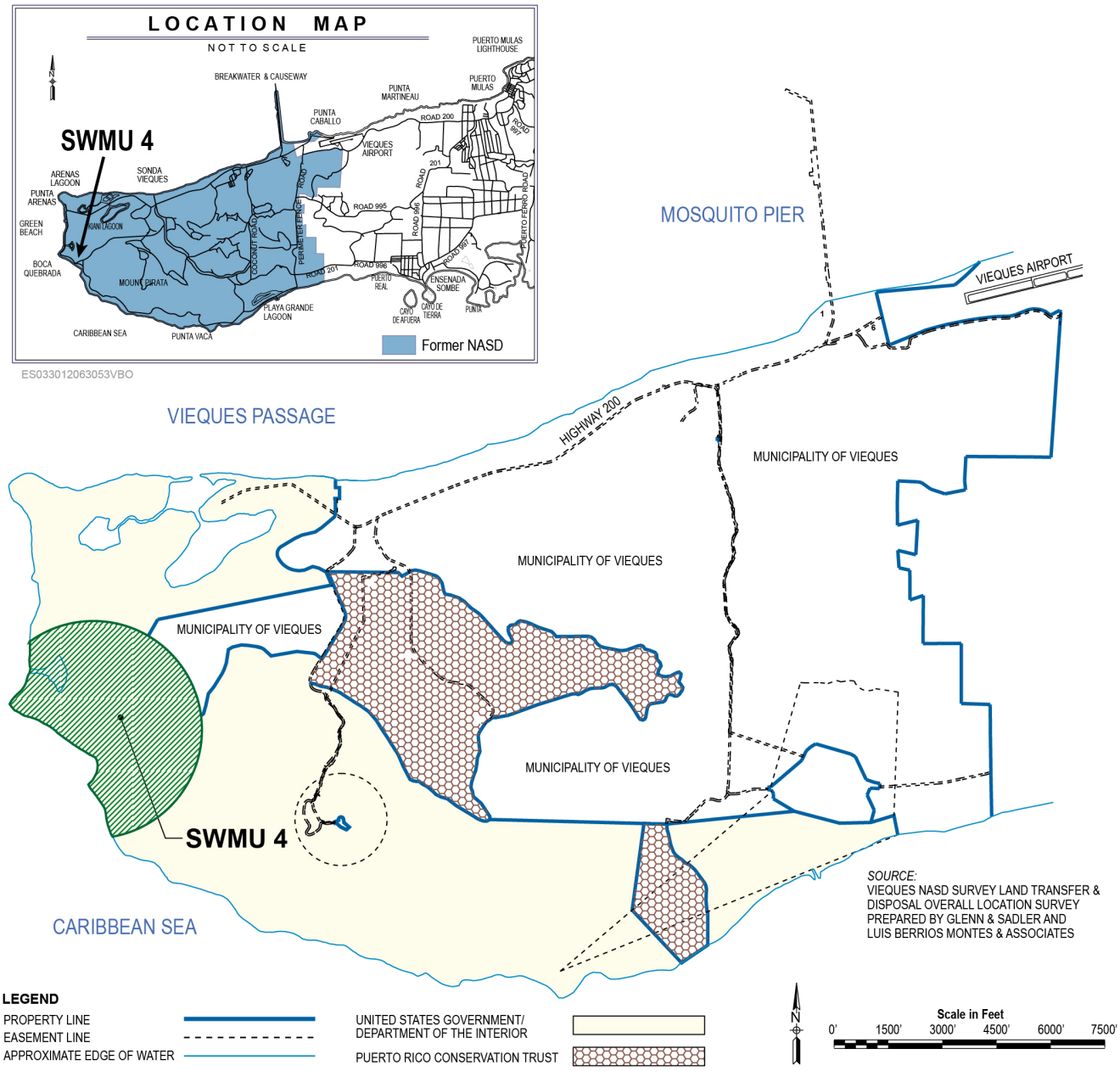


Figure 2. Former NASD and SWMU 4

1988 to evaluate past, present, or potential future releases of hazardous waste or hazardous constituents from any unit or activity that involved management of solid waste (Kearney, 1988). The Phase II RFA Report recommended soil, groundwater, and surface water sampling at the site.

Environmental Baseline Survey (2000)

An Environmental Baseline Survey (EBS) was conducted in 2000 to disclose relevant information regarding the conditions of the Former NASD prior to property transfer (Program Management Company, 2000). Due to the possibility of ordnance being found in the vicinity of the burn pit, a conservative safety buffer arc of 3,000 feet in radius was placed around the OB/OD pits.

Preliminary Assessment/Site Inspection (2000)

A Preliminary Assessment (PA)/Site Inspection (SI) (CH2M HILL, 2000) was conducted in 2000 to determine if a release of hazardous constituents had occurred as a result of Site-related activities and to assess whether the site required further investigation. The PA/SI included geophysical surveys, MEC removal, a qualitative ecological survey, and collection of soil and groundwater samples. Sixteen OB/OD pits were identified and a total of 61 MEC/ small arms were found. Explosives and inorganic constituents were detected above risk-based screening criteria. Based on the results of the PA/SI, a RI was recommended to delineate the nature and extent of MEC and environmental impacts in soil, and to complete a background study for soil and groundwater.

Background Investigation (2000)

A background study was conducted in 2000 for the western portion of Vieques to develop a set of **background** values for inorganic constituents in the soil to help distinguish inorganic concentrations that occur in environmental

media from those that may be present as a result of a site-related release (CH2M HILL, 2002). The background data were collected specifically from the western portion of Vieques to represent soil types similar to those where environmental sites are located in the Former NASD. The background inorganic constituent concentrations were used for comparison with soil inorganic constituent concentrations collected during the environmental investigations at SWMU 4 (OU-07).

Remedial Investigation/Feasibility Study (2002-2009)

The SWMU 4 RI/FS (CH2M HILL, 2012) was conducted to assess the nature and extent of contamination, assess potential risks to human health and the environment, and evaluate remedial alternatives at SWMU 4 (OU-07). The SWMU 4 RI was implemented in two separate investigations – one focusing on MEC and one focusing on chemical contaminants in soil, groundwater, sediment, and surface water. The MEC component of the RI was implemented in three phases from 2002 through 2003 and covered approximately 87 acres of the Site. In addition, a **non-time critical removal action** (NTCRA) was initiated in 2009 that encompassed approximately 24 acres of roads and beaches to reduce the explosive safety risk associated with the Site (CH2M HILL, July 2012). Following the MEC investigation, the environmental characterization component of the RI was conducted from January to March 2007, followed by supplemental investigations in April and July 2008.

The conclusion of the MEC RI was that MEC is potentially present across the Site, but it had been sufficiently characterized to proceed with an FS of potential remedial alternatives to address MEC exposure risk considering the planned future land use.

The conclusion of the environmental characterization component of the RI was that the horizontal and vertical extent of contamination and associated risks had been characterized sufficiently to proceed with an FS of potential remedial alternatives. The environmental-media component of the FS addressed potentially unacceptable human health risks related to perchlorate contamination in groundwater, and related to fish and aquatic crab consumption from Laguna Boca Quebrada.

The FS evaluated remedial alternatives to address MEC, groundwater, and biota at SWMU 4 (OU-07), in accordance with USEPA guidance. A more detailed description of the evaluation presented in the FS is presented in Section 7.

3 Site Characteristics

3.1 Physical Characteristics

SWMU 4 (OU-07) is mostly covered with dense vegetation. More sparse vegetation is confined to a relatively narrow band of land around the perimeter of the lagoon. The Site generally slopes from over 160 ft above mean sea level at the base of Mount Pirata to sea level at Laguna Boca Quebrada and the Caribbean Sea **(Figure 3)**.

Surface water within SWMU 4 (OU-07) occurs as ephemeral streams that flow only for a short period of time after precipitation events, and within Laguna Boca Quebrada, a 72-acre lagoon that is part of an estuarine wetland system that includes Laguna Kiani **(Figure 3)**. Laguna Boca Quebrada was directly connected to the ocean in the past, but the opening became closed by sand over time, resulting in increased salinity and mangrove decline in and around the lagoon. Surface water at SWMU 4 (OU-07) is classified by the Commonwealth of Puerto Rico as SB, where surface water may be intended for recreational use and for desirable plant and animal species preservation.

The first encountered groundwater beneath SWMU 4 (OU-07) is primarily within fractures of weathered volcanic bedrock termed **saprolite**, at depths ranging from approximately 8 to 50 feet below ground surface (ft bgs). Groundwater flows generally westward toward the coastline and Laguna Boca Quebrada, with an estimated velocity ranging from 30 to 140 ft/year. Groundwater beneath the Site is classified by the Commonwealth of Puerto Rico as SG, where groundwater may be intended for use as a source of drinking water supply, agricultural use, and/or flows into coastal, surface, and estuarine waters and wetlands.

3.2 Proposed Land Use

The Site is within the designated Vieques National Wildlife Refuge. Due to the presence of MEC at SWMU 4 (OU-07), the Site is currently closed to the general public. The proposed land use plan developed by the DOI in the Comprehensive Conservation Plan (USFWS, 2007) for SWMU 4 (OU 07) includes a parking area, an observation tower and associated trail for nature observation, and other recreational activities such as scenic roads for the general public. Groundwater is currently not used as a potable water source at or in the vicinity of SWMU 4 (OU-07), nor are there plans for potable use of groundwater in this area. Fishing and crabbing in Laguna Boca Quebrada are not permitted nor planned for the future due to the potential long-term existence of MEC in the lagoon.

3.3 Nature and Extent of Contamination

Sixteen suspected OB/OD pits were discovered at SWMU 4 (OU-07) during the RI activities **(Figure 3)**. The OB/OD pits located to the south of the access road (OB/OD Pits #1 through #13) showed relatively high densities of metallic anomalies, radiating outward to a distance of approximately 600 ft in all directions. The OB/OD pits located north of the access road (OB/OD Pits #14 through #16) were likely used less frequently based on the anomaly density observed. Beyond a distance of 1,500 ft from the OB/OD pits, the anomaly density decreases

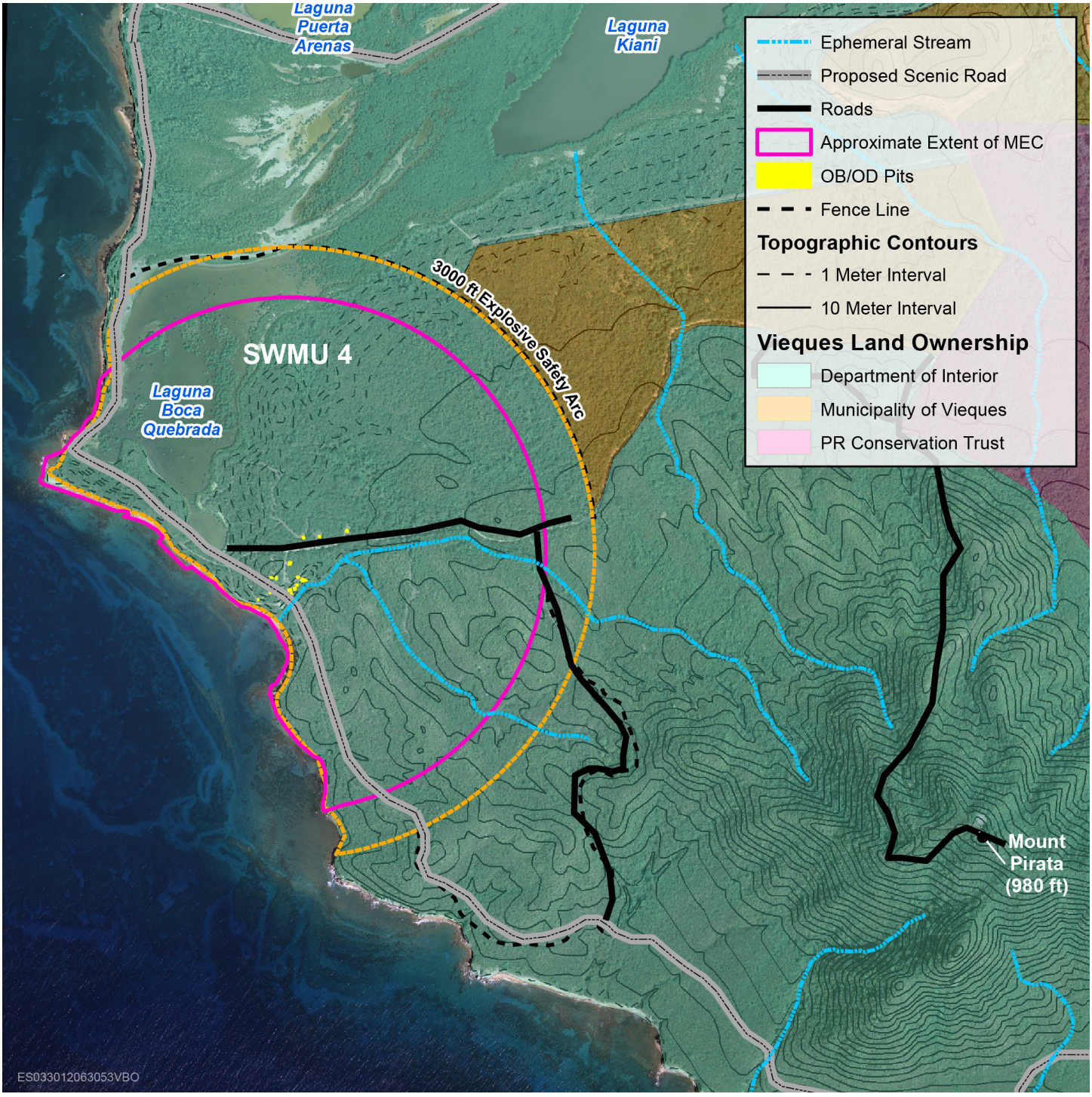


Figure 3. SWMU 4 Location Map

to less than 100 per acre. MEC was not identified beyond approximately 2,600 ft **(Figure 3)**. MEC recovered were predominately 20mm projectiles; other recovered munitions-related material included high explosive, low explosive, incendiary, white phosphorous, fuzes, and other items (CH2M HILL, 2012).

Analytical data collected during the PA/SI and RI provided the primary basis for the evaluation of the nature and extent of contamination in soil, surface water, sediment, and groundwater. Constituents detected above screening criteria and background concentrations (for inorganics) are summarized in **Table 1**.

The explosive perchlorate was the most frequently detected chemical at SWMU 4 (OU-07), with concentrations above the risk-based screening criterion for groundwater. However, a distinct perchlorate plume is not apparent at the Site (CH2M HILL, 2012); rather, relatively low, isolated concentrations have been observed.

Inorganic constituents detected above background concentrations and screening criteria in environmental media include aluminum, antimony, arsenic, barium, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, vanadium, and zinc **(Table 1)**. Copper and zinc had isolated exceedances

of screening criteria in soil, suggesting that they are not widespread contaminants. Lead was observed above the soil screening level (SSL) in soil primarily in the center of some of the OB/OD pits, but it was not detected above the action level in groundwater. Lead was generally below background concentrations in soil outside the OB/OD pits. All other inorganic constituent concentrations are not believed to be attributable to Site related impacts and are most likely background related (CH2M HILL, 2012).

Other constituents likely attributable to past Navy activities but observed infrequently (generally at only one sample location) above screening criteria in environmental media included: explosives 2,4,6-trinitrotoluene (TNT), hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX), tetryl, 2,4-dinitrotoluene (DNT); semi-volatile organic compounds (SVOCs) benzo(a) pyrene, benzo(a)anthracene, chrysene, 2,2'-oxybis(1-chloropropane), 3-nitroanaline, 4 nitrophenol; volatile organic compounds (VOCs) vinyl chloride, chloroform, 1,2-dibromo-3-chloropropane; and the polychlorinated biphenyl (PCB) Aroclor-1254 (CH2M HILL, 2012).

4 Summary of Site Risks

A summary of the **human health risk assessment** (HHRA), and **ecological risk assessment** (ERA) conducted for SWMU 4 (OU-07) during the RI is included in the following subsections. The RI/FS Report provides more detailed analysis and evaluation, and is available in the Administrative Record File.

4.1 Human Health Risk Assessment

The HHRA was conducted to evaluate potential human health risks associated with exposure to soil, groundwater, surface water, and sediment at SWMU 4 (OU-07) **(Table 2)**. Health risks are based on a health-protective estimate of the potential carcinogenic risk and the potential **non-cancer hazard**, which is expressed as a hazard index (HI). Potential current exposure scenarios evaluated for Site media comprised recreational users/ trespassers (adult, youth [6-16 years old], and child [1-6 years old]), fish consumers (adult, youth, and child), and land crab consumers (adult, youth, and child). Maintenance workers, industrial workers, construction workers, recreational users, fish and crab consumers, and residents (adult and child) were identified as potential future receptors. Conservative exposure pathways evaluated, as appropriate, comprised ingestion, dermal contact, and inhalation of chemicals in soil and groundwater, ingestion and dermal contact of chemicals in surface water and sediment, and ingestion of fish and land crab. 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.

Perchlorate in groundwater was identified as the only **chemical of concern** (COC) for the Site, and its identification was based on hypothetical future potable use scenarios for residents and industrial workers. However, this scenario is unlikely for SWMU 4 (OU-07) since legislation mandated the establishment of the Site as a wildlife refuge. As noted in Table 2, risk estimates for other media (soil, surface water, sediment, fish tissue, and land crabs) are either within acceptable levels or, where above acceptable levels, are attributable to laboratory blank contamination (SVOCs), regulated pesticide use, or background conditions (inorganics) and not from historical waste disposal; therefore, COCs were not identified for soil, surface water, sediment, fish, and land crab at SWMU 4 (OU-07). However, due to the uncertainty associated with bioaccumulation factors to estimate site-specific chemical concentrations in fish and aquatic crab tissue and the lack of bioaccumulation factors for explosive constituents, additional action is warranted to be protective with respect to fish and aquatic crab consumption.

4.2 Ecological Risk Assessment

An ERA was conducted to determine if potentially unacceptable risks to ecological receptors are present that warrant additional assessment or action at SWMU 4 (OU-07). 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 SWMU 4 (OU-07). The screening problem formulation for the ERA includes the selection of ecological assessment endpoints, risk hypotheses, and the toxicological properties and fate and transport behavior of the chemicals present at SWMU 4 (OU-07), which are based upon the preliminary conceptual site model. An assessment endpoint is an expression of the environmental component or value that is to be protected.

No COCs were identified for soil, surface water, and sediment, and no COCs were identified for food web exposure (i.e., food chain) at SWMU 4 (OU-07). Therefore, no unacceptable ecological risks were identified and no further evaluation or action is warranted for ecological receptors.

5 Scope and Role of Response Action

In cooperation with USEPA, EQB, and USFWS, and in accordance with the FFA and applicable guidance, the Navy performed investigations at SWMU 4 (OU 07) to evaluate the nature and extent of MEC and environmental-media contamination associated with past CERCLA release related to Navy activities and to assess the potential risks to human health and the environment. The Navy also analyzed remedial alternatives for addressing the MEC and associated contamination at SWMU 4 (OU-07). The preferred alternatives presented in this Proposed Plan are intended to address explosive safety risks and potentially unacceptable risks to receptors exposed to contamination and ensure that land use within the Site boundaries is controlled. The response action is intended to be the

Environmental Media	Chemical of Potential Concern (COPC)	Maximum Concentration Detected Above Screening Criteria and Background	West Vieques Background Value (Qa)	Screening Criteria			
				SSL DAF 6.2	June 2011 Regional Screening Level (RSL) for Residential Soil, Adjusted	June 2011 RSL for Industrial Soil, Adjusted	Ecological Criteria
Soil	**Semivolatile Organic Compounds (µg/kg)**						
	Benzo(a)pyrene	41	--	8,000	15	210	--
	2,4-dinitrotoluene (2,4-DNT)	1,980J	--	0.79	1,600	5,500	11,000
	Pesticides/PCBs (µg/kg)						
	Aroclor-1254	230J	--	120	110	740	--
	Explosives (µg/kg)						
	Perchlorate	9,950	--	160	55,000	720,000	1
	RDX	7,800J	--	6	5,500	24,000	1,000
	Total Inorganics (mg/kg)						
	Aluminum	32,800J	18,000	1,000,000	7,700	99,000	--
	Arsenic	4.9	1.2	1.7	0.39	1.6	18
	Barium	3,179	190	450	1,500	19,000	330
	Cobalt	28.5	13	3.1	2.3	30	13
	Copper	107	47	280	310	4,100	70
	Iron	30,500	28,000	4,100	5,500	72,000	--
	Lead	95.3J	6.9	22	400	800	120
	Manganese	5,120	1,200	360	180	2,300	220
	Mercury	0.21	0.024	0.2	2.3	31	0.1
	Nickel	60.5J	18	210	150	2,000	38
	Selenium	7.5	0.73	2.1	39	510	0.52
	Silver	6.8	0.076	4	39	510	560
	Thallium	1.10J	0.46	0.8	0.51	6.6	1
	Vanadium	113	80	1,600	39	520	2
	Zinc	128	53	3,200	2,300	31,000	120

Environmental Media	COPC	Maximum Concentration Detected Above Screening Criteria	Screening Criteria				
			June 2011 RSL for Tap Water, Adjusted	Maximum Contaminant Level	2010 Puerto Rico Water Quality Standards, Class SG		
Groundwater	**Dissolved Inorganics (µg/L)**						
	Arsenic	20.2	0.045	10	10		
	Barium	904	730	2,000	--		
	Cadmium	4.30J	1.82	5	5		
	Cobalt	6.20J	1.1	--	--		
	Manganese	7,210	88	--	--		
	Mercury	0.28	1.1	2	0.05		
	Selenium	34.9J	18	50	50		
	Total Inorganics (µg/L)						
	Aluminum	8,580J	3,700	--	--		
	Arsenic	6.6J	0.045	10	10		
	Barium	952	730	2,000	--		
	Cadmium	4.6J	1.82	5	5		
	Chromium	14.7	11	100	100		
	Cobalt	9.80J	1.1	--	--		
	Manganese	7,380	88	--	--		
	Mercury	0.2	1.1	2	0.05		
	Selenium	34.3J	18	50	50		
	Thallium	3.1J	0.24	2	0.24		
	Volatile Organic Compounds (µg/L)						
	Chloroform	0.2J	0.19	80	57		
	1,2-dibromo-3-chloropropane	0.6	0.00032	0.2	--		
	Vinyl chloride	0.2J	0.016	2	0.25		
	Semi-Volatile Organic Compounds (µg/L)						
	Naphthalene	0.42J	0.14	--	--		
	Benzo(a)anthracene	0.04J	0.029	--	0.038		
	chrysene	0.04J	2.9	--	0.038		
	2,2'-oxybis(1-chloropropane)	17	0.32	--	--		
	3-nitroanaline	7.7J	3.65	--	--		
	4-nitrophenol	3.7J	0.12	--	--		
	Pesticides/PCBs (µg/L)						
	Gamma-chlordane	0.014J	0.19	--	0.008		
	Alpha-BHC	0.025J	0.011	--	0.026		
	Explosives (µg/L)						
	Perchlorate	160	26	--	--		

Table 1. Soil, Groundwater, Surface Water, and Sediment Exceedances for SWMU 4

Environmental Media	COPC	Maximum Concentration Detected Above Screening Criteria	Screening Criteria: 2010 RSL for Tap Water, Adjusted	Screening Criteria: Marine Ecological Screening Criteria	Screening Criteria: 2010 Puerto Rico Water Quality Standards, Class SB	
Surface Water	**Dissolved Inorganics (µg/L)**					
	Arsenic	25.5	0.045	1.4	36	
	Barium	635	730	200	--	
	Copper	434	150	3.1	3.73	
	Manganese	3,510	88	100	--	
	Mercury	0.075J	1.1	0.94	0.051	
	Selenium	96.6	18	71	71.14	
	Total Inorganics (µg/L)					
	Aluminum	7,060	3,700	--	--	
	Antimony	7.7J	1.5	4,300	640	
	Arsenic	31.4	0.045	1.4	36	
	Barium	556	730	200	--	
	Copper	201	150	3.73	--	
	Iron	19,500J	2,600	50	--	
	Manganese	3,740	88	100	--	
	Mercury	0.077J	1.1	0.051	0.051	
	Selenium	84.3	18	71.1	71.14	
	Vanadium	30	18	50	--	
	Semi-Volatile Organic Compounds (µg/L)					
	Naphthalene	0.69	0.14	1.4	--	
	Pesticides/PCBs (µg/L)					
	4-4'-DDD	0.032J	0.28	0.001	0.001	

Environmental Media	COPC	Maximum Concentration Detected Above Screening Criteria	Screening Criteria: June 2011 RSL for Residential Soil, Adjusted	Screening Criteria: Ecological Screening Level			
Sediment	**Total Inorganics (mg/kg)**						
	Aluminum	60,500	7,700	18,000			
	Arsenic	4.4J	0.39	8.2			
	Barium	213	1,500	48			
	Cobalt	9.8J	2.3	10			
	Copper	45.6J	310	34			
	Iron	35,200	5,500	220,000			
	Manganese	879J	180	260			
	Mercury	0.18J	2.3	0.15			
	Selenium	2J	39	1			
	Silver	8.9	39	1			
	Vanadium	86.6	39	57			
	Zinc	217	2,300	150			
	Semi-Volatile Organic Compounds (µg/kg)						
	Butylbenzylphthalate	260J	260,000	63			
	Di-n-butylphthalate	1,200	610,000	58			
	bis(2-Ethylhexyl)phthalate	240J	35,000	182.16			
	Pesticides/PCBs (µg/kg)						
	4,4'-DDD	2.5J	2,000	2			
	4,4'-DDE	7.3	1,400	2.2			
	4,4'-DDT	3.3J	1,700	1.58			
	dieldrin	1.5J	30	0.2			
	Explosives (µg/kg)						
	Tetryl	100J	24,000	72			

Table 1. Soil, Groundwater, Surface Water, and Sediment Exceedances for SWMU 4

Media	Human Health Risk						
	Future Maintenance Worker	Future Industrial Worker	Future Construction Worker	Current/Future Recreational User/Trespasser	Future Residential	Current/ Future Fish Consumers	Current/Future Land Crab Consumers
Soil	ELCR = 2 x 10^{-7} and HI = 1 x 10^{-3} Acceptable	ELCR = 8 x 10^{-7} and HI = 0.02 Acceptable	ELCR = 1 x 10^{-7} and HI = 0.6 Acceptable	Adult: ELCR = 1 x 10^{-6} and HI = 0.05 Youth: ELCR = 9 x 10^{-7} and HI = 0.09 Child: ELCR = 3 x 10^{-6} and HI 0.4 Acceptable	Adult: : ELCR = no COPCs and HI = 0.2 Child: ELCR = no COPCs and HI = 1.5 Adult/Child: ELCR = 1 x 10^{-5} Acceptable*	No Exposure Pathway	Adult: : ELCR = 8 x 10^{-6} and HI = 25 Youth: ELCR = 6 x 10^{-6} and HI = 44 Child: ELCR = 5 x 10^{-6} and HI = 58 Acceptable*
Groundwater	No Exposure Pathway	ELCR = 4 x 10^{-5} and HI = 3 Acceptable*	No Exposure Pathway	No Exposure Pathway	Adult: ELCR = no COPCs and HI = 10 Child: ELCR = no COPCs and HI = 24 Adult/Child: ELCR = 2 x 10^{-3} Unacceptable	No Exposure Pathway	No Exposure Pathway
Surface Water	No Exposure Pathway	No Exposure Pathway	No Exposure Pathway	Adult: ELCR = 7 x 10^{-6} and HI = 0.4 Youth: ELCR = 4 x 10^{-6} and HI = 0.5 Child: ELCR = 5 x 10^{-6} and HI = 0.8 Acceptable	No Exposure Pathway	Adult: : ELCR = 6 x 10^{-4} and HI = 6,600 Youth: ELCR = 4 x 10^{-4} and HI = 12,000 Child: ELCR = 3 x 10^{-4} and HI = 16,000 Acceptable*	No Exposure Pathway
Sediment	No Exposure Pathway	No Exposure Pathway	No Exposure Pathway	Adult: ELCR = 7 x 10^{-7} and HI = 0.03 Youth: ELCR = 5 x 10^{-7} and HI = 0.05 Child: ELCR = 6 x 10^{-7} and HI = 0.1 Acceptable	No Exposure Pathway	Adult: : ELCR = 5 x 10^{-4} and HI = 8.4 Youth: ELCR = 4 x 10^{-4} and HI = 15 Child: ELCR = 3 x 10^{-4} and HI = 20 Acceptable*	No Exposure Pathway

*SVOCs, pesticides, and inorganic constituents contributed to potential unacceptable risks; SVOCs are attributable to laboratory blank contamination; pesticides are attributable to regulated pesticide application and not a result of a spill, improper storage, disposal, or use; inorganic constituents are attributable to background and not site related. Therefore, risk estimates based on site-related contaminants are within acceptable levels.

- COPCs (1,2-dibromo-3-chloropropane, bis-2(ethylhexyl)phthalate, butylbenzylphthalate, and di-n-butylphthalate) that may be related to the laboratory or analytical processes and are not likely site-related were not identified as COCs.
- Pesticides are present in environmental media at SWMU 4 (OU-07) likely as a result of application to control pests. This type of regulated and approved pesticide use is distinct from pesticide contamination that is the result of a spill or improper storage, disposal, or use, and the resulting concentrations are not required to be remediated under CERCLA. The concentrations of pesticides detected in SWMU 4 (OU-07) media are consistent with concentrations detected across multiple sites and attributed to normal pesticide application. In addition, the historical use of SWMU 4 (OU-07) suggests the site was not used for pesticide disposal. Therefore, pesticide COPCs were not identified as COCs.
- Inorganic COPCs (arsenic, barium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, silver, and zinc) that are wholly or primarily attributable to background were not identified as COCs.

Media	Ecological Risk
	All Receptors
Soil	Acceptable
Groundwater	No Exposure Pathway
Surface Water	Acceptable
Sediment	Acceptable

Table 2. SWMU 4 Risk Assessment Results

final remedy for SWMU 4 (OU-07), and it does not include or affect any other sites at the facility under the CERCLA process.

6 Remedial Action Objectives

Remedial action objectives (RAOs) are statements that define the extent to which sites require cleanup to protect human health and the environment. The RAOs at SWMU 4 reflect the MEC, associated contamination, and biota exposure routes and receptors at SWMU 4 (OU-07). The RAOs for SWMU 4 are as follows:

- Minimize explosive safety risk associated with MEC to be compatible with current and future land use.
- Minimize the potential for unauthorized access to the Site.
- Prevent exposure to perchlorate in groundwater at concentrations that pose a potentially unacceptable human health risk until the perchlorate concentrations reach the drinking water standard, or, in the absence of a drinking water standard, an **acceptable risk** level.
- Prevent unacceptable potential human health risk and/or exposure to edible fish and aquatic crab containing contaminant levels attributable to past Navy activities.

A remediation goal (RG) was developed for perchlorate in groundwater, because it is the only site-related chemical with a concentration contributing to potentially unacceptable risks and hazards at SWMU 4 (OU-07) (see Section 4.2 and Table 2, above). The RG for perchlorate is 26 µg/L and is based on the Tap Water Regional Screening Level (RSL) and a non-cancer HI of 1 since a MCL or Puerto Rico Water Quality Standard (PRWQS) currently does not exist. RGs have not been developed for fish and aquatic crab as they may not be necessary because the potential risk for hypothetical current and future adult exposure scenarios were based on modeled calculations, are likely overestimated, and may be attributable to background. If the remedial alternative is selected that includes long-term monitoring of biota, RGs and risk-based performance criteria may be developed, depending on the results of the initial post-ROD biota sampling and associated risk assessment.

7 Summary of Remedial Alternatives

The remedial alternatives developed and evaluated to address MEC safety risk, perchlorate in groundwater, and the biota exposure routes at SWMU 4 (OU-07) are detailed in the RI/FS Report. Following the screening of various technologies, the following remedial alternatives were selected for detailed evaluation and comparative analysis and are summarized in **Tables 3a, 3b, and 3c** and shown in **Figures 4 through 13**:

MEC

- Alternative M-1 – No Action
- Alternative M-2 – LUCs and ICs Only
- Alternative M-3 – Surface and Subsurface MEC Removal from Planned Parking and Picnic Area, OB/OD Pits, and Lagoon Perimeter; LUCs and ICs
- Alternative M-4 – Surface Clearance of Terrestrial Area Not Already Surface-cleared and Subsurface MEC Removal from Planned Parking Area, OB/OD Pits, and Lagoon Perimeter; LUCs and ICs
- Alternative M-5 – Surface and Subsurface MEC Removal from the Entire Terrestrial Area Not Already Cleared and Lagoon; LUCs and ICs

Groundwater

- Alternative G-1 – No Action
- Alternative G-2 – Long-Term Monitoring (LTM) and ICs
- Alternative G-3 – Enhanced In-situ Bioremediation (EISB)

Biota

- Alternative B-1 – No Action
- Alternative B-2 – Re-opening Ocean Access to the Lagoon and Long-term Biota Sampling with LUCs and ICs
- Alternative B-3 – Covering Lagoon with Soil

Each alternative, with the exception of the No Action alternative, was developed to meet the RAOs. Consistent with the NCP, a No Action alternative was evaluated as a baseline for the comparative analysis.

The NCP outlines the approach for comparing remedial alternatives. Evaluation of the alternatives uses nine evaluation criteria, which consists of "threshold," "primary balancing," and "modifying" criteria **(Table 4)**. To be considered for selection as the preferred alternative, a remedial alternative must first meet 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 two modifying criteria.

Each remedial alternative was evaluated in the RI/FS Report against the first seven of the nine criteria identified in the NCP. The two remaining criteria will be evaluated after the public comment period for this Proposed Plan.

7.1 Relative Evaluation of Alternatives

The comparative analysis of alternatives with respect to the first seven evaluation criteria is summarized below. The SWMU 4 RI/FS Report provides a more detailed discussion of the evaluation. **Tables 5a, 5b, and 5c** provide a relative ranking of the alternatives.

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 step-wise 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 (soil, air, groundwater, surface water, sediment).
- Evaluating if/how people may be exposed (exposure pathways) under current or potential future uses.
- 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-carcinogenic risk.
- 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. An additional cancer case indicates one more person than the number that may get cancer without site exposure.
- 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 risk estimates are evaluated to determine if they are high enough to cause health problems for people at or near the site.

Factors such as nature of the chemical source (i.e., attributable to background levels), laboratory contamination, and common pesticide use (i.e., unrelated to spills, or improper storage, disposal, or use) were considered when identifying final COPCs.

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 chemical 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 by comparing the exposure estimates with the effects thresholds.
- 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 within the framework of an 8-step, 3-tiered 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, such as 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.

Threshold Criteria

Overall Protection of Human Health and the Environment

MEC

Alternative M-1 does not achieve RAOs. Alternative M-2 will meet RAOs, but is not compatible with the future public land use desired by USFWS. All other alternatives provide additional MEC removal to reduce explosive safety risks in proposed future public-use areas and the 16 OB/OD pits and control unauthorized access to the Site by fencing, signage, ICs, and LTM.

Groundwater

Alternative G-1 will not be protective, whereas Alternative G-2 and Alternative G-3 prevent exposure to perchlorate in groundwater at concentrations that pose a potentially unacceptable human health risk.

Biota

Alternative B-1 will not be protective, whereas Alternative B-2 and Alternative B-3 will be protective by ensuring that potential consumption of edible fish and aquatic crab in Laguna Boca Quebrada is acceptable or controlled.

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

A complete list of the ARARs is included in the SWMU 4 RI/FS Report and Appendix A of this Proposed Plan.

MEC

All alternatives except Alternative M-1 can comply with the ARARs.

Groundwater

All alternatives except Alternative G-1 can comply with ARARs.

Biota

All alternatives except Alternative B-3 can comply with ARARs.

Primary Balancing Criteria

Long-Term Effectiveness and Permanence

MEC

Each of the alternatives, with the exception of Alternative M-1, is expected to achieve long-term effectiveness and permanence. Alternative M-2 uses LUCs and ICs to control exposure to MEC. Alternatives M-3, M-4, and M-5 provide a significant reduction in risk of MEC exposure by using a combination of MEC removal and LUCs and ICs.

Groundwater

Each of the alternatives, with the exception of Alternative G-1, is expected to achieve long-term effectiveness and permanence.

Biota

Each of the alternatives, with the exception of Alternative B-1, is expected to achieve long-term effectiveness and permanence. Alternative B-2 minimizes potentially unacceptable risk by controls and monitoring, while Alternative B-3 eliminates the source of potentially unacceptable risk.

Reduction in Toxicity, Mobility, or Volume through Treatment

MEC

Alternative M-1 does not result in any reduction of toxicity, mobility, or volume (TMV) by treatment. Alternative M-2 provides the least amount of TMV reduction by removing munitions-related material along the 3-acre vegetation buffer zone for the fence installation. Alternative M-3 provides TMV reduction by surface and subsurface removal of MEC within the intended 19-acre public access area, at the 16 OB/OD pits, vegetation buffer zone for the fence installation, and along accessible portions of the lagoon perimeter and will result in the removal of the highest density of MEC encountered at the Site. Alternative M-4 provides additional TMV reduction through surface MEC removal within an additional 246-acre area in combination with the Alternative M-3 areas. Alternative M-5 provides additional TMV reduction beyond Alternative M-4 through surface and subsurface MEC removal within the entire 352-acre terrestrial area and the 73-acre lagoon. However, the additional removal areas result in significantly more habitat damage and/or destruction to the vegetated areas and/or the lagoon. Although Alternatives M-4 and M-5 provide MEC removal over a larger acreage than Alternative M-3, Alternatives M-4 and M-5 provide minimal additional TMV since only a lower density of MEC was observed with distance from the OB/OD pits.

Groundwater

There is no reduction in TMV for Alternative G-1. Alternative G-2 would reduce TMV of perchlorate in groundwater through natural attenuation processes, such as dilution, sorption, and dispersion over time. Alternative G-2 reduces the TMV of perchlorate using treatment and natural attenuation processes.

Biota

Alternative B-1 does not result in any reduction of TMV by treatment. Alternative B-2 reduces TMV by tidal seawater exchange and restoration of the normal, open-ocean connection conditions. Alternative B-3 reduces TMV by completely eliminating the human exposure pathway of fish and crab consumption. However, this alternative eliminates the lagoon habitat.

Short-Term Effectiveness

A sustainability analysis was conducted for each of the remedial alternatives as part of this criterion for

Alternative	Components	Details	Cost
M-1 - No Action *No action and no restriction on activities.*	– not applicable (N/A)	– No action – The site would remains in its current condition (MEC surface/partial subsurface removal completed for the 87-acre area, 7-acres of beaches, and 17-acres of access roads). – Access to the site is currently partially restricted by chain-link fences, and locked and gated roads with signage. – 5-year reviews for 30 years since MEC potentially would remain at the site.	**Total Present-Worth Cost: $153,000** Discount Rate: 4% Assumed timeframe: 30 years
M-2 – LUCs and ICs Only *Minimize the potential for trespassing and intrusive activities that may result in uncontrolled exposure to MEC. Ensures land use is controlled.*	– ICs – LUCs – LTM	– No additional surface and subsurface MEC removal for the remaining 265-acre terrestrial area and 73-acre lagoon. – Implementing physical barriers (boundary survey, fencing, gates, and signage) and ICs (deed notations) to restrict future access and intrusive activities. The IC boundary encompassing SWMU 4 would be surveyed by a professional land surveyor. LUCs would restrict uncontrolled construction activity, but would provide the ability for planned land use development and to optimize any long-term monitoring program. – Installing 33,000 linear feet of barbed, three-wire fence with signage to inform the public and restrict access. – Implementing LTM, including periodic site inspections for trespassing, erosion, and fencing/signage. MEC that has become visible or partially visible due to erosion will be removed. – 5-year reviews for 30 years.	Capital Cost: $1,345,000 Present Value of Future, Annual Operations and Maintenance (O&M) Costs: $378,000 **Total Present-Worth Cost: $1,723,000** Discount Rate: 4% Assumed timeframe: 30 years
M-3 – Surface and Subsurface MEC Removal from Planned Parking and Picnic Area, OB/OD Pits, and Lagoon Perimeter; LUCs and ICs *Minimize MEC explosive risk of planned 19-acre parking and picnic area for public use, OB/OD Pits, and lagoon perimeter. Minimize the potential for trespassing and intrusive activities that may result in uncontrolled exposure to MEC. Ensure land use is controlled.*	– MEC removal to 2 ft bgs for public access area (19-acre) AND MEC removal (visible and partially visible) to 6 inches bgs for lagoon perimeter – ICs – LUCs – LTM	– Surface and subsurface MEC removal to 2 ft bgs for the intended 19-acre planned parking and picnic area. – Subsurface MEC removal to depth (assumed to 5 ft bgs) for the 16 OB/OD Pits. – Surface and subsurface MEC removal to 6 inch bgs along the accessible lagoon perimeter wetland and upland buffer. A qualitative survey of the readily accessible area will be conducted to identify the presence of any MEC on or near the ground surface. – Implementing physical barriers (boundary survey, fencing, gates, and signage) and ICs (deed notations) to restrict future access and intrusive activities. – Installing 25,000 linear feet of barbed three wire fence with signage to inform the public and restrict access. – Implementing LTM, including periodic site inspections for trespassing, erosion, and fencing/signage. MEC that has become visible or partially visible due to erosion will be removed. – 5-year reviews for 30 years.	Capital Cost: $4,238,000 Present Value of Future, Annual O&M Costs: $741,000 **Total Present-Worth Cost: $4,979,000** Discount Rate: 4% Assumed timeframe: 30 years
M-4 – Surface Clearance of Terrestrial Area Not Already Surface-cleared and Subsurface MEC Removal from Planned Parking and Picnic Area, OB/OD Pits, and Lagoon Perimeter; LUCs and ICs *Minimize MEC explosive risk of planned 19-acre parking and picnic area for public use, OB/OD Pits and lagoon perimeter. Minimize the potential for trespassing and intrusive activities that may result in uncontrolled exposure to MEC. Ensure land use is controlled.*	– MEC removal to 2 ft bgs for public access area (19-acre) AND surface MEC removal (visible and partially visible) (246 acres) AND MEC removal (visible and partially visible) to 6 inches bgs for lagoon perimeter – ICs – LUCs – LTM	– Surface clearance of visible and partially visible MEC for the remaining 246-acre terrestrial area. – Same as M-3 for other components. – USFWS opposes the deforestation that would be necessary across the 265 acres to perform the MEC removal.	Capital Cost: $16,861,000 Present Value of Future, Annual O&M Costs: $741,000 **Total Present-Worth Cost: $17,602,000** Discount Rate: 4% Assumed timeframe: 30 years
M-5 – Surface and Subsurface MEC Removal from the Entire Terrestrial Area Not Already Cleared and Lagoon; LUCs and ICs *Minimize MEC explosive risk of entire SWMU 4. Minimize the potential for trespassing and intrusive activities that may result in uncontrolled exposure to MEC. Ensure land use is controlled.*	– MEC removal to 2 ft bgs for entire terrestrial area (352 acres) and lagoon (73 acres) – ICs – LUCs – LTM	– Surface and subsurface MEC removal to a depth of 2 ft bgs for the entire 352-acre terrestrial area, which includes the previously surface cleared 87-acre area and the remaining 265-acre terrestrial area not cleared for MEC. – Subsurface MEC removal to depth (assuming 5 ft bgs) for the 16 OB/OD Pits. – Surface and subsurface MEC removal to a depth of 2 ft bgs for the 73-acre lagoon area after dewatering. – Implementing LUC physical barriers (boundary survey and signage; no fence and gates) and ICs (deed notations) to restrict future intrusive activities. – Implementing LTM, including periodic site inspections for erosion and signage. MEC that has become visible or partially visible due to erosion will be removed. – 5-year reviews for 30 years. – USFWS opposes the deforestation that would be necessary across the 352 acres and the dewatering/damage/destruction to the lagoon to perform the MEC removal	Capital Cost: $56,379,000 Present Value of Future, Annual O&M Costs: $776,000 **Total Present-Worth Cost: $57,155,000** Discount Rate: 4% Assumed timeframe: 30 years

Table 3a. MEC Remedial Alternatives

Alternative	Components	Details	Cost
G-1 - No Action *No action and no restriction on activities.*	– N/A	– No action – 5-year reviews for 30 years	**Total Present-Worth Cost: $153,000** Discount Rate: 4% Assumed timeframe: 30 years
G-2 – LTM and ICs *Prevent exposure to perchlorate in groundwater at concentrations above RG of 26 µg/L*	– LTM – ICs	– Periodic groundwater sampling for up to 12 wells for perchlorate and up to 3 wells for natural attenuation parameters (assuming once every 5 years). – Implementing ICs including groundwater use restrictions. – 5-year reviews for 30 years	Capital Cost: $159,000 Present Value of Future, Annual Operations and Maintenance (O&M) Costs: $411,000 **Total Present-Worth Cost: $570,000** Discount Rate: 4% Assumed timeframe: 30 years
G-3 – EISB *Reduce perchlorate concentration in groundwater below RG of 26 ppb*	– Substrate Injection (EVO) – LTM – ICs	– Installing a total of 200 feet of bio-barrier wall with 8 injection well points. – Injecting organic carbon source substrate for enhanced anaerobic degradation up to 2 years during one single injection event. – Periodic groundwater sampling for up to 12 wells for perchlorate and 2 wells for natural attenuation parameters (assuming annual). – Implementing ICs including groundwater use restrictions. – 5-year reviews for 10 years	Capital Cost: $673,000 Present Value of Future, Annual O&M Costs: $464,000 **Total Present-Worth Cost: $1,137,000** Discount Rate: 4% Assumed timeframe: 10 years

Table 3b. Groundwater Remedial Alternatives

Alternative	Components	Details	Cost
B-1 - No Action *No action and no restriction on activities.*	– N/A	– No action – 5-year reviews for 30 years	**Total Present-Worth Cost: $153,000** Discount Rate: 4% Assumed timeframe: 30 years
B-2 – Re-opening Ocean Access to the Lagoon and Long-term Biota Sampling with LUC/IC *Ensure potential human health risk and/or exposure to edible fish and aquatic crab containing contaminant levels attributable to past Navy activities are acceptable or controlled.*	– LTM (biota) – LUCs – ICs	– Re-opening the lagoon to the ocean through retrofit of the existing inlet and construction of a culvert and jetty – Periodic biota (fish and aquatic crab) tissue sampling, (assuming annual) for 5 years. – Implementing physical barriers (boundary survey, fencing, gates, and signage), and ICs (deed notations) to restrict future access and fishing/crabbing activities. – One 5-year review	Capital Cost: $460,000 Present Value of Future, Annual Operations and Maintenance (O&M) Costs: $407,000 **Total Present-Worth Cost: $867,000** Discount Rate: 4% Assumed timeframe: 5years
B-3 – Covering Lagoon with Soil *Eliminate the pathway of potential human exposure to potentially contaminated fish and crab by soil covering.*	– Soil Covering (73 acres) – LUCs – ICs	– Lagoon dewatering and MEC removal to 2 ft bgs to allow soil covering construction – Installation of a minimum 2 feet of soil cover over the entire 73-acre dewatered lagoon area – Implementing O&M, including performing annual soil cover and erosion inspections. – Implementing physical barriers (boundary survey, fencing, gates, and signage), and ICs (deed notations) to restrict future access activities. – 5-year reviews for 30 years – USFWS opposes destruction of the lagoon.	Capital Cost: $23,314,000 Present Value of Future, Annual O&M Costs: $499,000 **Total Present-Worth Cost: $23,813,000** Discount Rate: 4% Assumed timeframe: 30 years

Table 3c. Biota Remedial Alternatives

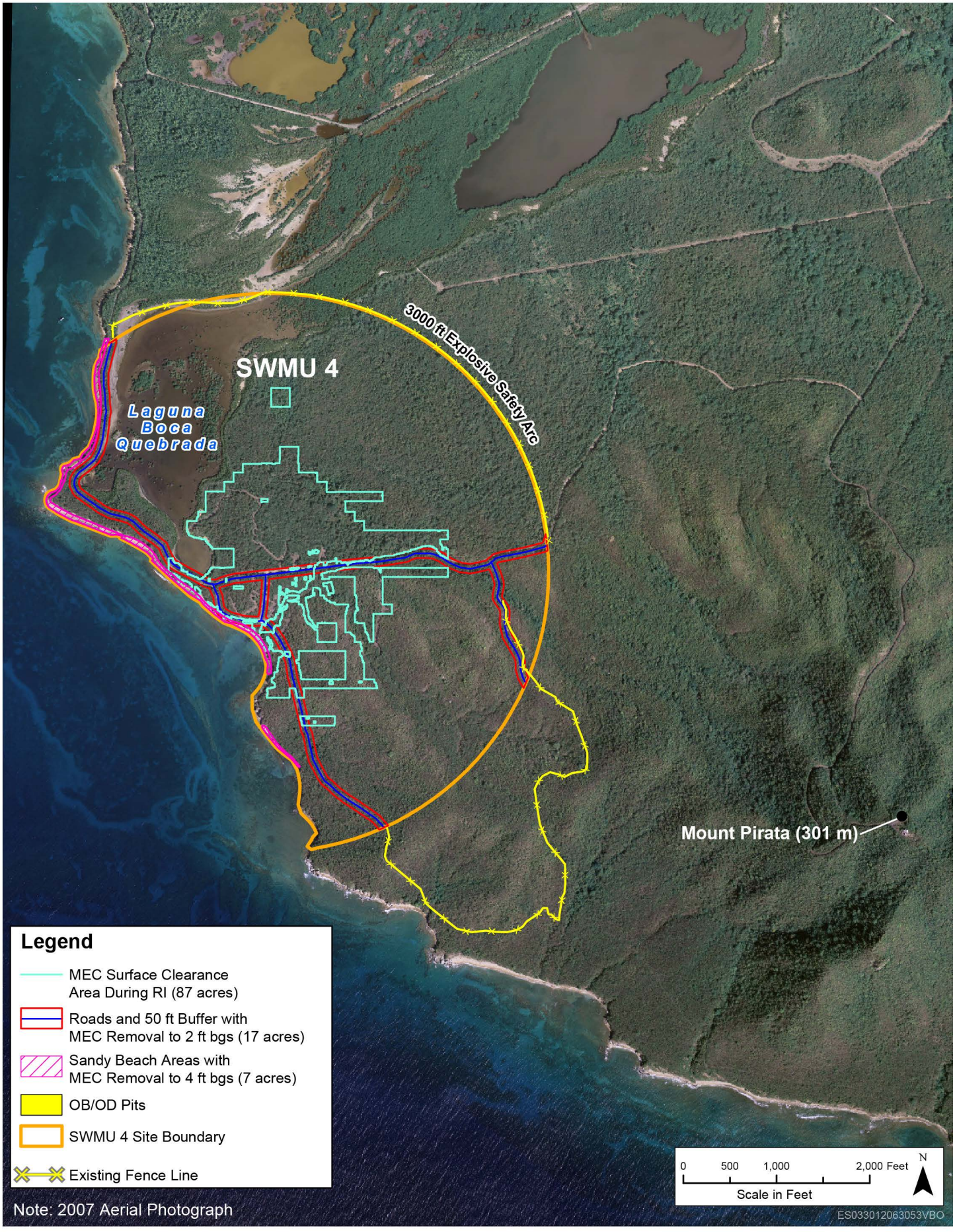


Figure 4. Alternatives M-1 and B-1 – No Action

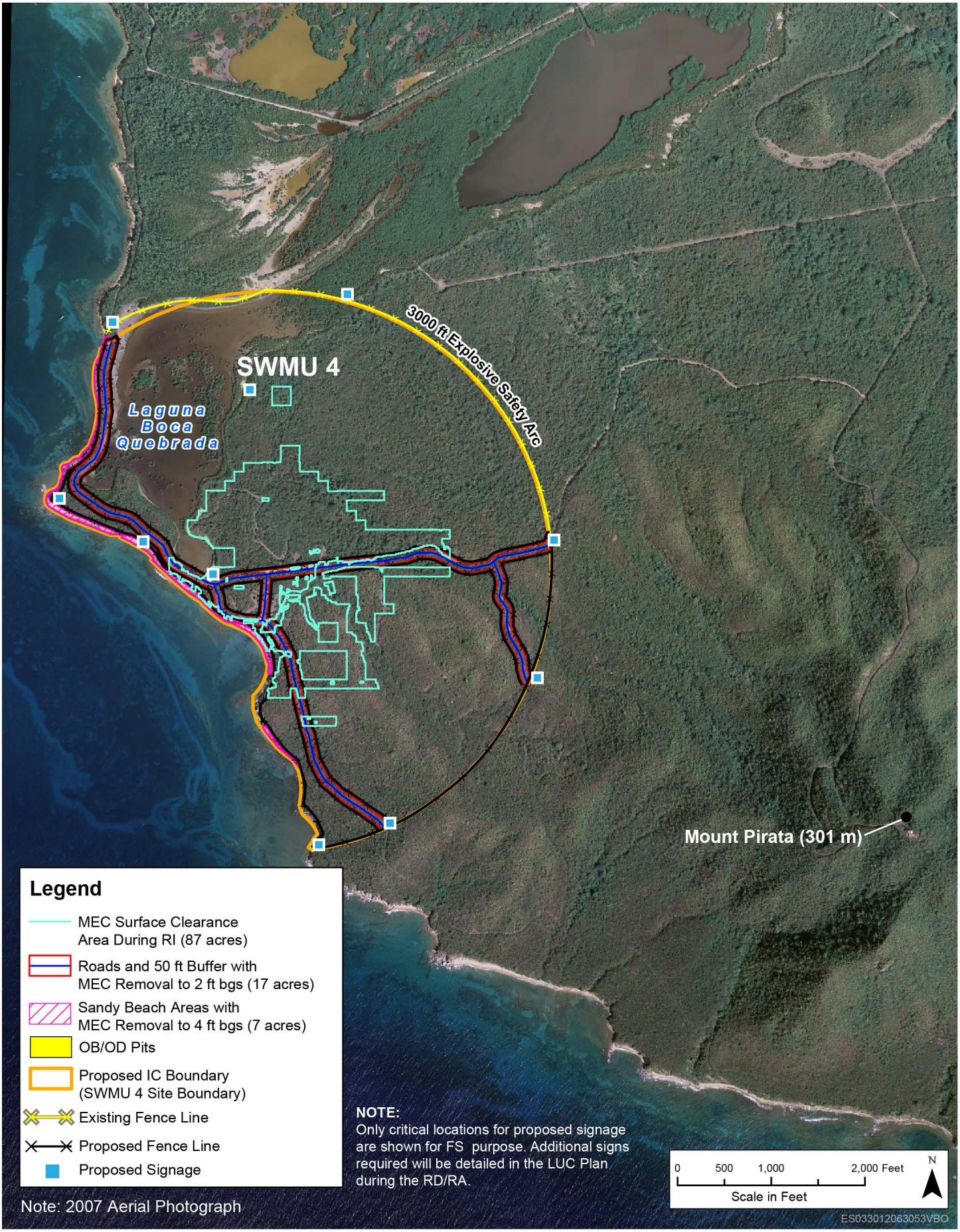


Figure 5. Alternative M-2 – LUCs and ICs Only

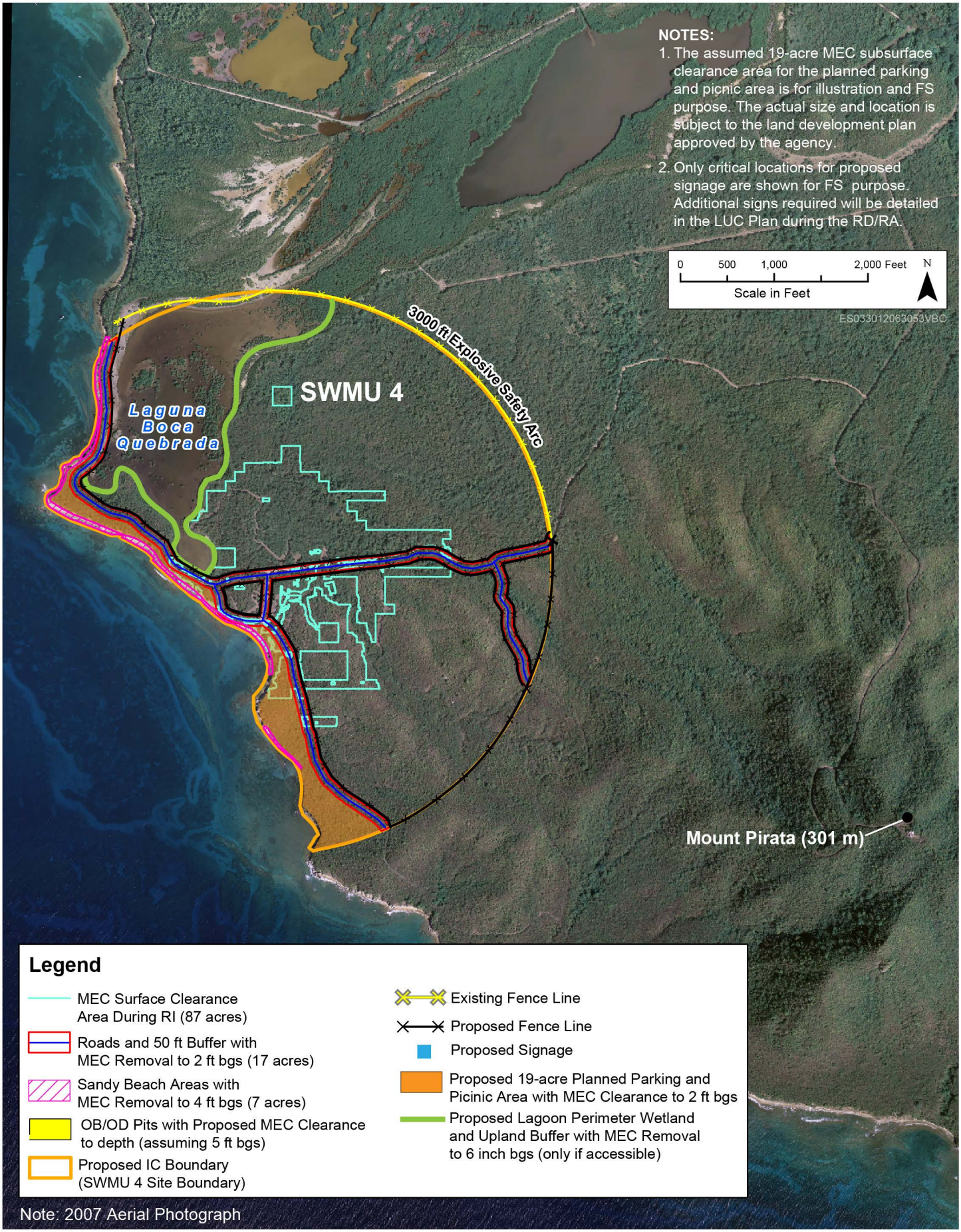


Figure 6. Alternative M-3 – Surface and Subsurface MEC Removal from Planned Parking and Picnic Area, OB/OD Pits, and Lagoon Perimeter; LUCs and ICs

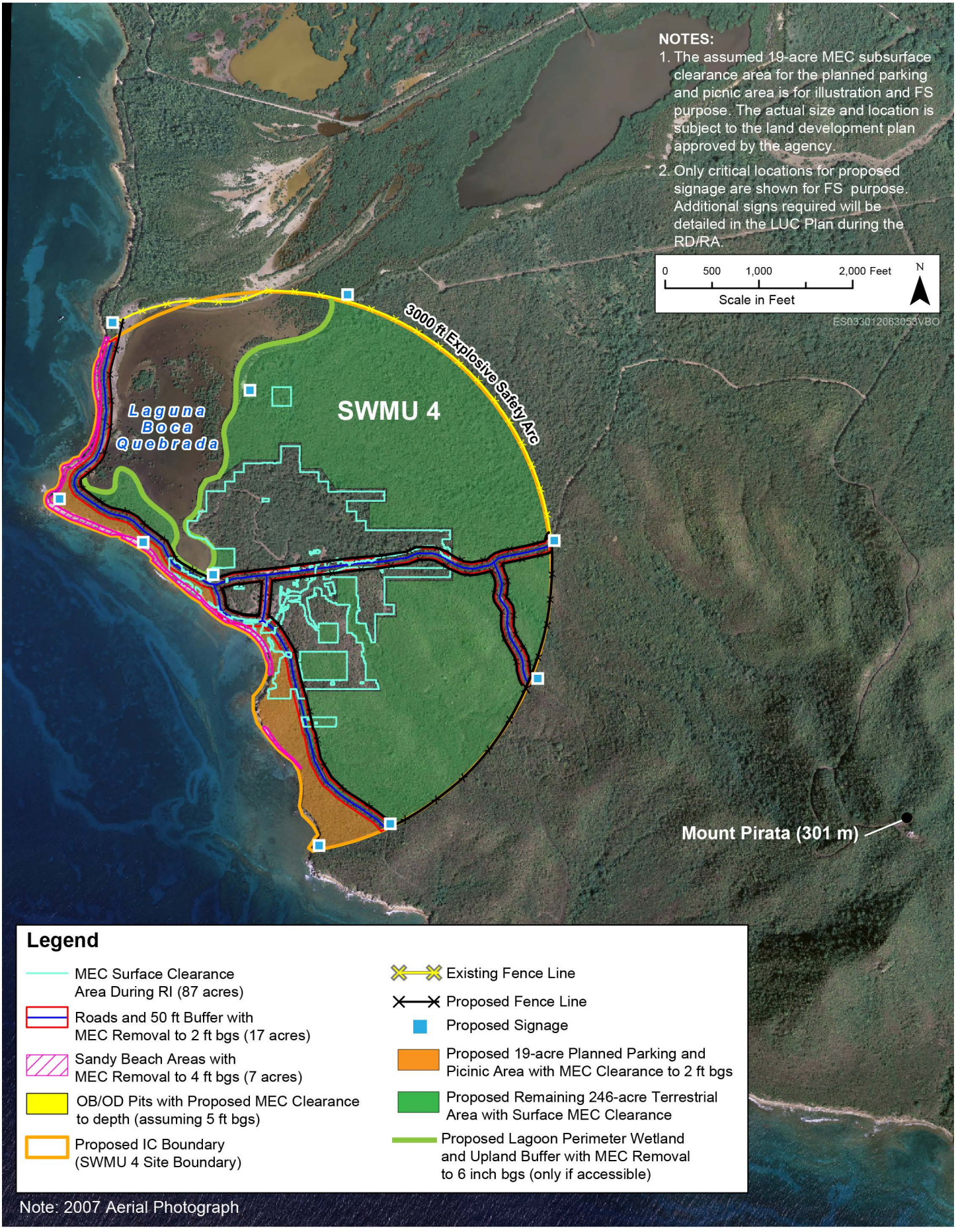


Figure 7. Alternative M-4 – Surface Clearance of Terrestrial Area Not Already Surface-cleared and Subsurface MEC Removal from Planned Parking Area, OB/OD Pits, and Lagoon Perimeter; LUCs and ICs

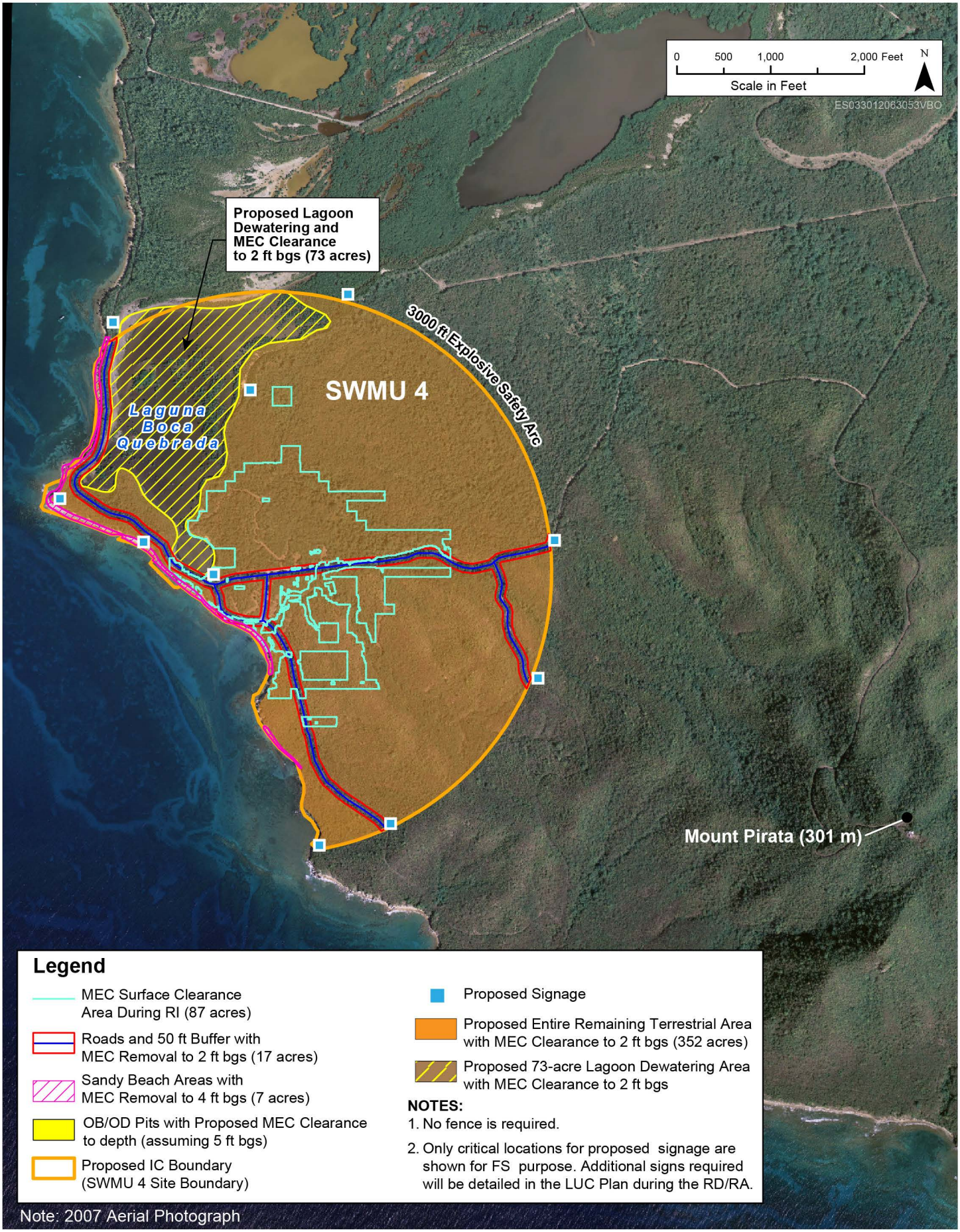


Figure 8. Alternative M-5 – Surface and Subsurface MEC Removal from the Entire Terrestrial Area Not Already Cleared and Lagoon; LUCs and ICs

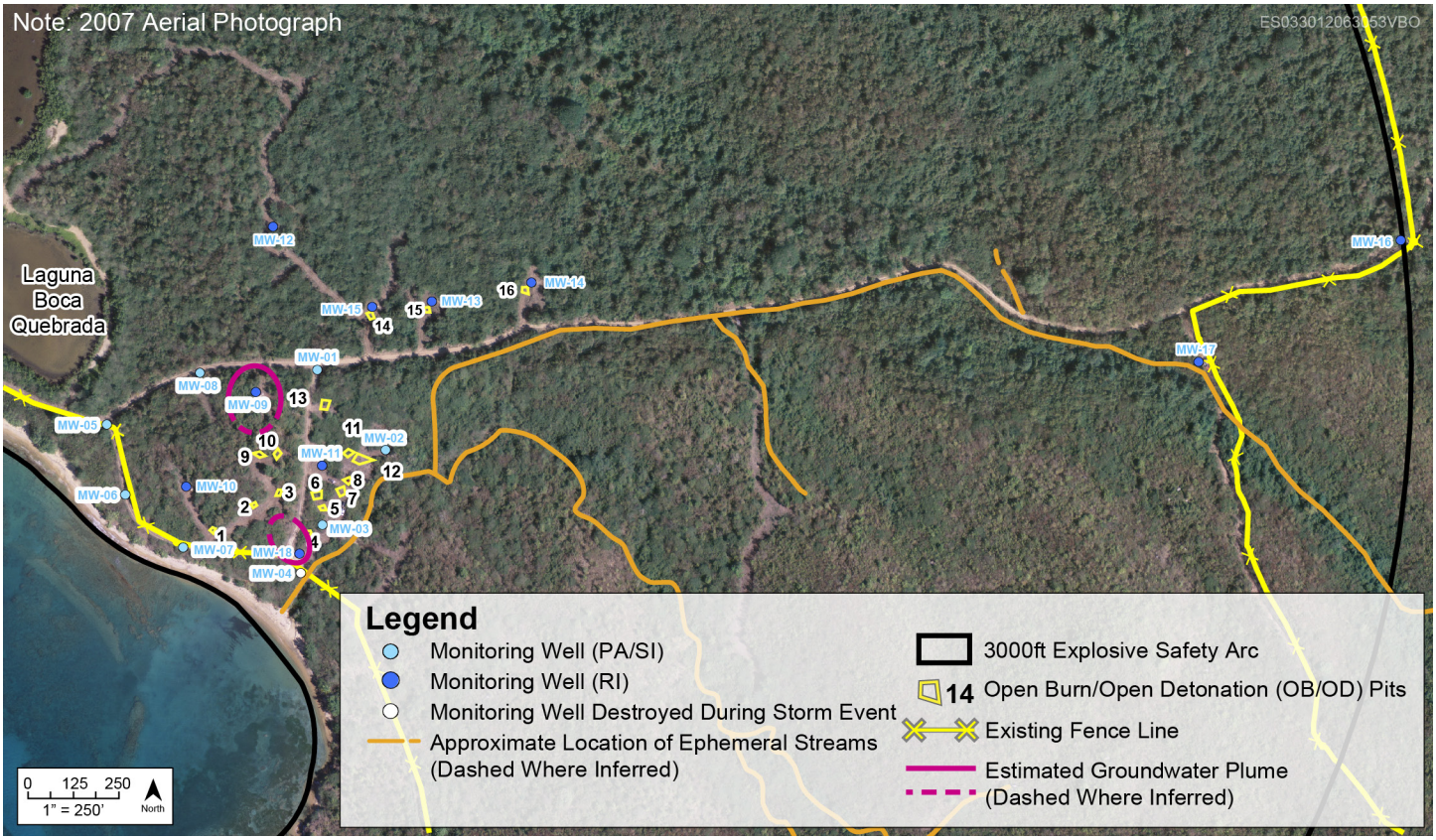


Figure 9. Alternative G-1 – No Action

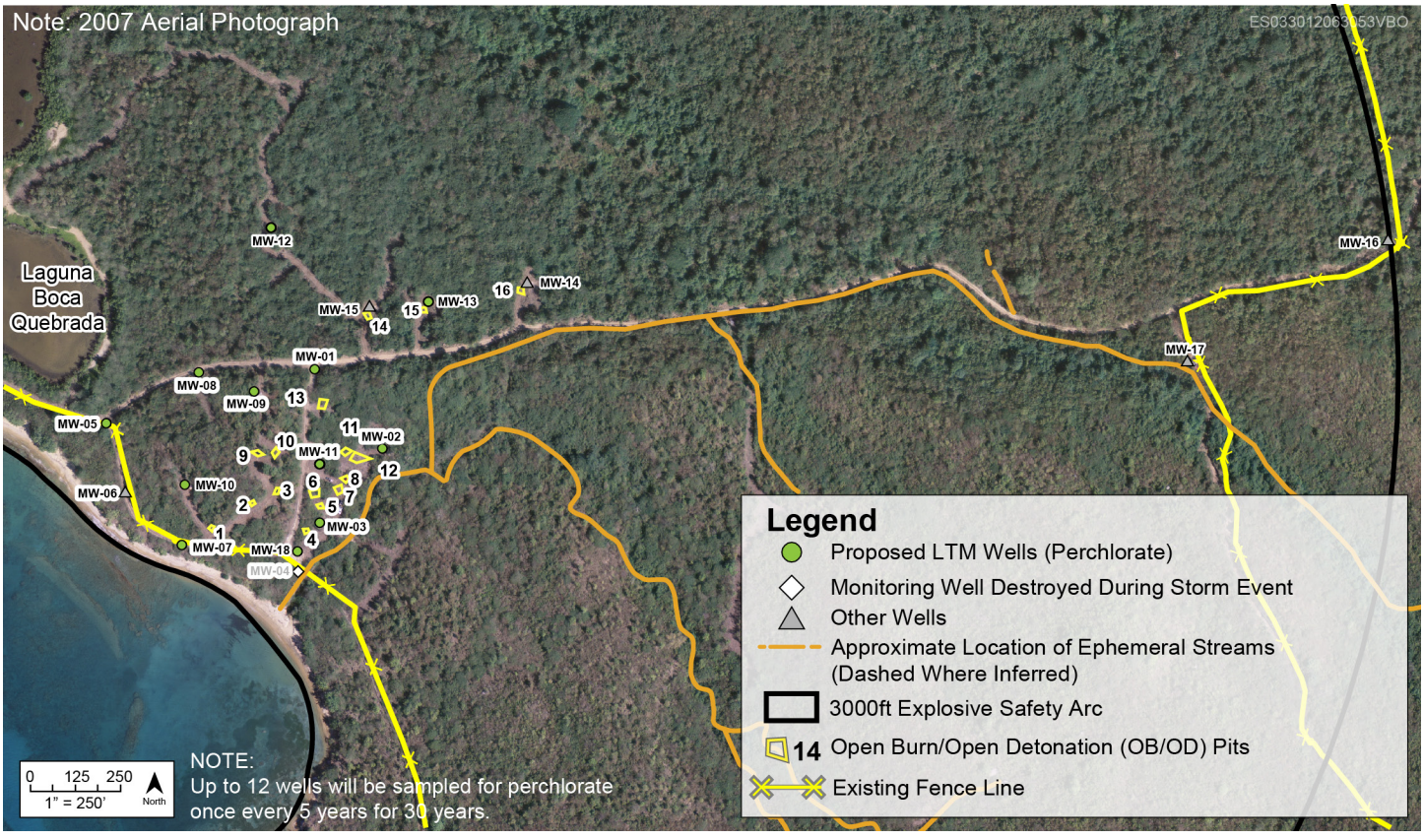


Figure 10. Alternative G-2 – Long-Term Monitoring (LTM) and ICs

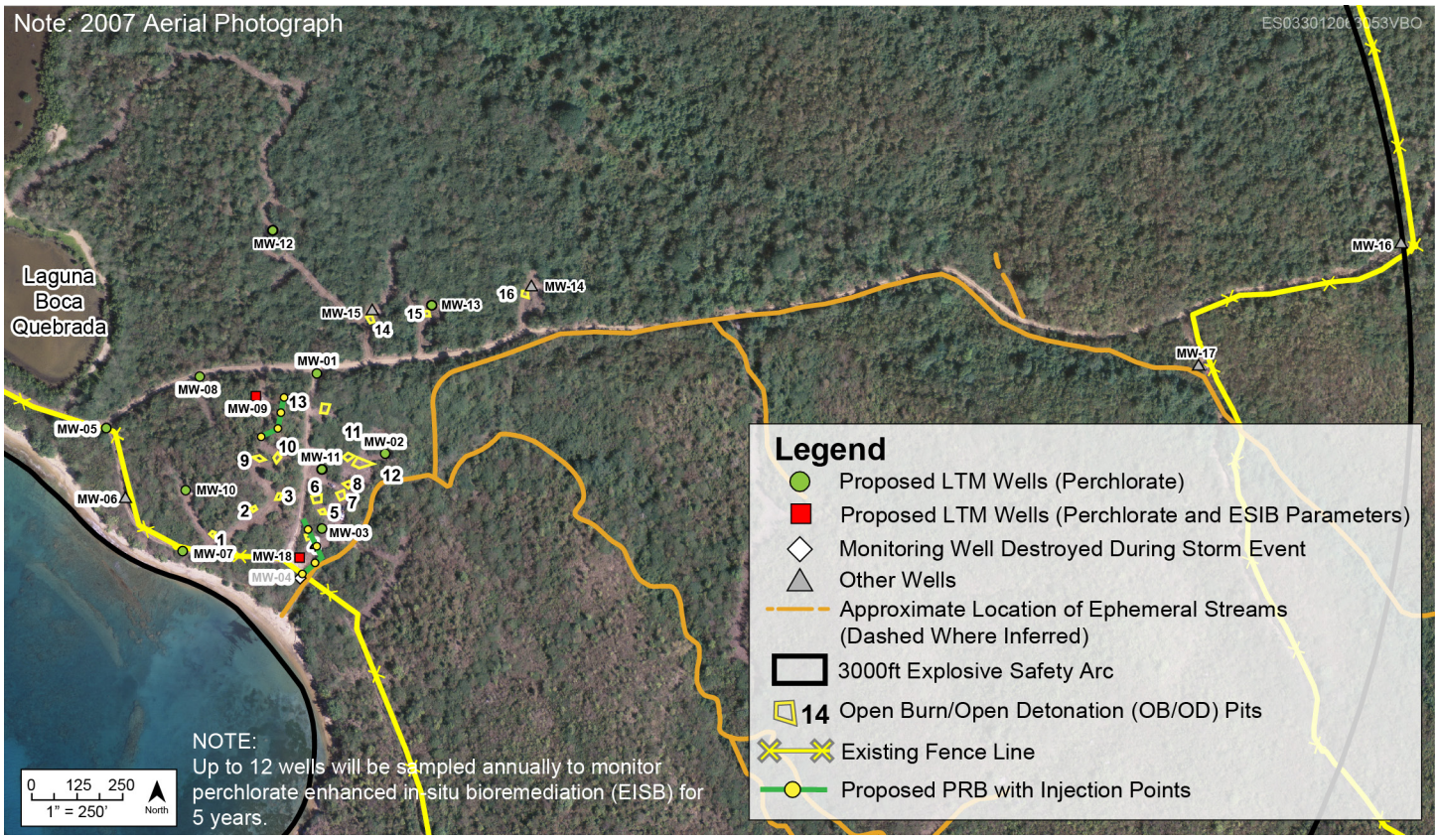


Figure 11. Alternative G-3 – Enhanced In-situ Bioremediation (EISB)

consideration. Sustainability is a "green remediation" consideration focused on energy conservation, reduction of green house gases such as carbon dioxide, waste minimization, and re-use and recycling of materials.

MEC

Alternative M-2 involves only the installation of fencing and signage, which has the least short-term construction impacts. Alternatives M-3 through M-5 would include MEC removal and construction activities with varying levels of potential impacts to workers. Alternatives M-4 and M-5 could potentially impact the community along the northeastern site boundary from removal activities. Potential impacts to the environment are primarily associated with temporary land disturbance, including vegetation clearance, erosion, and re-vegetation for Alternatives M-3 through M-5, as well as lagoon dewatering for Alternative M-5. Alternatives M-2 and M-3 have the lowest environmental footprint, followed by Alternatives M-4, and M-5, which require significant more vegetation clearance.

Groundwater

Short-term impacts to workers and the environment are minimal under Alternative G 2. Alternative G-3 has more potential impacts to workers and the environment, primarily associated with vegetation clearance, installation of injection wells, and injection and sampling activities. Alternative G-2 has the lowest environmental footprint, whereas Alternative G-3 has the highest environmental footprint.

Biota

Alternative B-2 has limited impacts associated with sampling activities and culvert and jetty installation for ocean access. Alternative B-3 has significant short-term impacts to the environment through dewatering and destruction of the lagoon habitat. Alternative B 2 has the lowest environmental footprint, whereas Alternative B-3 has the highest environmental footprint.

Implementability

MEC

Alternative M-1 would not obtain administrative approval since it does not meet the RAOs. Alternative M-2 is technically feasible, but public access areas would need to be limited to only areas that have been previously cleared of surface and subsurface MEC. Alternatives M-3 and M-4 are both technically and administratively feasible. Alternative M-5 would be the most complex alternative to implement and a pilot study would likely be required to assess the feasibility of this alternative.

Groundwater

Alternative G-1 would not obtain administrative approval since it does not meet the RAOs. No significant technical and administrative difficulties are associated with Alternative G-2 implementability. Alternative G-3 would be the most complex due to the technical challenges and uncertainty associated with injection of a substrate into the weathered bedrock.

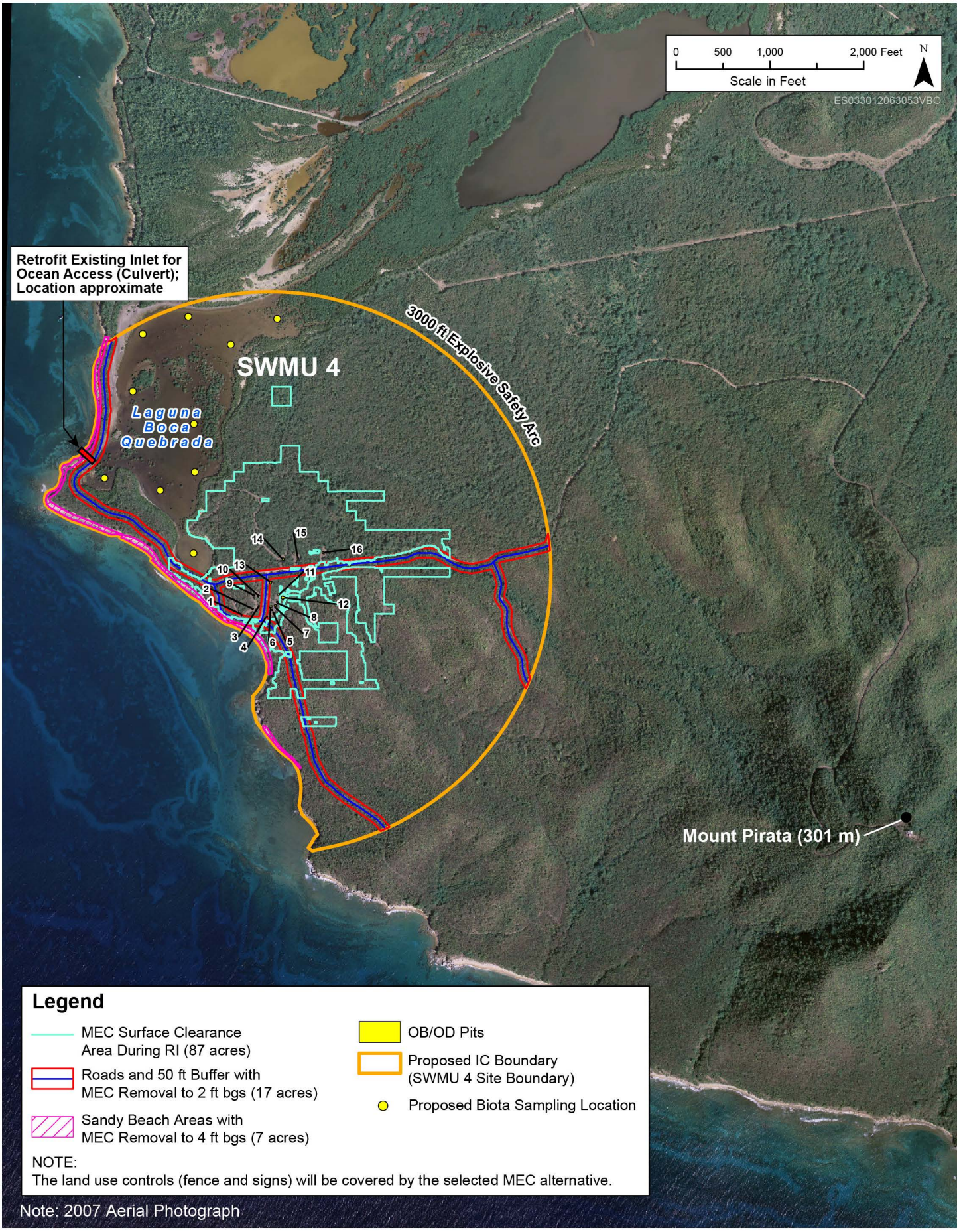


Figure 12. Alternative B-2 – Re-opening Ocean Access to the Lagoon and Long-term Biota Sampling with LUCs and ICs

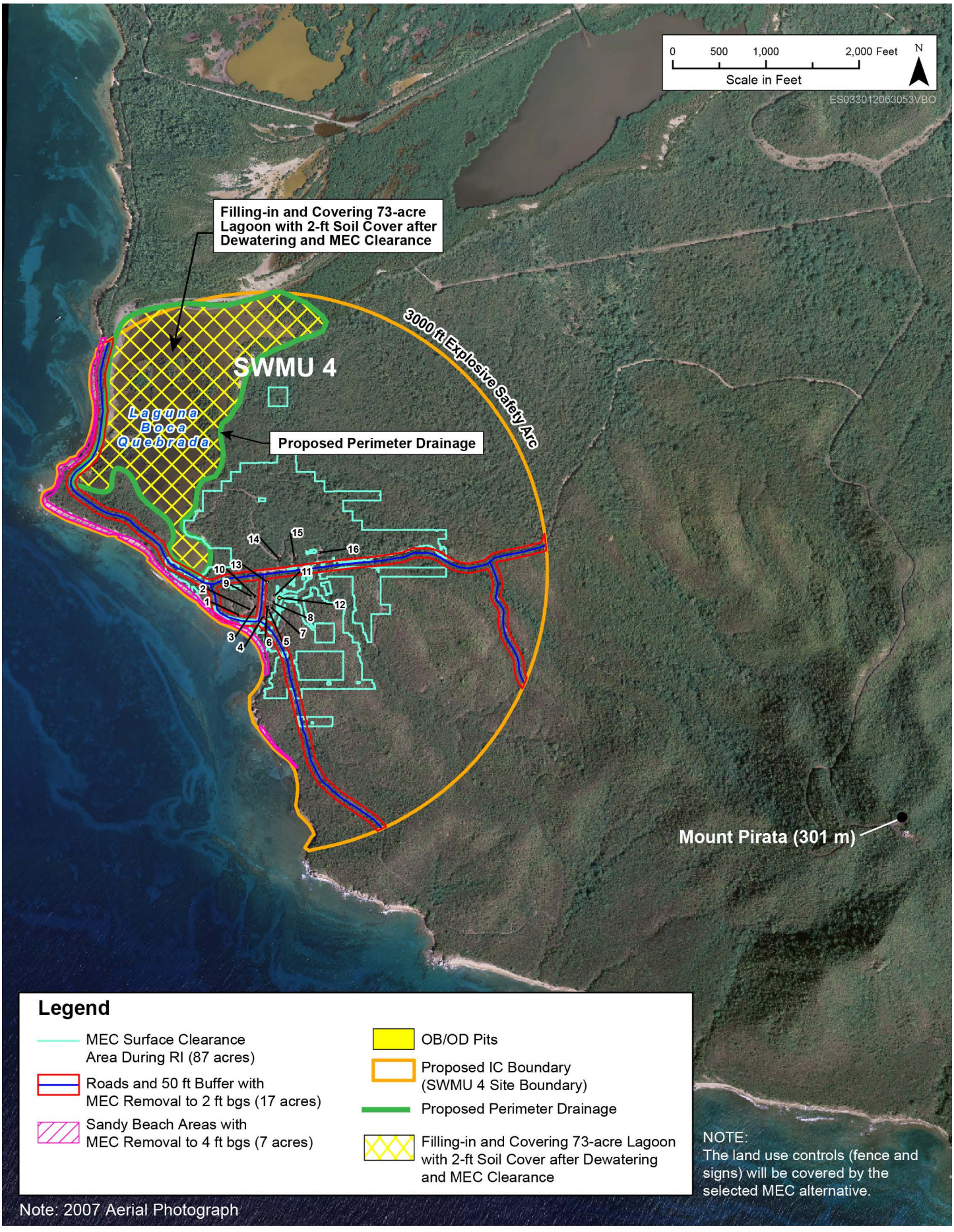


Figure 13. Alternative B-3 – Covering Lagoon with Soil

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 laws 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 alternatives described in the Proposed Plan, and RI/FS report. The specific responses to the public comments are addressed in the "Responsiveness Summary" section of the ROD.

Table 4. Evaluation Criteria for Comparative Analysis of Alternatives

Criteria	Alternative M-1 (No Action)	Alternative M-2 (LUC and IC only)	Alternative M-3 (Surface and Subsurface MEC Removal from Planned Parking and Picnic Area; LUCs and ICs)	Alternative M-4 (Surface Clearance of Terrestrial Area Not Already Surface-cleared and Subsurface MEC Removal from Planned Parking and Picnic Area; LUCs and ICs)	Alternative M-5 (Surface and Subsurface MEC Removal From Entire Terrestrial Area Not Already Cleared and Lagoon; LUCs and ICs)
Overall protection of human health and the environment	○	●	●	●	●
Compliance with ARARs	●	●	●	●	○
Long-term effectiveness and permanence	◔	◒	◕	◕	◕
Reduction of toxicity, mobility, or volume through treatment	○	◔	◒	◕	◕
Short-term effectiveness[1]	●	◕	◕	◒	◔
Implementability	○	●	●	◒	◔
Total Present Value**	$153,000	$1,723,000	$4,979,000	$17,602,000	$57,155,000

Notes: Individual criterion scores: ○ – not met, ◔ – poor, ◒ – satisfactory, ◕ – good, ● – excellent/fully meets.
Rankings are provided as qualitative descriptions of the relative compliance of each alternative with the criteria.
**The cost represents a +50/-30% range of accuracy, based on estimates prepared in accordance with USEPA cost estimating guidance.
[1] The sustainability footprint in terms of projected greenhouse gas (GHG) emissions, air emissions, energy consumptions, and accident risk was factored in the scoring of each alternative.

Table 5A. Comparative Analysis of MEC Remedial Alternatives

Criteria	Alternative G-1 (No Action)	Alternative G-2 (Long-Term Monitoring and Institutional Controls)	Alternative G-3 (EISB with EVO Injection)
Overall protection of human health and the environment	○	●	●
Compliance with ARARs	○	●	●
Long-term effectiveness and permanence	◔	●	●
Reduction of toxicity, mobility, or volume through treatment	○	○	◕
Short-term effectiveness [1]	●	◕	◒
Implementability	○	●	◕
Total Present Value**	$153,000	$570,000	$1,137,000

Notes: Individual criterion scores: ○ – not met, ◔ – poor, ◒ – satisfactory, ◕ – good, ● – excellent/fully meets.
Rankings are provided as qualitative descriptions of the relative compliance of each alternative with the criteria.
**The cost represents a +50/-30% range of accuracy, based on estimates prepared in accordance with USEPA cost estimating guidance.
[1] The sustainability footprint in terms of projected greenhouse gas (GHG) emissions, air emissions, energy consumptions, and accident risk was factored in the scoring of each alternative.

Table 5B. Comparative Analysis of Groundwater Remedial Alternatives

Criteria	Alternative B-1 (No Action)	Alternative B-2 (Re-opening Ocean Access to the Lagoon and Long-term Biota Sampling with LUC/IC)	Alternative B-3 (Filling in and Covering Lagoon with Soil)
Overall protection of human health and the environment	○	●	◒
Compliance with ARARs	●	●	○
Long-term effectiveness and permanence	◔	◕	●
Reduction of toxicity, mobility, or volume through treatment	○	◒	●
Short-term effectiveness [1]	●	◕	◒
Implementability	○	●	◔
Total Present Value**	$153,000	$867,000	$23,813,000

Notes: Individual criterion scores: ○ – not met, ◔ – poor, ◒ – satisfactory, ◕ – good, ● – excellent/fully meets.
Rankings are provided as qualitative descriptions of the relative compliance of each alternative with the criteria.
**The cost represents a +50/-30% range of accuracy, based on estimates prepared in accordance with USEPA cost estimating guidance.
[1] The sustainability footprint in terms of projected greenhouse gas (GHG) emissions, air emissions, energy consumptions, and accident risk was factored in the scoring of each alternative.

Table 5C. Comparative Analysis of Biota Remedial Alternatives

Biota

Alternative B-1 would not obtain administrative approval since it does not meet the RAOs. Alternative B-2 is readily implementable and Alternative B-3 would be the most complex alternative to implement due to challenges associated with dewatering the lagoon, MEC clearance, and large scale of construction activities.

Cost

MEC

Alternative M-1 is the least costly, but does not meet the RAOs. Alternative M-2 has a present-worth cost of $1,723,000. Alternative M-3 has a present-worth cost of $4,979,000, which is substantially lower than the costs of Alternatives M 4 ($17,602,000) and M-5 ($57,155,000), which would require extensive vegetation removal and excavation of non-hazardous metal scrap.

Groundwater

Alternative G-1 is the least costly, but does not meet the RAOs. Alternative G-2 is the next lowest cost alternative with an estimated present-worth cost of $570,000. Alternative G-3 has the highest present-worth cost of $1,137,000.

Biota

Alternative B-1 is the least costly, but does not meet the RAOs. Alternative B-2 has a present-worth cost of $867,000, which is significantly lower than Alternative B-3. Alternative B-3 is the least-cost effective alternative, with an estimated present-worth cost of $22,813,000.

Modifying Criteria

Commonwealth Acceptance

Commonwealth involvement has been continual throughout the CERCLA process for SWMU 4 (OU 07) and EQB supports the preferred alternatives. However, their final concurrence will be provided following the review of all comments received during the public comment period.

Community Acceptance

Community acceptance will be evaluated after the public meeting and public comment period for the Proposed Plan, and substantive public comments will be addressed and documented in the forthcoming ROD for SWMU 4 (OU-07).

8 Preferred Alternatives

The Navy and USEPA, in consultation with EQB, agree that the preferred alternatives for SWMU 4 (OU-07) are Alternative M-3 – *Surface and Subsurface Munitions and Explosives of Concern Removal from Planned Parking and Picnic Area, OB/OD Pits, and Lagoon Perimeter, Land Use Controls and Institutional Controls*; Alternative G-2 – *Long-Term Monitoring and Institutional Controls*, and Alternative B-2 – *Re-opening Ocean Access to the Lagoon and Long-term Biota Sampling with Land Use Controls/ Institutional Controls*.

Based on the evaluation of the data, information currently available, and the comparative analysis, the preferred alternatives meet the statutory requirements of CERCLA for protection of human health and the environment under current and projected future land use as a wildlife refuge with managed areas open to the public for recreational use.

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, EQB, and 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 alternatives at SWMU 4 (OU-07). The Navy will summarize and respond to substantive comments in a Responsiveness Summary, which will become part of the official remedy selection decision for SWMU 4 (OU-07).

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 alternatives. Documentation pertaining to the investigations and removal actions at SWMU 4 (OU 07) and the development of the preferred alternatives 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 alternatives for SWMU 4 (OU-07). The public comment period will be from July 23, 2012 to September 5, 2012, and a public meeting will be held on August 9, 2012 at 6:00 PM at the Multiple Use Center, located at Calle Antonio Mellado – (across from Plaza), Isabel Segunda, Vieques, Puerto Rico. All interested parties are encouraged to attend the public meeting to learn more about the preferred alternatives for SWMU 4 (OU-07). The meeting will provide an additional opportunity to submit comments on the Proposed Plan to the Navy.

Comments on the preferred alternatives, or this Proposed Plan, must be postmarked no later than September 5, 2012. On the basis of comments or new information, the Navy and USEPA, in consultation with PREQB, may modify the preferred alternatives or choose other alternatives. 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 alternatives for SWMU 4 (OU-07) are available to the public in the Information Repository, which is located at:

Biblioteca Electronica
Benítez Guzmán Street, Corner with
Baldorioty de Castro Street
Isabel Segunda
Vieques, PR 00765
(787) 741-5000

Hours of Operation:
Monday – Friday, 8:00 a.m. – 4:00 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.

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.

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

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Wilmarie Rivera
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Puerto Rico Environmental Quality Board
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San Juan, PR 00929-2604
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wilmarierivera@jca.pr.gov

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. Potential ecological risk has a hazard quotient less than one.

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

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 probability reflecting the increased chance that a person will develop cancer if exposed to chemicals or substances at a particular site and exposure scenario, as described in the Human Health Risk Assessment.

Chemical of Concern (COC): A contaminant that contributes significant risk to an exposure pathway for 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 regulates and provides for cleanup and emergency response in connection with numerous existing, inactive hazardous waste disposal sites that endanger public health and safety or the environment.

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.

Excess Lifetime Cancer Risk: 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.

Groundwater: The supply of freshwater 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.

Land Use Control (LUC): Physical, legal, or administrative methods that restrict the use of or limits access to property to reduce risks to human health and the environment.

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.

Municipality of Vieques: One of the property owners of Vieques.

Munitions and Explosives of Concern: Distinguishes specific categories of military munitions that may pose unique explosive safety risks.

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.

Non-Cancer Hazard: Non-cancer hazards (or risk) are expressed as a quotient that compares the potential exposure to contaminants at a particular site to the acceptable level of exposure. There is a level of exposure (the reference dose) below which it is unlikely for even a sensitive population to experience adverse health effects. USEPA's threshold level for non-cancer risk at Superfund sites is 1, meaning that if the exposure at a particular site exceeds the threshold, there may be a concern for potential non-cancer effects.

Non-Time Critical Removal Action: A removal action conducted to address priority risks when a planning period of at least six months is available.

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 by USEPA, such as a rulemaking, permit, or Superfund-remedy selection.

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

Receptors: Humans, animals, or plants that may be exposed to contaminants related to 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 public comments that were considered regarding the selected remedy.

Remedial Action: A cleanup method proposed or selected 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 analyzes 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.

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

Soil Screening Level (SSL): A screening criterion designed to evaluate the potential for chemicals to leach from soil to groundwater and to be protective of exposures in a residential setting.

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: Risk that exceeds USEPA's acceptable risk range for Superfund hazardous waste sites (hazard index greater than 1 and excess lifetime cancer risk greater than 1 x 10-4). Potential ecological risk has a hazard quotient equal to or greater than one.

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.

Appendix A
ARARs

Media	Requirement	Prerequisite	Citation	Alternative	ARAR Determination	Comment
Soil	U.S. Environmental Protection Agency (EPA) Regional Screening Levels (RSLs)	RSLs are conservative, risk-based criteria for evaluating and cleaning up contaminated CERCLA sites. EPA has developed these risk-based concentrations for many constituents associated with contaminated sites.	USEPA RSL Table for Residential Soil only as they apply to munitions related constituents	M-3, M-4, M-5	To be considered	RSLs will be used to assess the results of post-BIP sampling. Only munitions related constituents having RSLs are incorporated.
Sediment	U.S. Environmental Protection Agency (EPA) Regional Screening Levels (RSLs) or formerly EPA Region 9 Preliminary Remediation Goals (PRGs)	RSLs are conservative, risk-based criteria for evaluating and cleaning up contaminated CERCLA sites. EPA has developed these risk-based concentrations for many constituents associated with contaminated sites.	Risk Assessment Guidance for Superfund (RAGS) only as it applies to lead in fish and crab tissue consumed by humans	B-2, B-3	To be considered	A quantitative human health risk assessment will be conducted in accordance with regulatory guidance and Vieques HHRA Master Protocol, as appropriate, to assess the results of returning the lagoon to its natural state. Samples of fish and crab will be collected and analyzed for lead. The results of the analysis will be assessed to determine if there are unacceptable risks to human health from the consumption of lead contained in fish and crab tissues. If, after 5 years, no unacceptable risks have been identified this sampling will end. No unacceptable risk is defined as having a hazard index (HI) of less than 1 and excess lifetime cancer risk (ELCR) of less than 10^{-4}.
Groundwater	Chemical concentrations corresponding to fixed levels of human health risk (i.e., a hazard quotient of 1, or lifetime cancer risk of 10-6, whichever occurs at a lower concentration).	Assessment of potential human health risks.	USEPA RSL Table for Residential Tapwaters only as they apply to perchlorate	G-1 through G-3	To be considered	RSLs are used in the risk assessments to identify chemicals of concern (COCs) and for determining the area that may need to be remediated. Site concentrations are screened against RSLs as a preliminary indicator of the presence of potentially unacceptable risk. Remedial goals for the following COCs were developed based on the Tap Water RSL and a non-cancer hazard index (HI) of 1.0: Perchlorate: 26 ppb

Appendix A: Federal Chemical-Specific ARARs

Media	Requirement	Prerequisite	Citation	Alternative	ARAR Determination	Comment
Surface Water	Sets surface water standards for receiving waters.	Discharging of surface water from the lagoon to adjacent surface water body	Rule 1303C, 1303.1A, B, D, E, and H	M-5, B-3	Applicable	Applicable to surface water discharges associated with dewatering the lagoon. Investigation did not identify COCs in surface water, therefore it is assumed that existing concentrations of any substances are equivalent to background and further testing is not required.

Appendix A: Puerto Rico Chemical-Specific ARARs

Location	Requirement	Prerequisite	Citation	Alternative	ARAR Determination	Comment
Coastal Zone Management Act						
Coastal zone or area that will affect the coastal zone	Federal activities must be consistent with, to the area that will affect maximum extent practicable, State coastal zone management programs. Federal agencies must supply the State with a consistency determination.	Activity taking place in a wetland, flood plain, estuary, beach, dune, barrier island, coral reef, and fish and wildlife and their habitat, within the coastal zone.	15 CFR 930.33(a)(1), (a)(2), (b); .35(a), (b); .36(a)	All	Applicable	Activities at SWMU 4 that will affect Puerto Rico's coastal zone will be consistent to the maximum extent practicable with Puerto Rico's enforceable policies. Activities performed on-site and in compliance with CERCLA are not subject to administrative review; however the substantive requirements of making a consistency determination will be met.
Migratory Bird Treaty Act						
Migratory bird area	Protects almost all species of native birds in the United States from unregulated taking.	Presence of migratory birds.	*Migratory Bird Treaty Act*, 16 USC 703	All	Applicable	The site is located in the Atlantic Americas Migratory Flyway. If migratory birds, or their nests or eggs, are identified at the site, operations will not destroy the birds, nests, or eggs.

Appendix A: Federal Location-Specific ARARs

Location	Requirement	Prerequisite	Citation	Alternative	ARAR Determination	Comment
No Puerto Rico Location-Specific ARARs apply.						

Appendix A: Puerto Rico Location-Specific ARARs

Action	Requirement	Prerequisite	Citation	Alternative	ARAR Determination	Comment
Management of non-hazardous solid waste onsite in containers or in piles.	Non-hazardous solid waste staged onsite must not create a hazard or public nuisance.	Generation of non-hazardous solid waste that is managed onsite in containers or in piles.	40 CFR 273.3-1(a); 3-3; 3-4(a); 3-7(a); 3-8(d)	M-2 through M-5; G-2, G-3; and B-2	Applicable	It is anticipated that non-hazardous solid wastes will be generated during the implementation of these alternatives. IDW will be sampled to confirm characterization prior to disposal. It will be assumed that MDAS (Materials Documented as Safe) is regulated as scrap metal.
Performing activities that will disturb greater than one acre of land	Requires the development and implementation of best management practices and erosion and sedimentation control measures during construction activity.	Implementation of construction activities that will disturb more than one acre of land	one to five acres: 40 CFR 122.26(a)(1)(ii), (a) (9)(i)(b), (b)(15); 122.44(k)(2) and (s)(1) five acres or more: 40 CFR 122.26(a)(1)(ii), (a)(9)(i)(b), (b)(14)(x); 122.44(k)(2) and (s)(2)	M-3 through M-5, B-3	Applicable	If any of the selected remedies or the combination thereof disturb greater than one acre of land a Storm Water Pollution Prevention Plan will be prepared and implemented. Since activities are taking place onsite and in compliance with CERCLA, the substantive requirements will be met, but a permit will not be required.
Discharge of dredge-and-fill material	No discharge of dredged or fill material will be allowed unless appropriate and practicable steps are taken that minimize potential adverse impacts of the discharge on the aquatic ecosystem.	Discharges of dredged or fill material to surface waters, including wetlands.	40 CFR 230.10(d); 33 CFR 320.4(a), (b), (d), (p), (r)	M-5; B-3	Applicable	Construction of a cover for the lagoon will require fill material to be placed over existing wetland areas. Since this is an onsite CERCLA response action, the substantive requirements will be met, but a permit will not be required. A Compensatory Mitigation Plan will be prepared and compensatory mitigation will be performed if required.
Management of military munitions	Specifies management requirements for those military munitions that are no longer exempt from the definition of solid waste	Management of unused military munitions that have been disposed of or fired/used military munitions that have been removed from the range.	40 CFR 266.202(b) and (c) ; 205 (a) and (b)	all	Applicable	If any military munitions lose their exemption from the definition of solid waste they will be handled in accordance with these rules.
Storage of fuels and oils (petroleum and non-petroleum) onsite	If storage capacity limits are exceeded a Spill, Prevention, Control, and Countermeasures Plan must be prepared and implemented with procedures, methods, equipment, and other requirements to prevent the discharge of into or upon the navigable waters of the United States.	Total onsite storage capacity exceeding 1,320 gallons in containers that are 55 gallons or larger in size. Empty or partially filled containers must still have their entire volume included in the summation.	40 CFR 112.1(b) through (d), 112.3 [excluding paragraph f], 112.5 through 8, and 12	G-3, M-5, and B-3	Applicable	It is anticipated that fuels or other treatment chemicals will be stored onsite. If the storage capacity in containers that are 55 gallons or greater is equal to or exceeds 1,320 gallons a Spill Prevention, Control, and Countermeasure (SPCC) Plan must be prepared and implemented. Containers include oil (including those oils used for enhanced biodegradation) and fuel reservoirs in equipment.

Action	Requirement	Prerequisite	Citation	Alternative	ARAR Determination	Comment
Land disturbance	A Control of Erosion and Sediment (CES) Plan and a Work Plan must be prepared for any activities that involve the alteration of ground or soil conditions that have not been specifically excluded.	Disturbance of more than 40 cubic meters of soil during construction activity	Puerto Rico Regulation 5754.1230(B), (C)	M-3 through M-5, B-2, B-3	Applicable	Remedial alternatives involve the disturbance of more than 40 cubic meters of soil. A CES and Work Plan will be prepared for this activity.
Production of Fugitive Dust	Dust control measures must be implemented during construction activities to prevent emissions beyond the property boundary. These include, but are not limited to, the use of water or other chemicals on road ways to control dust, covering haul trucks, and cleaning tracked soil off of paved roads.	Construction activity causing particulate matter to become airborne	Puerto Rico Regulation 5300.404(A)(2), (4), (7); (B)	M-3 through M-5; B-2, B-3	Applicable	Applicable to activities that produce fugitive dust. Dust control measures will be implemented.
Performing construction activities that generate noise	No construction activity may be performed at night or in such a way that vibrations are produced that can be felt beyond the property boundary. If equipment used in construction is not manufactured in accordance with USEPA standards for newly manufactured equipment then it may not produce noise that exceeds 70 dBA.	Construction activity including earthwork	Puerto Rico Regulation 3418.3.1.5(A),(C);3.1.10; 3.1.13; and 4.1	M-3 through M-5; B-2, B-3	Applicable	The site is considered to be in Zone II (Commercial) for noise production. Noise pollution during MEC clearance and demolition, dewatering, and earthwork activities will be prevented.
Underground injection	Establishes construction and operation standards for underground injection wells.	Construction of any dug hole or well that is deeper than its largest surface dimension, where the principal function of the hole is the subsurface emplacement of fluids. Fluids include both liquids and gasses.	Puerto Rico Underground Injection Regulations 304.A.2.a, b, d, e; 304.A.4, 304.B.1, C.2.a, b; C.3.c	G-3	Applicable	Applicable to injection of substrate; substantive compliance would be required, although actual permit would not be. Injections of substrate would be accomplished with Class V type B7 wells.
Management of non-hazardous solid waste onsite in containers and piles	Non-hazardous solid waste staged onsite must not create a hazard or public nuisance.	Generation of non-hazardous solid waste that is managed onsite in containers or in piles.	Puerto Rico Non-Hazardous Solid Waste Regulation 531.H	M-2 through M-5; G-2, G-3; and B-2	Applicable	It is anticipated that non-hazardous solid wastes will be generated during the implementation of these alternatives. IDW will be sampled to confirm characterization prior to disposal. It will be assumed that MDAS is regulated as scrap metal.

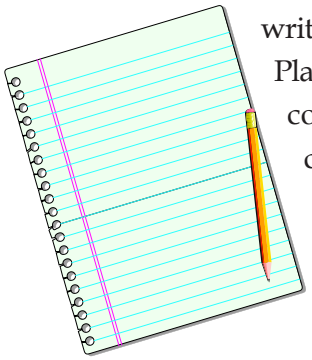
Please print or type your comments below.

Mark Your Calendar for the Public Comment Period

Public Comment Period

July 23 to September 5, 2012

Submit Written Comments



The Navy and USEPA will accept written comments on the Proposed Plan during the 45-day public comment period. To submit comments or obtain further information, please refer to page 35.

Attend the Public Meeting

August 9, 2012 at 6:00 pm

Vieques Multiple Use Center
Calle Antonio Mellado – (across from Plaza)
Isabel Segunda, Vieques, PR

The Navy will hold a public meeting to present the rationale for the proposed remedial action alternatives. Verbal and written comments will also be accepted at this meeting.

FOLD HERE

Place stamp here

NAVFAC Atlantic
Attention: Code EV41/Mr. Kevin Cloe
6506 Hampton Blvd.
Norfolk, VA 23508-1278