



Atlantic
Norfolk, Virginia

Final

Second Five-Year Review Report

Atlantic Fleet Weapons Training Area – Vieques
Vieques, Puerto Rico

December 2023



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Prepared for NAVFAC Atlantic
by CH2M HILL, Inc.
Virginia Beach, Virginia
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This report documents completion of the Second Five-Year Review for the Atlantic Fleet Weapons Training Area—Vieques, specifically for Area of Concern E and Solid Waste Management Unit 4 within the former Naval Ammunition Support Detachment and Solid Waste Management Unit 1, UXO 1, and UXO 18 within the former Vieques Naval Training Range, as required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in accordance with CERCLA §121(c), as amended, and the National Oil and Hazardous Substance Pollution Contingency Plan, part 300.430(f)(4)(ii) of the Code of Federal Regulations.

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Executive Summary

The Department of the Navy (Navy), Naval Facilities Engineering Systems Command Atlantic (NAVFAC), conducted the second five-year review for the Atlantic Fleet Weapons Training Area (AFWTA) – Vieques, which comprises the former Naval Ammunition Support Detachment (NASD) and the former Vieques Naval Training Range (VNTR) in Vieques, Puerto Rico, as required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), in accordance with CERCLA §121(c), as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), Part 300.430(f)(4)(ii) of the Code of Federal Regulations (CFR). The report has been prepared in accordance with the United States Environmental Protection Agency (EPA) Comprehensive Five-Year Review Guidance (EPA, 2001) and supplemental EPA guidance (EPA, 2012a, 2012b), Navy Policy on Five-Year Reviews (DON, 2011), the Toolkit for Preparing Five-Year Reviews (NAVFAC, 2013), and the Department of the Navy Environmental Restoration Program Manual (DON, 2018).

This report was prepared under the Navy Comprehensive Long-term Environmental Action–Navy (CLEAN) Contract N62470-21-D-0007, Contract Task Order N6247021F4140, for submittal to EPA, the Commonwealth of Puerto Rico Department of Natural and Environmental Resources (PRDNER), and the United States Fish and Wildlife Services (USFWS). The Navy, as lead agency for the cleanup, works jointly with EPA, PRDNER, and USFWS to implement the Vieques Environmental Restoration Program.

This document summarizes the evaluation of the remedial actions implemented under a Record of Decision (ROD) to determine whether the remedy is functioning as intended and remains protective of human health and the environment, in accordance with the requirements set forth in each of their respective RODs. In chronological order, remedial actions were implemented at the following sites, which have been assigned Operable Unit (OU) designations for tracking in the EPA Superfund Enterprise Management System (SEMS):

- Solid Waste Management Unit (SWMU) 1 (OU 11) – Former Camp Garcia Landfill
- Area of Concern (AOC) E (OU 2) – Former Underground Storage Tank (UST) Area
- UXO 1 (OU 18) – Former Eastern Conservation Area
- UXO 18 (OU 28) – Cayo La Chiva
- SWMU 4 (OU 7) – Former Open Burn/Open Detonation (OB/OD) Area

The protectiveness of the remedies was evaluated through reviews of technical reports associated with long-term monitoring (LTM) and maintenance, site visits and inspections, and community involvement activities. As applicable, Five-Year Review Reports also identify issues that may be preventing a remedy from functioning as designed, or a remedy that may not be achieving current or future protectiveness. The overall evaluation of the effectiveness of each remedy is presented as a protectiveness statement developed for each site/OU. A Five-Year Review Summary Form is provided that includes site identification, site status, review status, issues/recommendations (as applicable), and protectiveness statements.

Three additional sites – UXO 12 (OU 23 in EPA SEMS), Former Eastern Maneuver Area (EMA) Interior; UXO 14 (OU 25 in EPA SEMS), Former EMA South; and UXO 15 (OU 26 in EPA SEMS), Puerto Ferro – for which RODs were issued during the current five-year review period, but for which remedial actions have not been implemented are also included in this Five-year Review Report; however, protectiveness evaluations regarding these sites is not conducted because the remedies have not yet been implemented. Consequently, a protectiveness determination of Will be Protective is identified for these sites.

This is the second five-year review for the AFWTA – Vieques, which was triggered for statutory review by initiation of the remedial action implementation at SWMU 1 in August 2013. The community was notified of the initiation of the current five-year review process through public notice placed in the April 2023 information flyer distributed

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.

throughout Vieques. Additionally, updates regarding the remedial actions implemented at all five sites listed above have been provided at various Restoration Advisory Board (RAB) meetings prior to and since their implementation. Further, the status of each site has been and will continue to be provided in annual remedial action long-term monitoring and maintenance reports made available to Vieques RAB members and the general public. The annual Site Management Plan updates, which are provided for formal public comment, also include the remedial action status for each site.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Atlantic Fleet Weapons Training Area – Vieques		
USEPA Identification (ID): PRN000204694		
EPA Region: 2	State (Commonwealth): Puerto Rico	City/County (Municipality): Vieques
SITE STATUS		
National Priorities List (NPL) Status: Final		
Multiple Operable Units (OUs): Yes		Has the site achieved construction completion? No
REVIEW STATUS		
Lead Agency: Department of Navy		
Who conducted the review? Navy, EPA Region 2, USFWS, and PRDNER		
Author Name: Naval Facilities Engineering Systems Command Atlantic		
Review Period: August 2022 through August 2023		
Date(s) of Site Inspection: August 23 and 24, 2022		
Type of Review: Statutory		
Review Number: 2		
Triggering Action: Initiation of first remedial action under a ROD (SWMU 1)		
Trigger Action Date: August 2013		
Due Date: September 21, 2023		
ISSUES/RECOMMENDATIONS		
OU(s) without Issues/Recommendations Identified in the Five-Year Review:		
OU 11 (SWMU 1) – Former Camp Garcia Landfill OU 2 (AOC E) – Former UST Area OU 18 (UXO 1) – Former Eastern Conservation Area OU 28 (UXO 18) – Cayo La Chiva OU 7 (SWMU 4) – Former OB/OD Area OU 23 (UXO 12) – Former EMA Interior OU 25 (UXO 14) – Former EMA South OU 26 (UXO 15) – Puerto Ferro		
Issues and Recommendations Identified in the Five-Year Review: None		

Five-Year Review Summary Form

PROTECTIVENESS STATEMENT(S)		
<i>Operable Unit:</i> OU 11 (SWMU 1)	<i>Protectiveness Determination:</i> Protective	<i>Addendum Due Date (if applicable):</i> Not applicable
The remedy at SWMU 1 is currently and is anticipated to remain protective of human health and the environment. Remedy implementation included surficial debris removal across the landfill surface followed by natural revegetation of the landfill surface. In addition, land use controls (LUCs) were implemented, are monitored/maintained, and have been shown to effectively control land use within the site boundaries and reduce the potential for exposure to landfilled debris and associated contamination that would potentially pose an unacceptable risk to exposed receptors.		
<i>Operable Unit:</i> OU 2 (AOC E)	<i>Protectiveness Determination:</i> Protective	<i>Addendum Due Date (if applicable):</i> Not applicable
The remedy at AOC E is currently and is anticipated to remain protective of human health and the environment. LUCs were implemented, are monitored/maintained, and have been shown to effectively reduce the potential for exposure to groundwater constituents of concern (COCs) at concentrations above remedial goals (RGs). In addition, groundwater LTM has demonstrated a decline in all COC concentrations to below RGs, pending at least two additional rounds of annual sampling to demonstrate stable or further declining concentrations of the remaining COC (methyl-tert-butyl ether [MTBE]) below its RG.		
<i>Operable Unit:</i> OU 18 (UXO 1)	<i>Protectiveness Determination:</i> Protective	<i>Addendum Due Date (if applicable):</i> Not applicable
The remedy at UXO 1 is currently and is anticipated to remain protective of human health and the environment. LUCs were implemented, are monitored/maintained, and have been shown to effectively ensure land use remains as planned by the Department of the Interior (DOI) and to reduce the potential for uncontrolled human contact with explosive hazards at the site.		
<i>Operable Unit:</i> OU 28 (UXO 18)	<i>Protectiveness Determination:</i> Protective	<i>Addendum Due Date (if applicable):</i> Not applicable
The remedy at UXO 18 is currently and is anticipated to remain protective of human health and the environment. Remedy implementation included inspecting areas of potential and/or planned public access to ensure no munitions and explosives of concern (MEC) was likely present. In addition, LUCs were implemented, are monitored/maintained, and have been shown to effectively reduce the potential for unauthorized access to portions of the site and reduce the potential for exposure to explosive hazards.		
<i>Operable Unit:</i> OU 7 (SWMU 4)	<i>Protectiveness Determination:</i> Protective	<i>Addendum Due Date (if applicable):</i> Not applicable
The remedy at SWMU 4 is currently and is anticipated to remain protective of human health and the environment. LUCs were implemented and will be monitored/maintained to reduce the potential for unauthorized access to portions of the site, reduce the potential for exposure to explosive hazards, and reduce the potential for exposure to perchlorate in groundwater until concentrations reach the RG.		
<i>Operable Unit:</i> OU 23 (UXO 12)	<i>Protectiveness Determination:</i> Will be Protective	<i>Addendum Due Date (if applicable):</i> Not applicable
Upon implementation, the remedy at UXO 12 is anticipated to be immediately protective of human health and the environment. The remedy will include MEC clearance in areas of planned public use. In addition, LUCs will be implemented and monitored/maintained to reduce the potential for exposure to explosive hazards and reduce the potential for unauthorized access to portions of the site, including unauthorized use of groundwater.		

<i>Operable Unit:</i> OU 25 (UXO 14)	<i>Protectiveness Determination:</i> Will be Protective	<i>Addendum Due Date (if applicable):</i> Not applicable
Upon implementation, the remedy at UXO 14 is anticipated to be immediately protective of human health and the environment. The remedy will include MEC clearance in areas of planned public use. In addition, LUCs will be implemented and monitored/maintained to reduce the potential for exposure to explosive hazards and reduce the potential for unauthorized access to portions of the site, including unauthorized use of groundwater.		
<i>Operable Unit:</i> OU 26 (UXO 15)	<i>Protectiveness Determination:</i> Will be Protective	<i>Addendum Due Date (if applicable):</i> Not applicable
Upon implementation, the remedy at UXO 15 is anticipated to be immediately protective of human health and the environment. The remedy will include MEC clearance in areas of planned public use. In addition, LUCs will be implemented and monitored/maintained to reduce the potential for exposure to explosive hazards and reduce the potential for unauthorized access to portions of the site.		

Resumen Ejecutivo

El Departamento de la Marina de los Estados Unidos (Marina) Comando de Sistemas de Ingeniería de Instalaciones Navales del Atlántico realizó esta segunda Revisión de Cinco-Años para el Área de Adiestramiento con Armas de la Flota del Atlántico (AFWTA, por sus siglas en inglés) – Vieques. Esta área incluye al Antiguo Destacamento de Apoyo a Municiones Navales (NASD, por sus siglas en inglés) y el Antiguo Campo de Adiestramiento Naval de Vieques (VNTR, por sus siglas en inglés), Puerto Rico. La revisión se llevó a cabo como parte de su cumplimiento con la Ley Integral de Respuesta, Compensación y Responsabilidad Ambiental (CERCLA, por sus siglas en inglés), de acuerdo con la sección CERCLA §121(c) según enmendada, y el Plan de Contingencia Nacional para la Contaminación con Petróleo y Sustancias Peligrosas (NCP, por sus siglas en inglés), Parte 300.430(f)(4)(ii) del Código de Regulaciones Federales (CFR, por sus siglas en inglés). El informe ha sido preparado de acuerdo con las Guías Comprensivas para Revisiones de Cinco-Años (EPA, 2001) y sus suplementos (EPA, 2012^a, 2012b), publicadas por la Agencia de Protección Ambiental de los Estados Unidos (EPA, por sus siglas en inglés), la Política de la Marina para las Revisiones de Cinco Años (Marina, 2011), las Herramientas para Preparar Revisiones de Cinco Años (NAVFAC, 2013), y el Manual para el Manejo del Programa de Restauración Ambiental del Departamento de Defensa (DON, por sus siglas en inglés 2018).

Este informe se preparó bajo el Contrato N62470-21-D-0007, Orden de Tarea del Contrato N6247021F4140 del Contrato de Acción Integral Ambiental a Largo Plazo de la Marina (Navy CLEAN, por sus siglas en inglés) para presentación a la Agencia Ambiental de los Estados Unidos (EPA, por sus siglas en inglés) el Departamento de Recursos Naturales y Ambientales del Estado Libre Asociado de Puerto Rico (PRDNER, por sus siglas en inglés), y el Servicio de Pesca y Vida Silvestre de los Estados Unidos (USFWS, por sus siglas en inglés). La Marina, como la agencia principal para la limpieza trabaja conjuntamente con la EPA, el PRDNER y USFWS para implementar el Programa de Restauración Ambiental de Vieques.

Este documento resume la evaluación de las acciones para la remediación implementadas en los sitios bajo un Récord de Decisión (ROD, por sus siglas en inglés) para determinar si el remedio está funcionando según lo previsto y sigue protegiendo la salud humana y el medio ambiente, de acuerdo con los requisitos establecidos en cada una de sus respectivos RODs. En orden cronológico, se implementaron acciones correctivas en los siguientes sitios, a los que se les han asignado designaciones de Unidad Operativa (OU, por sus siglas en inglés) para el seguimiento en el Sistema de Gestión Empresarial Superfund (SEMS, por sus siglas en inglés) de la EPA

- Unidad de Desperdicios Sólidos (SWMU, por sus siglas en inglés) 1 (OU 11) – Antiguo Vertedero del Campamento García.
- Unidad de Manejo de Área de Preocupación (AOC, por sus siglas en inglés) E (OU 2) – Antigua Área del Tanque de Almacenamiento Enterrado (UST, por sus siglas en inglés)
- UXO 1 (OU 18) – Antigua Área de Conservación del Este
- UXO 18 (OU 28) – Cayo La Chiva
- SWMU 4 (OU 7) – Antigua Área de Quema/Detonación Abierta

La medida en la cual los remedios proveen protección fue evaluada mediante revisiones de reportes técnicos asociados con el Monitoreo a Largo Plazo (LTM, por sus siglas en inglés) y mantenimiento, visitas al sitio, e inspecciones y actividades de participación comunitaria. Según corresponda, los informes de Revisión de Cinco Años también identifican asuntos, que pudieran prevenir que un remedio funcione según diseñado o sea apropiado, o que por alguna razón no se esté logrando el objetivo de proveer protección. La evaluación general de la efectividad de cada remedio se presenta como una declaración de protección que se desarrolla para cada sitio/OU. Se proporciona un Formulario de Resumen de la Revisión de Cinco Años que incluye la identificación del

NOTA: ESTE RESUMEN SE PRESENTA EN INGLÉS Y EN ESPAÑOL PARA LA CONVENIENCIA DEL LECTOR. SE HAN HECHO TODOS LOS ESFUERZOS PARA QUE LA TRADUCCIÓN SEA PRECISA EN LO MÁS RAZONABLEMENTE POSIBLE. SIN EMBARGO, LOS LECTORES DEBEN ESTAR AL TANTO QUE EL TEXTO EN INGLÉS ES LA VERSIÓN OFICIAL.

sitio, el estado del sitio, el estado de la revisión, los problemas/recomendaciones (según corresponda) y las declaraciones de protección.

Tres sitios adicionales: UXO 12 (OU 23 en el SEMS de la EPA), Interior de la Antigua Área de Maniobras del Este (EMA, por sus siglas en inglés); UXO 14 (OU 25 en el SEMS de la EPA), antigua EMA Sur; y UXO 15 (OU 26 en el SEMS de la EPA), Puerto Ferro – para los cuales se emitieron RODs durante el actual período de revisión de cinco años, pero para los cuales no se han implementado medidas correctivas también se incluyen en este Informe de Revisión de Cinco Años; Sin embargo, no se llevan a cabo evaluaciones de protección con respecto a estos sitios porque aún no se han implementado los remedios. En consecuencia, se identifica una determinación de protección de Will be Protective (*Será Protector*) para estos sitios.

Esta es la segunda revisión de cinco años de la AFWTA – Vieques, que se activó para la revisión estatutaria mediante el inicio de la implementación de las medidas correctivas en SWMU 1 en agosto de 2013. Se notificó a la comunidad el inicio del actual proceso de revisión de cinco años a través de un aviso público colocado en el folleto informativo de abril de 2023 distribuido en todo Vieques. Además, se han proporcionado actualizaciones sobre las acciones correctivas implementadas en los cinco sitios enumerados anteriormente en varias reuniones de la Junta de Consejo de Restauración (RAB, por sus siglas en inglés) antes y después de su implementación. Además, el estado de cada sitio ha sido y seguirá siendo proporcionado en los informes anuales de monitoreo y mantenimiento a largo plazo de medidas correctivas que se ponen a disposición de los miembros del RAB de Vieques y del público en general. Las actualizaciones anuales del Plan de Manejo del Sitio, que se proporcionan para comentarios públicos formales, también incluyen el estado de las acciones correctivas para cada sitio.

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Acronyms and Abbreviations

µg/L	microgram(s) per liter
1,2-DCA	1,2-dichloroethane
FFFF	aqueous film-forming foam
AFWTA	Atlantic Fleet Weapons Training Area
amsl	above mean sea level
AOC	Area of Concern
ARAR	applicable or relevant and appropriate requirement
AST	above ground storage tank
BERA	Baseline Ecological Risk Assessment
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-Term Environmental Action – Navy
COC	constituent of concern
COPC	constituent of potential concern
CSM	Conceptual Site Model
DOI	Department of the Interior
ECA	Eastern Conservation Area
eco-SSL	ecological soil screening level
ELCR	excess lifetime cancer risk
EMA	Eastern Maneuver Area
EPA	United States Environmental Protection Agency
ERA	Ecological Risk Assessment
ESD	Explanation of Significant Difference(s)
FS	Feasibility Study
FYR	Five-Year Review
HHRA	Human Health Risk Assessment
HI	hazard index
HQ	hazard quotient
IC	institutional control
ID	identification
IRACR	Interim Remedial Action Completion Report
ISCO	in situ chemical oxidation
LIA	Live Impact Area
LOAEL	Lowest Observed Adverse Effect Level
LTM	long-term monitoring
LUC	land use control
MCL	Maximum Contaminant Level
MD	munitions debris
MEC	munitions and explosives of concern
mg/L	milligrams per liter
MOV	Municipality of Vieques
MPE	multi-phase extraction
MTBE	methyl-tert-butyl ether

NASD	Naval Ammunition Support Detachment
NAVFAC	Naval Facilities Systems Engineering Command Atlantic
Navy	Department of the Navy
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NOAEL	No Observed Adverse Effect Level
NPL	National Priorities List
O&M	operations and maintenance
OB/OD	open burn/open detonation
OU	Operable Unit
PA/SI	Preliminary Assessment/Site Investigation
PAOC	Potential Area of Concern
PCB	polychlorinated biphenyl
PFAS	per- and polyfluoroalkyl substances
PFAS	polyfluoroalkyl substance
PRCT	Puerto Rico Conservation Trust
PRDNER	Puerto Rico Department of Natural and Environmental Resources
PRWQS	Puerto Rico Water Quality Standards
RAB	Restoration Advisory Board
RACR	Remedial Action Completion Report
RAO	remedial action objective
RC	Response Complete
RCRA	Resource Conservation and Recovery Act
RG	remedial goal
RI	Remedial Investigation
RIP	Remedy In Place
RME	reasonable maximum exposure
ROD	Record of Decision
RSL	Regional Screening Level
SEMS	Superfund Enterprise Management System
SERA	Screening Ecological Risk Assessment
SI/ESI	Site Inspection/Expanded Site Inspection
SIA	Surface Impact Area
SOP	Standard Operating Procedure
SPLP	Synthetic Precipitation Leaching Procedure
SSL	Soil Screening Level
SVOC	semivolatile organic compound
SWMU	Solid Waste Management Unit
TRV	Toxicity Reference Value
UAV	unmanned aerial vehicle
USCG	United States Coast Guard
USFWS	United States Fish and Wildlife Service
UST	underground storage tank
UU/UE	unlimited use and unrestricted exposure
VNTR	Vieques Naval Training Range
VOC	volatile organic compound

Introduction

The purpose of a five-year review (FYR) is to evaluate remedy performance to determine if it is and will continue to be protective of human health and the environment in accordance with the requirements of the associated Record of Decision (ROD). The methods, findings, and conclusions of reviews are documented in FYR reports such as this one. In addition, the FYR identifies issues that may affect remedy performance or protectiveness found during the review, if any, and documents recommendations to address them.

The FYR is required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), in accordance with CERCLA §121(c), as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), Part 300.430(f)(4)(ii) of the Code of Federal Regulations (CFR). This report was prepared under the Department of the Navy (Navy) Comprehensive Long-term Environmental Action–Navy (CLEAN) Contract N62470-21-D-0007, Contract Task Order N6247021F4140, and in accordance with the United States Environmental Protection Agency (EPA) Comprehensive Five-Year Review Guidance (EPA, 2001) and supplemental EPA guidance (EPA, 2012a, 2012b), Navy Policy on Five-Year Reviews (DON, 2011), the Toolkit for Preparing Five-Year Reviews (NAVFAC, 2013), and the Department of the Navy Environmental Restoration Program (DON, 2018).

The FYR Report was prepared by the Naval Facilities Engineering Systems Command Atlantic (NAVFAC) for submittal to the EPA, the Puerto Rico Department of Natural and Environmental Resources (PRDNER), and the United States Fish and Wildlife Services (USFWS). NAVFAC, EPA, PRDNER, and USFWS work jointly to implement the Vieques Environmental Restoration Program.

This FYR Report presents the findings of the second FYR for the Atlantic Fleet Weapons Training Area (AFWTA) – Vieques, which comprises the former Naval Ammunition Support Detachment (NASD) and the former Vieques Naval Training Range (VNTR) in Vieques, Puerto Rico (Figure 1-1). Specifically, this second FYR Report summarizes the evaluation of the remedial actions implemented at sites prior to or during the current FYR period under a ROD to determine whether the remedy is functioning as intended and is protective of human health and the environment, in accordance with the requirements set forth in each of their respective RODs.

In chronological order, remedial actions were implemented at the following sites, which have been assigned Operable Unit (OU) designations for tracking in the EPA Superfund Enterprise Management System (SEMS):

- Solid Waste Management Unit (SWMU) 1 (OU 11) – Former Camp Garcia Landfill
- Area of Concern (AOC) E (OU 2) – Former Underground Storage Tank (UST) Area
- UXO 1 (OU 18) – Former Eastern Conservation Area
- UXO 18 (OU 28) – Cayo La Chiva
- SWMU 4 (OU 07 in EPA SEMS) – Former Open Burn/Open Detonation (OB/OD) Area

Table 1-1 provides the CERCLA process status of these five sites and all other sites whose characterization and cleanup are being performed under CERCLA authority. The statutory FYR process was triggered by initiation of the remedial action implementation at SWMU 1 in August 2013 due to the presence of landfilled debris that may contain hazardous contaminants. Subsequently, RODs were issued and remedial actions were implemented at AOC E, UXOs 1 and 18, and SWMU 4 due to the contaminants in groundwater (AOC E and SWMU 4) and/or explosive hazards that may remain (UXOs 1 and 18 and SWMU 4) that do not allow for unlimited use and unrestricted exposure (UU/UE) at the sites. The protectiveness of the remedy at each site was evaluated through evaluation of the remedy implementation as well as reviews of technical status reports associated with long-term monitoring (LTM) and maintenance, site visits and inspections results, and community involvement activities.

The RODs for UXO 12 (OU 23 in EPA SEMS), UXO 14 (OU 25 in EPA SEMS), and UXO 15 (OU 26 in EPA SEMS) have been issued. Although the remedial actions have not been implemented at the sites, once implemented, the remedies are anticipated to be immediately protective. While these three sites are included in the Five-Year

Review Summary Form and Five-Year Review Summary Table (Table 1-2), detail discussion regarding the sites is not included in this report because the remedies have not yet been implemented. Consequently, a protectiveness determination of "Will be Protective" is identified for these sites.

RODs for UXO 16.1 and UXO 17 Potential Area of Concern (PAOC) EE have not been issued but are anticipated to be issued in 2023 or 2024. Therefore, remedy protectiveness evaluation for UXO 16.1 and UXO 17 PAOC EE is not applicable to the second FYR evaluation process.

1.1 Installation Background and History

Vieques is located in the Caribbean Sea approximately 7 miles southeast of the eastern tip of the main island of Puerto Rico and 20 miles southwest of Saint Thomas, United States Virgin Islands (Figure 1-1). Vieques 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. The former AFWTA was historically divided into two portions – the NASD and VNTR. Site operations on the western end of Vieques (former NASD) consisted mainly of ammunition loading and storage, vehicle and facility maintenance, and OB/OD. The eastern end of Vieques (former VNTR) was used for various aspects of naval gunfire training, including air-to-ground ordnance delivery and amphibious landings, as well as housing the main base of operations for these activities, Camp Garcia.

On February 11, 2005, Vieques was placed on the National Priority List (NPL) as the "Former AFWTA – Vieques," which required all subsequent environmental restoration activities to be conducted under CERCLA unless and until removed from CERCLA authority. The Navy, Department of the Interior (DOI), EPA, and Puerto Rico Environmental Quality Board (now known as PRDNER) executed a Federal Facility Agreement on September 7, 2007, that established the procedural framework and schedule for implementing the CERCLA response actions for Vieques.

1.1.1 Former Naval Ammunition Support Detachment

The former NASD consists of approximately 8,100 acres and was apportioned and transferred to the DOI, the Municipality of Vieques, and the Puerto Rico Conservation Trust (PRCT) in 2001, in accordance with Public Law 106-398. The property owned by DOI is managed by USFWS as part of the Vieques National Wildlife Refuge. AOC E and SWMU 4 are located within the former NASD (Figure 1-2).

1.1.2 Former Vieques Naval Training Range

The former VNTR was transferred to DOI to be operated by USFWS as part of the Vieques National Wildlife Refuge in 2003, in accordance with Public Law 107-107. The former VNTR consists of approximately 14,600 acres and is divided into four separate historical operational areas that from west to east comprise the 11,000-acre Former Eastern Maneuver Area (EMA), the 2,500-acre Former Surface Impact Area (SIA), the 900-acre Former Live Impact Area (LIA), and the 200-acre Former Eastern Conservation Area (ECA), as shown in Figure 1-3.

- EMA – established in 1947 to provide military maneuvering areas and ranges for training in amphibious landings, small arms fire, artillery and tank fire, shore fire control, and combat engineering tasks.
- SIA – established in the 1950s when several Marine artillery targets were constructed; in 1969, a bullseye target was constructed and used for inert bombing.
- LIA – established in 1965, where several targets were maintained for aerial bombing including old tanks and vehicles, a simulated railroad tunnel, simulated ammunition dump, simulated fuel farm, a simulated airstrip, two simulated surface-to-air missile sites, and a strafing target; several point and area targets were used for ships to practice naval gunfire support; one bullseye target used for inert bombing; and an OB/OD area was used for treatment of retrograde ordnance and open burning of propellants and pyrotechnics.
- ECA – established as a conservation area and not used as a munitions training area; however, the site is located adjacent to the LIA.

Following cessation of military operations on the former NASD and VNTR, the Navy subdivided the former operational areas into smaller parcels (i.e., AOC, SWMU, UXO, etc.) based on considerations such as historic use, geographic features, and land use. SWMU 1 and UXO 18 are located within the EMA and UXO 1 is located within the ECA of the former VNTR (Figure 1-3). AOC E and SWMU 4 are located in the former NASD (Figure 1-2).

1.2 Report Organization

The FYR Report consists of an Executive Summary and seven sections, organized as follows:

- Executive Summary – Summarizes the FYR process conducted at Vieques and subsequent findings. A summary table of the OUs, associated sites, site descriptions, basis for action, site status, recommendations and follow-up actions, and protectiveness determinations is provided as Table 1-2.
- Section 1 – Introduces the FYR, the objectives and its purpose, summarizes the report organization, and provides background information for Vieques.
- Section 2 – Describes the FYR process and how the current FYR was conducted.
- Sections 3, 4, 5, and 6 – Evaluates the five sites included in this second FYR. Discussion elements for each site include the site chronology; site description; physical characteristics; description of remedial actions (remedy implementation and remedy operation and maintenance [O&M]); the results of the FYR and technical assessment; issues, recommendations, and follow-up actions; and statement of protectiveness. Figures showing the locations of each site, associated sites, and actions, as well as tables with the risk summaries for each OU, are provided within each section, as applicable.
- Section 7 – References

Tables and figures are located at the end of each section, respectively. Appendixes are provided at the end of the document.

TABLE 1-1

Operable Unit Cross Reference Table*Second Five-Year Review Report**Atlantic Fleet Weapons Training Area - Vieques**Vieques, Puerto Rico*

EPA SEMS OU Number and Description	Common Site Name	Site Description	Status in CERCLA Process
00 - SITEWIDE			
01 - EAST & WEST BEACHES & ROADS	See OUs 07, 10, 12, 13, 15, 16, 19, 22, and 27	See OUs 07, 10, 12, 13, 15, 16, 19, 22, and 27	See OUs 07, 10, 12, 13, 15, 16, 19, 22, and 27
02 - WEST AOC E - UST AREA	AOC E - UST Site 2016	Waste oil UST - contaminated soil found during removal of UST	Remedial Action Performance Monitoring
03 - WEST AOC H - POWER PLANT	AOC H - Power Plant	Operated 1941-1943; aboveground storage tank (AST); used for fire fighter training ~1960s-1980s	No Further Action ROD
04 - WEST AOC I - ASPHALT PLANT	AOC I - Asphalt Plant	Former AST storage area stained with asphalt emulsion	No Further Action ROD
05 - WEST AOC J - SWD AREA	AOC J - Former Staging Area Disp.	Solid and potentially hazardous waste disposal site ~1965-1973	No Further Action ROD
06 - WEST AOC R - MAINT BLDG & SWD	AOC R - Former Staging/Ops Area	Construction staging and public works operations; AST; vehicle maintenance ~1965-1971	No Further Action ROD
07 - WEST SWMU 4 - OB/OD AREA	SWMU 4 -OB/OD Site	An open burn/open detonation area where there was thermal destruction of unserviceable munitions from approximately 1965-1980.	Remedial Action Performance Monitoring
08 - WEST SWMU 6 - SWD AREA	SWMU 6 - Mangrove Disposal Site	Disposal of trash (lubricants, oils, solvents, and paint) ~1965-1980	No Further Action ROD
09 - WEST SWMU 7 - SWD AREA	SWMU 7 - Quebrada Disposal Site	Disposal of trash (lubricants, oils, solvents, and paint) ~1965-1980	No Further Action ROD
10 - UX07 EMA/SIA NORTH BEACHES	UXO 7 EMA/SIA North Beaches	The SIA was established in the 1950s when Marine artillery targets were constructed for Marine artillery fire from the SIA and EMA. Marine artillery gun positions were constructed in the EMA in the 1950s and 1960s to direct artillery fire towards the targets in the SIA.	Feasibility Study
11 - EAST SWMU 1 - CAMP GARCIA LF	SWMU 1 - Former Camp Garcia Landfill	Camp Garcia Landfill (EMA)	Remedial Action Performance Monitoring
12 - UX02 LIVE IMPACT AREA -BEACHES	UXO 2, LIA Beaches	The LIA was established in 1964; since 1974 over 150,000 rounds and 4,700 tons of naval gunfire; over 40,000 rounds (10,000 tons) of ATG bombing.	Feasibility Study
13 - UX03 LIVE IMPACT AREA -ROADS	UXO 3, LIA Roads	The LIA was established in 1964; since 1974 over 150,000 rounds and 4,700 tons of naval gunfire; over 40,000 rounds (10,000 tons) of ATG bombing.	Feasibility Study
14 - UX04 LIVE IMPACT AREA-INTERIOR	UXO 4, LIA Interior	The LIA was established in 1964; since 1974 over 150,000 rounds and 4,700 tons of naval gunfire; over 40,000 rounds (10,000 tons) of ATG bombing.	Removal Action/Remedial Investigation
15 - UX05 SIA - RESTRICTED ROAD	UXO 5, SIA Restricted Roads	The SIA was established in the 1950s when Marine artillery targets were constructed for Marine artillery fire from the SIA and EMA during 1969, additional targets were established for inert bombing and strafing runs.	Feasibility Study
16 - UX08 SIA SOUTH BEACHES	UXO 8, SIA South Beaches	The SIA was established in the 1950s when Marine artillery targets were constructed for Marine artillery fire from the SIA and EMA.	Feasibility Study

TABLE 1-1

Operable Unit Cross Reference Table*Second Five-Year Review Report**Atlantic Fleet Weapons Training Area - Vieques**Vieques, Puerto Rico*

EPA SEMS OU Number and Description	Common Site Name	Site Description	Status in CERCLA Process
17 - UX016 -UNDERWATER SITES	UXO 16, Underwater Areas	UXO 16 comprises approximately 11,500 underwater acres adjacent to the range and munitions-related operational areas of the Former NASD and Former VNTR. It also includes three former ship anchorage areas and Mosquito Pier, where munitions offloading and transferring took place.	UXO 16.1 is in Record of Decision; all other areas are Remedial Investigation
18 - UX01 EASTERN CONSERVATION AREA	UXO 1, Eastern Conservation Area	Adjacent to LIA bombing range. Bombing prohibited since the 1970s.	Remedial Action Performance Monitoring
19 - UX06 EMA/SIA PUBLIC ROADS	UXO 6, EMA/SIA Public Roads	The SIA was established in the 1950s when Marine artillery targets were constructed for Marine artillery fire from the SIA and EMA. Marine artillery gun positions were constructed in the EMA in the 1950s and 1960s to direct artillery fire towards the targets in the SIA.	Feasibility Study
20 - UX09 SIA EXTERIOR	UXO 9, SIA Exterior: Includes SWMU 5, Spent Battery Accumulation Area; SWMU 8, Waste Oil Accumulation Area; SWMU 12, Solid Waste Collection Unit Area; AOC A, Diesel Fuel Fill Pipe Area; PI 1, Water Production Well; PI 17, Amphibious assault exercises, possible small arms bunkers and/or air targets; PI 22, Civilian residences and target area.	The SIA was established in the 1950s when Marine artillery targets were constructed for Marine artillery fire from the SIA and EMA.	Removal Action/Remedial Investigation
21 - UX010 SIA INTERIOR	UXO 10, SIA Interior	The SIA was established in the 1950s when Marine artillery targets were constructed for Marine artillery fire from the SIA and EMA.	Removal Action/Remedial Investigation
22 - UX011 EMA PUBLIC ROADS	UXO 11, EMA Public Roads	Marine artillery gun positions were constructed in the EMA since the 1950s to direct artillery fire towards the targets in the SIA.	Feasibility Study
23 - UX012 EMA INTERIOR	UXO 12, EMA Interior: Includes PI 2 Water Production Well, small arms range; PI 3, Water Production well, small arms range; PI 12, Wind Driven and Private Water Production Well; PI 15 Former Location of Civilian Home, possible observation pt or small arms range; PI 16, Former Location of Civilian Home, limited OB/OD may have occurred; PI 18, Small Arms Range; PI 19, Small Arms Range, Artillery Firing Point; PAOC Y, Observed large metal object on east side of roadway; PAOC Z, Observed on overturned tractor-trailer on north side of roadway.	Marine artillery gun positions were constructed in the EMA since the 1950s to direct artillery fire towards the targets in the SIA.	Remedial Design
24 - UX013 EMA WEST	UXO 13, EMA West: Includes PI 23, Water Production Well, Possible Observation Point; PAOC AA, Small Arms Range No. 1; PAOC BB, Small Arms Range No. 2, PAOC CC, Small Arms Range No 3; PAOC DD, Small Arms Range No. 4.	During 1966, six ranges were established in the MRS and used for the firing of small arms, grenades, rockets. These ranges were deactivated in 1999.	Removal Action/Remedial Investigation

TABLE 1-1

Operable Unit Cross Reference Table*Second Five-Year Review Report**Atlantic Fleet Weapons Training Area - Vieques**Vieques, Puerto Rico*

EPA SEMS OU Number and Description	Common Site Name	Site Description	Status in CERCLA Process
25 - UX014 EMA SOUTH	UXO 14, EMA South	Range 10 was located within UXO 14 and was used for frontal assaults using M-1, M-14 rifles; M-2 carbines, Browning Automatic 13 rifles, service pistols, and 45 caliber machine guns. Demolition charges up to ¼ pound were detonated to simulate combat.	Remedial Design
26 - UX015 PUERTO FERRO	UXO 15, Puerto Ferro: Includes PI 9 Ammunition Storage in Earthen Berms and Disposal of Ammunition (OB/OD possibly); PI 13, Lighthouse and ordnance possible launched from site.	UXO 15 contains an area that was alleged to have been used as an area of ammunitions storage with earthen berms and small OB/OD. Also, the MRS is described to have ordnance possibly fired from the site toward the LIA/SIA.	Remedial Design
27 - UX017 CAMP GARCIA	UXO 17, Other Sites: Includes PAOC EE (Former Storage of Munitions in Earthen Berms, PAOC FF, Former Artillery Firing Point, PI 14 (Scrape Metal Ammunition Boxes, Shell Casing Disposal), PI 21 (Quarry, Potential Former Artillery Firing Position), <u>Red Beach and Blue Beach</u>	PAOC EE is a suspected location of former storage of munitions in earthen berms.	Record of Decision (PAOC EE), Remedial Investigation (Playa Caracas), No Further Action Decision Document (PI 14, PI 21, PAOC EE)
28 - UX018 CAYO LA CHIVA	UXO 18, Cayo La Chiva	A site inspection of the island adjacent to Blue Beach, a public beach, identified five 5-inch rocket munitions items. Historical records did not identify this site as a munitions operations site.	Remedial Action Performance Monitoring
29 - SWMU 20 FORMER HELICOPTER MAINTENANCE AREA	SWMU 20, Former Helicopter Maintenance Area, Trenched Area, Disturbed Area, and Bermed Areas used for Fuel Bladder Storage (formerly PI 4)	Interviews and records indicate location of former helicopter maintenance area, barracks, and a mess hall. Observed several large segments of concrete culverts/pipes and concrete foundation slabs with a septic vault box to the south of the concrete slabs. Observed two large, rectangular, bermed areas formerly used for fuel bladder storage (from interviews). No evidence of munitions, hazardous waste, hazardous material, or petroleum disposal was observed (NAVFAC, 2003c). A TCE plume exists in the groundwater and extends in a southeastern direction from former operational area at the site.	Remedial Investigation/Feasibility Study
30 - LAGUNA LA CHIVA	La Chiva Lagoon		No Further Action Decision Document

Note:

Please refer to the Vieques Site Management Plan for details of all Vieques sites and their past activities (CH2M. 2022)

Table 1-2

Five-Year Review Summary Table*Second Five-Year Review Report**Atlantic Fleet Weapons Training Area - Vieques**Vieques, Puerto Rico*

SEMS OU	Site	Site Description	Basis for Action	Site Status	Recommendations and Follow-up Actions	Protectiveness
11	SWMU 1	Former Camp Garcia Landfill	Landfill Debris	LTM, O&M, and LUCs	Removal of site fencing as native vegetation and absence of attractive features provide sufficient deterrence for potential trespassers. Reduction in frequency of groundwater sampling events based on almost 20 years of data without any indication of increasing trends in contaminant concentrations.	Protective
2	AOC E	Former UST Area	COCs in Groundwater	LTM, O&M, and LUCs	None	Protective
18	UXO 1	Eastern Conservation Area	Potential Explosive Hazard	LTM, O&M, and LUCs	None	Protective
28	UXO 18	Cayo La Chiva	Potential Explosive Hazard	LTM, O&M, and LUCs	Return to annual LTM frequency based on findings from the 2022 60-day monitoring events that suggest little to no public use.	Protective
7	SWMU 4	Former OB/OD Area	COC in Groundwater; Potential Explosive Hazard	LTM, O&M, and LUCs	None	Protective
23	UXO 12	Former EMA Interior	Potential Explosive Hazard	Record of Decision	N/A	Will be Protective
25	UXO 14	Former EMA South	Potential Explosive Hazard	Record of Decision	N/A	Will be Protective
26	UXO 15	Puerto Ferro	Potential Explosive Hazard	Record of Decision	N/A	Will be Protective

Notes:

AOC = Area of Concern

LTM = long-term monitoring

LUCs = land use controls

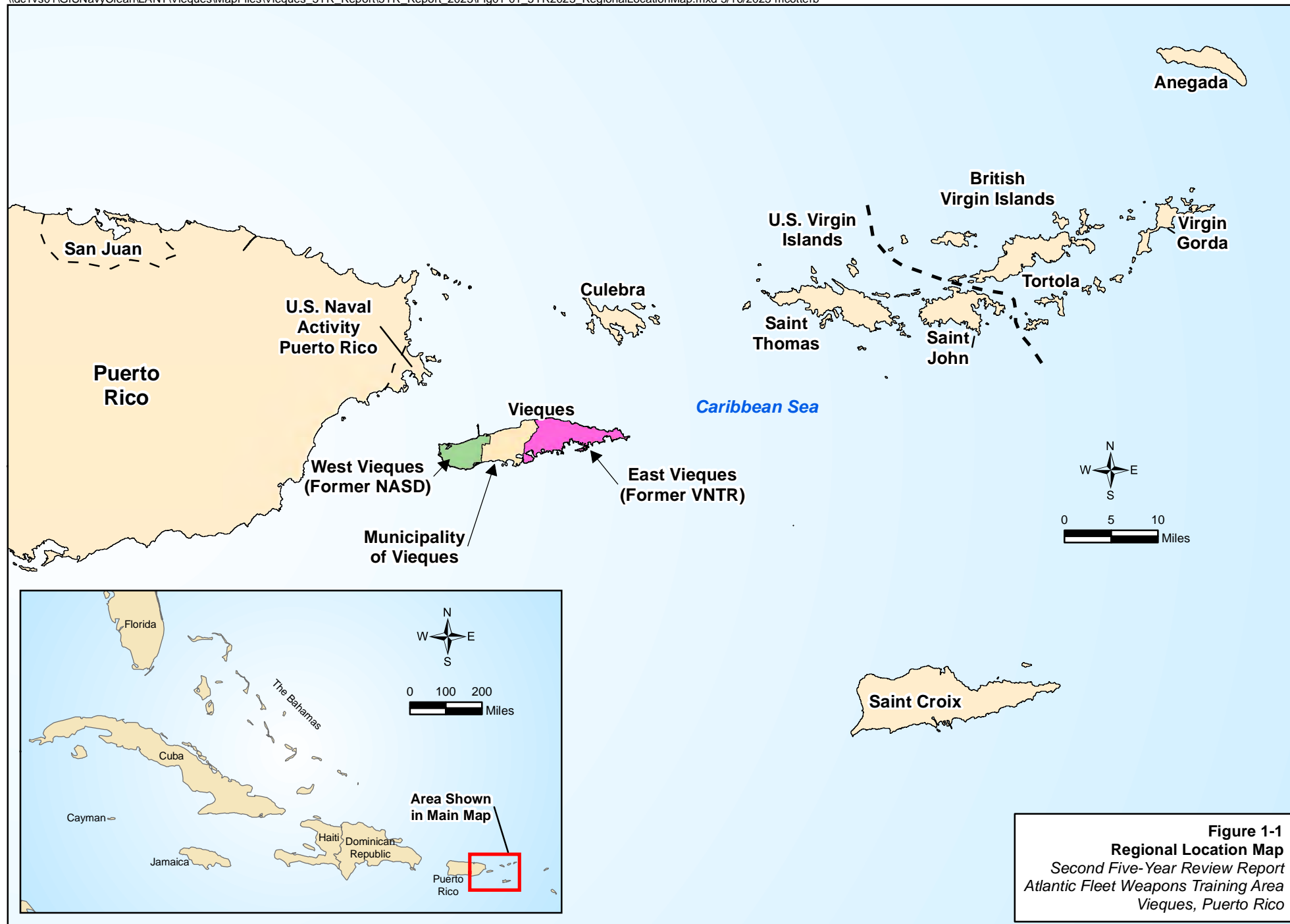
O&M = operations and maintenance

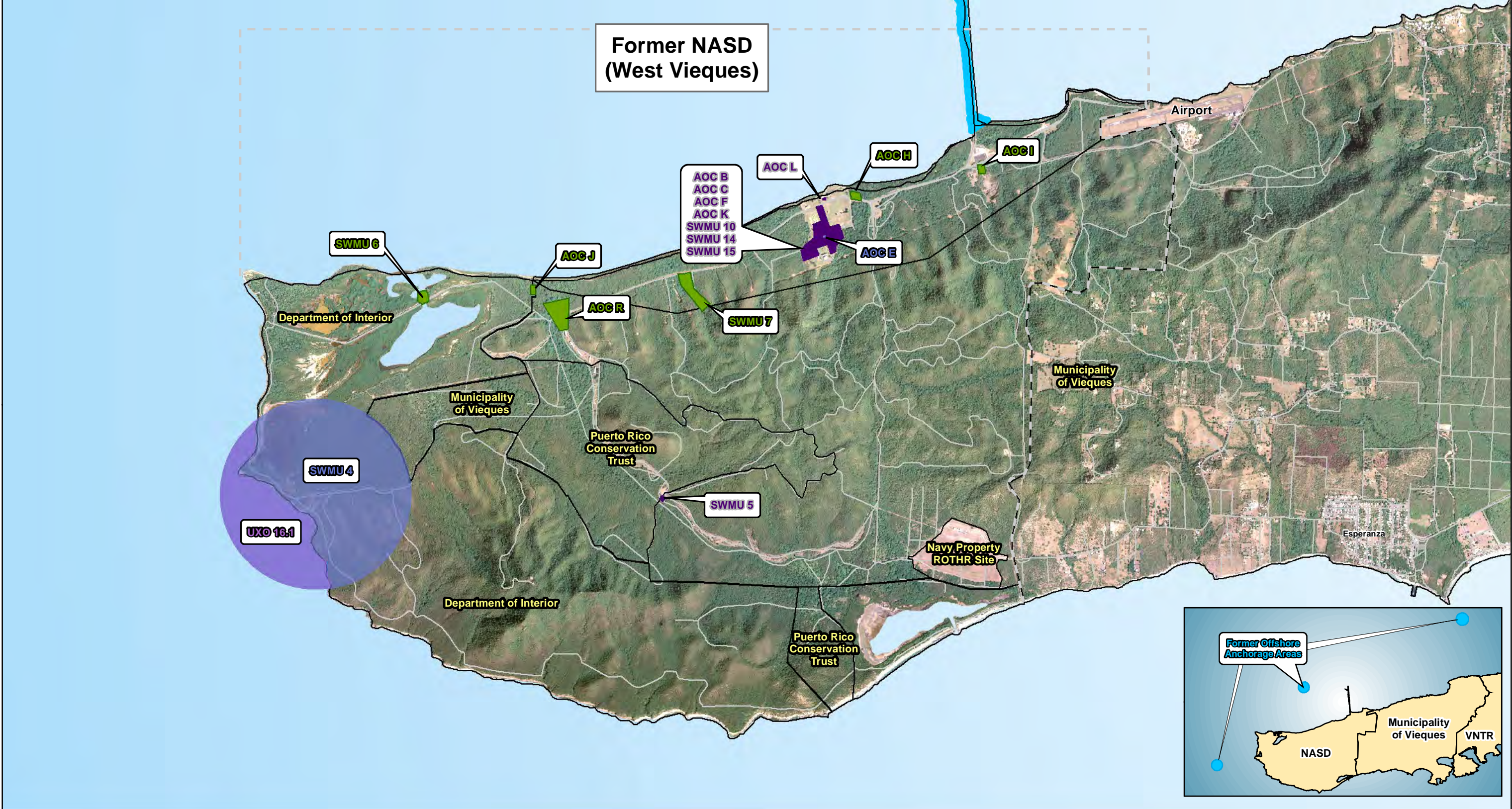
OU = operable Unit

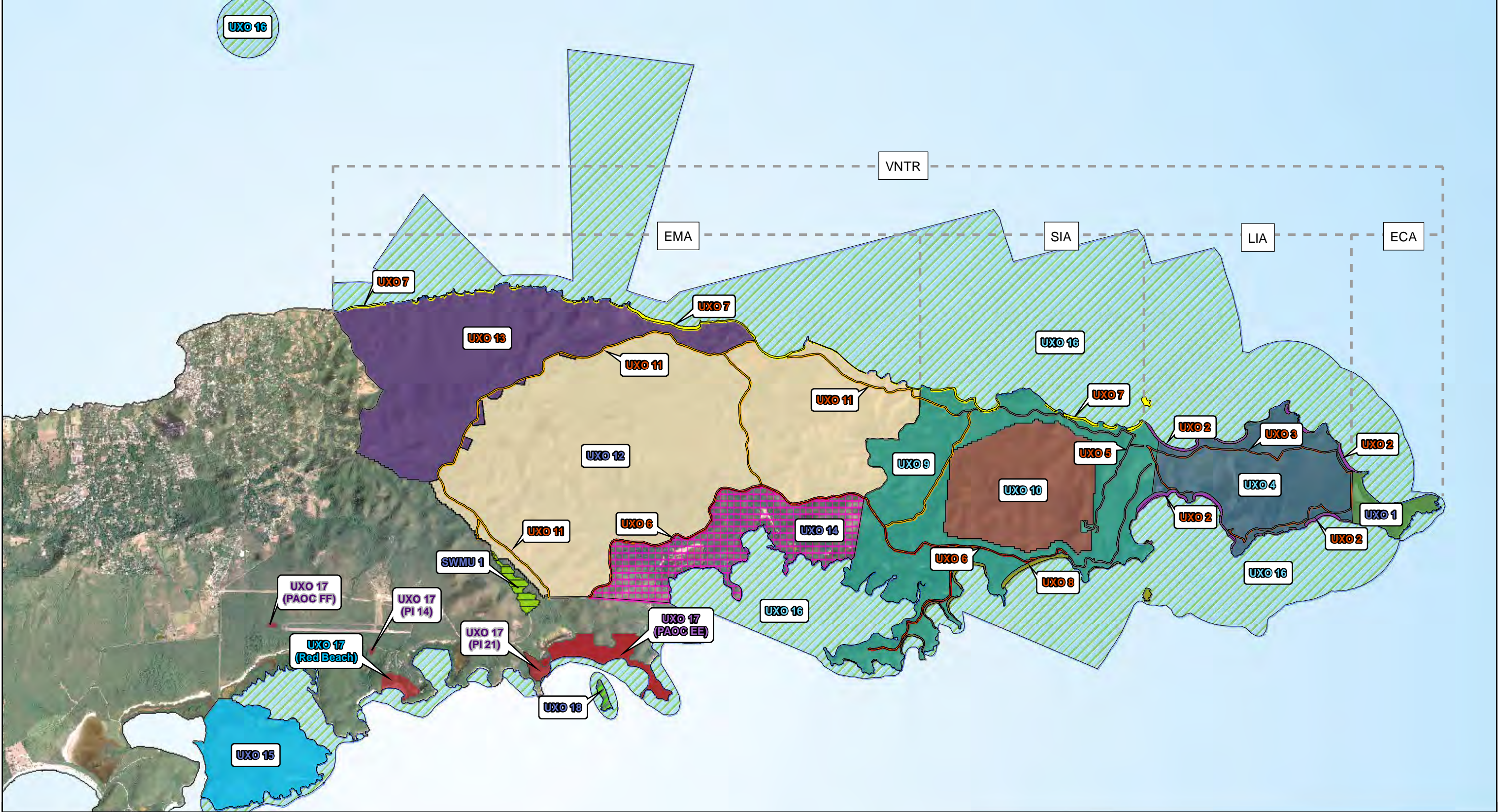
SWMU = Solid Waste Management Unit

UST = underground storage tank

N/A = not applicable







Legend

Munitions Response Sites

- UXO 1 - ECA
- UXO 2 - LIA Beaches
- UXO 3 - LIA Roads
- UXO 4 - LIA Interior
- UXO 5 - SIA Restricted Roads
- UXO 6 - EMA/SIA Planned Public Roads
- UXO 7 - EMA/SIA North Beaches
- UXO 8 - SIA South Beaches
- UXO 9 - SIA Exterior
- UXO 10 - SIA Interior
- UXO 11 - EMA Planned Public Roads
- UXO 12 - EMA Interior
- UXO 13 - EMA West
- UXO 14 - EMA South
- UXO 15 - Puerto Ferro
- UXO 16 - Underwater Areas
- UXO 17 - Public Use Beaches (PAOC EE, Red Beach), Camp Garcia Area, PAOC FF, PI 14 and PI 21
- UXO 18 - Cayo de la Chiva
- SWMU 1

Sites - No Action/No Further Action Decision Document

Sites - Remedial Investigation

Sites - Feasibility Study

Sites - Proposed Plan

Sites - Record of Decision

Sites - Remedial Action/Long-term Monitoring

Figure 1-3

East Vieques Environmental and Munitions Response Sites

Second Five-Year Review Report

Atlantic Fleet Weapons Training Area

Vieques, Puerto Rico

0 2,300 4,600 9,200 Feet

Five-Year Review Process

The second FYR for Vieques was conducted in accordance with the Comprehensive Five-Year Review Guidance (EPA, 2001) and supplements (EPA 2012a, 2012b), Navy Policy on Five-Year Reviews (DON, 2011), the Toolkit for Preparing Five-Year Reviews (NAVFAC, 2013), and the Department of the Navy Environmental Restoration Program Manual (DON, 2018). Remedy protectiveness for the five sites with RODs were evaluated through technical document reviews, site inspections, and community involvement activities, as applicable, as described in the following subsections. For three additional sites where RODs have been issued but the remedial actions have not yet been implemented, the remedies are anticipated to be immediately protective upon implementation.

2.1 Community Involvement

The Navy maintains an information repository, including the official Administrative Record, at the Vieques public website at <https://www.navfac.navy.mil/vieques>. EPA also maintains a copy of the Vieques Administrative Record on their website at <https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0204694>. The public website is accessible from any device with access to the Internet or any mobile device with cellular data access.

The Navy officially started an active Restoration Advisory Board (RAB) in August 2004, which offers an expanded forum for community input and participation in the Vieques environmental restoration efforts. The RAB grew out of a Technical Review Committee formed in 2001 and consists of community members and members from government agencies. The RAB was initially governed by a charter that was signed in May 2005 that allows for the exchange of information on the environmental restoration and munitions response processes and to foster communication among the community, regulators, and other stakeholders associated with or interested in the cleanup on Vieques. The Navy, EPA, PRDNER, and USFWS provide presentations on topics of interest, including cleanup progress. Consistent aspects of the RAB meetings are updates and interactive dialogue on the cleanup progress of all sites, including SWMU 1, AOC E, UXO 1, UXO 18, SWMU 4, UXO 12, UXO 14, and UXO 15.

The RAB approach and processes have been modified over time through collaboration between the RAB members and the Navy to ensure the program provides the flexibility to meet the needs and interests of the community. RAB meetings are held quarterly. RAB meetings are open to the general public, presented simultaneously in both Spanish and English, and are announced via public notices available in informational flyers placed in public areas in Vieques, emailed through an electronic mailing list, posted on the Vieques Environmental Restoration Facebook page (<https://www.facebook.com/ViequesRestoration/>) and broadcasted by a megaphone truck through the local community.

Community involvement and notifications specific to the FYR include:

- Publishing a public notice (Appendix A) in English and Spanish that the FYR process is being initiated for SWMU 1, AOC E, UXO 1, UXO 18, SWMU 4 in the April 2023 informational flyer distributed on Vieques, sent to the Vieques mailing list, and posted on the Navy's Vieques Facebook page <https://www.facebook.com/ViequesRestoration/>. The purpose of the notice is to inform the public that the FYR is being conducted, to provide information where the remedial actions under review can be obtained, and how the community can contribute during the review process.
- Inclusion of the FYR Report in the Administrative Record on the NAVFAC public website. (<http://www.navfac.navy.mil/vieques>).
- Publishing a second public notice (Appendix A) in English and Spanish to announce the conclusion of the FYR process for the SWMU 1, AOC E, UXO 1, UXO 18, and SWMU 4 remedial actions and the availability of the final report summarizing the results to the public in the Administrative Record.

2.2 Document Review

The second FYR consisted of a review of site-specific documentation for each site. First, the ROD for each site was reviewed with respect to the potential risks to human health and the environment, remedial action objectives (RAOs), selected remedy, and applicable or relevant and appropriate requirements (ARARs). Additional review of relevant documents, most importantly the LTM and O&M work plans and associated annual reports, were also reviewed to assess remedy performance and continued protection of human health and the environment. The results of this evaluation are documented in the site-specific sections that follow. Appendix B includes a comprehensive list of the documents reviewed for each site.

2.3 Site Inspections

The second FYR site inspection was conducted on August 23 and 24, 2022 and included representatives of the Navy, EPA, PRDNER, and USFWS. Completed annual LTM and the FYR inspection checklists and photographic logs from the annual inspections for SWMU 1, AOC E, UXO 1, and UXO 18 are provided in Appendix C (SWMU 1), Appendix D (AOC E), Appendix E (UXO 1), and Appendix F (UXO 18). The purpose of the inspections was to assess the status of land use controls (LUCs) and the protectiveness of the remedies and identify any issues warranting corrective measures. SWMU 4 was not included in the FYR site inspection because its remedy implementation was not conducted until 2023 but will be included as part of future FYR site inspections.

2.4 Climate Change Considerations

According to Region 2 Guidance for Incorporating Climate Change Considerations in Five Year Reviews, three climate change tools were utilized to assess the five sites with remedies in place for which remedial actions are being implemented (i.e., SWMU 1, AOC E, UXO 1, UXO 18, and SWMU 4). The three climate change tools are detailed as follows:

- *Climate Explorer* – Tool that gives users a way to check how climate conditions in the United States are projected to change over the coming decades (Link: [Climate Explorer](#)).
- *Risk Factor* – Tool that allows users to find a property's risk from environmental threats such as flooding, wildfires, extreme heat, and severe wind, and understand how risks are changing because of changing environment(s) (Link: [Risk Factor](#)).
- *Sea Level Rise* – Map viewer that provides a preliminary look at sea level rise and coastal impacts (Link: [Sea Level Rise Viewer](#)).

Screenshots from each of the tools assessed are included in Appendix G (Climate Change) under the applicable site header. Potential site impacts from climate change assessments are detailed in the Technical Assessment section under Question A in the Systems Operations/O&M subsection for each site.

2.5 Next Five-Year Review

The third FYR for Vieques will be five years following signature of Second FYR Report.

SWMU 1 – Former Camp Garcia Landfill

3.1 Site Chronology

Historical environmental investigations and the remedial action conducted at SWMU 1 are summarized in Table 3-1.

3.2 Site Background

3.2.1 Description and History

A Resource Conservation and Recovery Act (RCRA) Consent Order was signed in January 2000 to address known and potential environmental sites suspected of hazardous constituent releases. SWMU 1 was included in the RCRA Consent Order. The Navy ceased training exercises at the former VNTR on April 30, 2003, in accordance with the Presidential Directive to the Secretary of Defense on January 30, 2000, when the land was transferred to the DOI, to be managed by the USFWS as a National Wildlife Refuge. Although the DOI is directed to protect and conserve the transferred land as a wildlife refuge, the Navy retains the responsibility for conducting the environmental investigations and clean-up of the property, as warranted.

SWMU 1 is approximately 51 acres in size and located within a valley east of Camp Garcia, within the EMA of the former VNTR (Figures 3-1 and 3-2). SWMU 1 was an active landfill from 1954 to 1978 for the disposal of municipal waste from Camp Garcia. While this SWMU was operational, it was an unlined landfill that was used to dispose of paper, corrugated containers, cans and food packaging material, rags, scrap metal, and yard waste. Approximately 1,800 to 3,120 tons of waste was disposed in the landfill, but no hazardous materials reportedly were placed in the disposal area. During operation, materials were disposed in trenches, which were then covered with about 6 inches of soil to control blowing of litter. A final 2-foot-thick soil cover, consisting of compacted native soils, was placed over the trenches. Following the remedial action implementation, the landfill was allowed to naturally revegetate.

As set forth in the land transfer agreement between the DOI and Navy, DOI agreed that use and access in areas that could potentially impact the remedy at environmental sites would be limited until CERCLA related activities are completed. In addition to the dense vegetation across SWMU 1, there is no current or planned use at SWMU 1 and there are no features at the site that would likely attract trespassers.

3.2.2 Physical Characteristics

SWMU 1 is situated in a valley that gently slopes from the northwest to the southeast, with an approximate 55-foot elevation change (Figure 3-1). SWMU 1 is bounded by steep hills to the west and an ephemeral stream and steep hills to the east. The site is densely vegetated, dominated by thick thorn scrub. Surface water occurs within the ephemeral stream only during periods of heavy and prolonged rainfall.

Groundwater at SWMU 1 is within alluvial deposits, saprolite, and fractured volcanic bedrock and ranges in elevation from 23 to 3 feet above mean sea level (amsl). Groundwater flows generally to the south in the northern portion of the site and to the southeast in the southern portion of the site, generally mimicking the land topography, at a velocity that ranges from 17 to 158 feet per year.

3.2.3 Land and Resource Use

The former VNTR occupies over 14,000 acres, most of which are undeveloped. On April 30, 2003, the land containing SWMU 1 was transferred to the DOI. The site is located on a designated wildlife refuge where the future land use will remain the same with no planned public use. Groundwater beneath SWMU 1 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 waters that support ecological communities of exceptional ecological value. However, groundwater is not used as a potable water source at or in the vicinity of SWMU 1; it is

generally brackish and becomes saline in the southern portion of the site because of its close proximity to the sea (total dissolved solids concentrations have historically ranged between about 1,400 and 18,000 milligrams per liter [mg/L]); and there are no plans for future potable use of groundwater in this area. No archaeological or cultural resources are located within SWMU 1.

3.2.4 History of Contamination

Geophysical surveys, exploratory excavations, and media (soil and groundwater) analytical data collected during the Preliminary Assessment/Site Investigation (PA/SI) and Site Inspection/Expanded Site Inspection (SI/ESI) (as documented in the Streamlined Remedial Investigation (RI)/Feasibility Study (FS) Report [CH2M, 2011]) provide the primary basis for the evaluation of the nature and extent of the landfill debris and associated contamination. Chemical concentrations were compared to risk-based screening criteria for human health and ecological receptors, and Federal and Commonwealth of Puerto Rico Water Quality Standards (PRWQS).

The landfill debris is primarily municipal-type debris, such as waste paper, corrugated containers, cans and food packaging material, rags, wood, scrap metal, and yard waste, that was disposed in trenches between 1954 and 1978. Several munitions-related debris (i.e., spent ammunition, small arm cartridges, and practice items) were also observed. The depth of the landfill debris is variable across the site; however, it was observed to a depth of about 10 feet below ground surface (bgs). Small, isolated, randomly distributed areas were observed to have landfill debris exposed on the surface, either from soil erosion, incomplete placement of the initial cover, or disturbance during the investigations.

As summarized in the ROD, constituents detected above regulatory screening criteria and background concentrations in soil primarily occurred within the extent of the landfill. One semivolatile organic compound (SVOC) (benzo(a)pyrene), 3 pesticides (4,4'-DDE, 4,4'-DDT, and endrin ketone), and 11 inorganic constituents (arsenic, chromium, cobalt, copper, iron, lead, mercury, selenium, thallium, vanadium, and zinc) were detected above screening criteria and background concentrations (for inorganics) in the surface soil landfill cover. The detected concentrations are distributed relatively evenly across the landfill without any "hot spots" (isolated areas of significantly elevated concentrations) or discrete area of elevated concentrations. Six pesticides (4,4'-DDD, 4,4'-DDE, 4,4'-DDT, dieldrin, endrin, and gamma-chlordane) and 12 inorganic constituents (aluminum, antimony, arsenic, barium, chromium, cobalt, copper, iron, lead, nickel, selenium, and vanadium) were detected above screening criteria and background concentrations (for inorganics) in the subsurface soil within the landfill debris. As discussed in Section 4.2.5, no constituent concentration was found to pose an unacceptable risk.

Several inorganics (aluminum, arsenic, chromium, cobalt, iron, and vanadium) were detected above background concentrations (ephemeral stream samples were compared to soil background data) and screening criteria in the subsurface soil beneath the landfill debris and within soil of the ephemeral stream. Only lead in subsurface soil beneath the landfill debris is likely associated with a release; however, lead was not observed above screening criteria in groundwater. All other inorganic concentrations within the subsurface soil beneath the landfill debris and within soil of the ephemeral stream were at or only slightly exceeded background concentrations and are attributable to background. Groundwater data collected from beneath and downgradient of the landfill indicate that although some concentrations are above background, they are generally below EPA Maximum Contaminant Levels (MCLs) and PRWQS and do not indicate widespread leaching from the landfill has occurred (Table 3-2).

The potential for migration of constituents in SWMU 1 environmental media from wind erosion, volatilization, surface runoff, leaching to groundwater, and groundwater flow is minimal. The 2-foot-thick soil cover over trenches and vegetation reduces the potential for wind erosion and surface runoff. Volatile constituents observed in groundwater were at low concentrations such that volatilization is likely negligible. The groundwater monitoring data, as well as the number of years that the waste has been in place (between 30 and 55 years), indicate that the potential for leaching from the landfill is minimal.

3.2.5 Site Risks

The Human Health Risk Assessment (HHRA) and Ecological Risk Assessment (ERA) conducted for SWMU 1 during the RI/FS are summarized in the following subsections and the results are presented in Table 3-3. The HHRA for

soil beneath the landfill included in the RI/FS Report was revised to include subsurface soil, which demonstrated human health risks from exposure to landfill soil are acceptable under current and anticipated future land use.

Human Health

Surface soil samples collected during the PA/SI and the SI/ESI (as documented in the Streamlined RI/FS Report), were used to quantitatively evaluate potential human health risks due to potential exposure to site media. Exposure scenarios evaluated for site media comprised adult trespassers and USFWS workers, based on current and future land use. Conservative exposure pathways comprised ingestion, dermal contact, and inhalation of chemicals in ephemeral stream surface soil and landfill cover surface soil. No unacceptable human health risks were identified based on exposure scenarios at SWMU 1; however, only surface soil and groundwater were evaluated. Therefore, as documented in Appendix B of the SWMU 1 Remedial Action Completion Report (CH2M, 2017a), subsurface soil samples (0-6 foot interval) collected during the PA/SI and the SI/ESI were used to prepare a revised HHRA to assess potential exposure to both surface and subsurface soil. Potential cancer risks were below EPA's risk range of 10^{-4} to 10^{-6} and non-cancer hazards were below a hazard index (HI) of 1. Although no unacceptable risks were identified for human health, this determination is predicated upon the land use remaining the same, which includes controlling access to subsurface debris.

Ecological Risk

An ERA was conducted for SWMU 1, consisting of Steps 1 through 3A of the ERA process, in accordance with Navy ERA policy, and Navy and EPA ERA guidance. In Step 1 (preliminary problem formulation) the goals, scope, and focus of the ERA were established, and the environmental setting (i.e., habitats, vegetation, wildlife, protected species), types and concentrations of chemicals in surface soil, and potentially complete exposure pathways were described. This information was used to develop the ecological Conceptual Site Model (CSM) and ecological assessment and measurement endpoints. Potentially complete pathways were identified for lower trophic level receptors (plants and soil invertebrates) and upper-trophic level receptors (birds and mammals) exposed to surface soil. Due to the ephemeral nature of the adjacent stream, aquatic exposure pathways are not present. Therefore, the ephemeral stream was more appropriately evaluated as a terrestrial habitat.

In Step 2, hazard quotients (HQs) were calculated to characterize the potential for constituents to pose unacceptable ecological risk using conservative exposure assumptions. HQs represent a ratio of the exposure level to an ecological effect level and are an estimate of potential risk. Maximum soil constituent concentrations in surface soil were used in Step 2 to estimate potential exposures to upper and lower trophic level ecological receptors selected to represent the assessment endpoints at SWMU 1. Upper trophic level effects were determined using a food web model that estimated the concentration of each bioaccumulating chemical in each relevant dietary component, and comparing the total dietary intake of the chemical to wildlife toxicity reference values (TRVs). TRVs were based on chronic No Observed Adverse Effect Levels (NOAELs) and chronic Lowest Observed Adverse Effect Levels (LOAELs) obtained from scientific literature. Only constituents with the potential to bioaccumulate were evaluated for food web exposures. For lower trophic level receptors, the exposure concentrations for soil were screened against ecological soil screening levels (eco-SSLs) developed by EPA, or alternative regulatory-approved screening values as provided in the Master Ecological Risk Assessment Protocol for Vieques if eco-SSLs were not available. Chemicals with HQs greater than 1 were identified as ecological constituents of potential concern (COPCs) for further evaluation in Step 3A of the ERA. Identified COPCs at Step 2 comprised inorganic constituents in surface soil.

In Step 3A, the conservative exposure assumptions employed for Step 2 were refined and risk estimates were recalculated using more realistic assumptions including the use of mean values for soil concentrations, bioaccumulation factors, and exposure parameters. Other factors considered in Step 3A included comparison to background concentrations, other accepted ecological screening values in the scientific literature, frequency of detection, frequency and magnitude of screening value exceedance, and spatial distribution of the COPCs.

The Step 3A refinement resulted in no constituents of concern (COCs) being identified for either upper or lower trophic level receptors. Chemicals detected above ecological screening criteria were attributable to background or

had infrequent detections. Thus, risks to ecological receptors were determined to be acceptable and the conditions upon which that conclusion was drawn still exist at SWMU 1.

3.3 Remedial Action Summary

3.3.1 Basis for Taking Action

Although no unacceptable risks were identified for human health or ecological receptors, this determination was based on the land use and controls on access to subsurface debris remaining the same. Therefore, the response action addresses potential exposure from direct contact with subsurface landfill debris, reduces the potential for erosion of landfill debris, and ensures land use within the landfill boundaries is controlled. Long-term groundwater monitoring is conducted to determine if a future release from the landfill occurs that results in groundwater contamination that may necessitate a groundwater response action.

3.3.2 Response Action

The remedy for SWMU 1 selected in the ROD (NAVFAC, 2011) is Enhanced Native Soil Cover and Institutional Controls (ICs) to reduce the potential for direct contact with subsurface landfill debris that would potentially pose an unacceptable risk to exposed receptors. The following RAOs were developed for the landfill debris, associated contamination, and potential exposure routes and receptors at SWMU 1:

- Prevent direct contact with surface and subsurface landfill debris and associated contamination that would potentially pose an unacceptable risk to exposed receptors.
- Minimize the potential for erosion of landfill debris.
- Ensure land use (including the use of groundwater) within the landfill boundaries is controlled, unless or until additional action is implemented that mitigates potentially unacceptable risks associated with unrestricted land use.

An RAO for groundwater was not deemed necessary because there is no groundwater contamination requiring remediation and no evidence that leaching is a concern. However, groundwater LTM is performed and if LTM data indicate a future release from the landfill results in groundwater contamination necessitating a groundwater response action.

3.3.3 Status of Implementation

Remedial action implementation was initiated in September 2012 but was halted when more debris was encountered on the surface than was anticipated. Based on this finding, the Navy and regulatory agencies concurred on temporarily removing the vegetation across the landfill in order to ensure surface debris at the landfill could be removed, thereby eliminating the need for additional native soil cover. A ROD Explanation of Significant Differences (ESD) was produced describing this change to the ROD (NAVFAC, 2016). As a result, a work plan to clear the landfill surface of the debris and potential munitions-related items, as well as refine the landfill boundary using subsurface geophysics was finalized in September 2013 and fieldwork took place between September 2013 and November 2015. Approximately 11,631 pounds of debris was removed from the landfill surface and geophysics confirmed the landfill to be approximately 51 acres in size. The remaining remedial action items (i.e., those identified in the 2011 ROD) were addressed in early 2016, including a survey of the LUC boundary by a professional surveyor, installing markers at LUC boundary corners, and installing a fence with warning signs along the main east-west road through the southern portion of the landfill. The SWMU 1 Remedial Action Completion Report (CH2M, 2017a) represents achievement of the Response Complete (RC) milestone and also documents the Remedy In Place (RIP) milestone.

Components of the remedial action include inspecting the landfill cover conditions, barriers and ICs, LTM of groundwater, and O&M. Implementation and maintenance details for LTM at SWMU 1 are detailed in the Revised Operations and Maintenance, Land Use Control, and Long-Term Monitoring Work Plan - Solid Waste Management

Unit 1 (CH2M, 2016). The Navy is responsible for implementing, maintaining, inspecting, reporting on, and enforcing the landfill and ICs in accordance with the ROD.

To ensure the RAOs are met for SWMU 1, annual visual inspections are conducted to look for surface debris and evidence of erosion, and evaluate the condition of drainage features, LTM monitoring wells, and fencing/signage (checklists and photos shown in Appendix C). Annual O&M, LTM, and LUC inspections (with additional post-hurricane inspections) have been implemented at SWMU 1 from 2016 to 2022 to ensure the RAOs are being met.

3.4 Progress Since the Last Review

The First FYR Report (CH2M, 2018b) protectiveness determination for SWMU 1 stated: “The remedy at SWMU 1 is protective of human health and the environment and has reached Response Complete status because it has met the RAOs. Surface debris has been removed, direct contact with and erosion of subsurface landfill debris is controlled by the vegetative cover and LUCs are effective controlling land (including groundwater) use, which is verified through the LUC inspection and maintenance program. LTM data indicate that the remedy is functioning as required.” As such, the previous FYR did not include any issues and recommendations to evaluate during this FYR period.

3.5 Five-Year Review Process

3.5.1 Site Inspection

An FYR inspection was performed for SWMU 1 on August 23, 2022 (Appendix C). Observations did not find anything that affected the overall remedy protectiveness. However, a fly over of the area with an unmanned aerial vehicle (UAV) was recommended for a future annual inspection, which is planned for the 2023 annual inspection.

3.5.2 Data Review

Four annual monitoring events (2019 through 2022) were completed since the First FYR. In addition to evaluating the condition of LUCs, each event included sampling of the six LTM wells the Navy and regulatory agency concurred provide the appropriate coverage of the internal landfill conditions and, most importantly, the downgradient conditions, as shown in Figure 3-2. Results of SWMU 1 annual monitoring are presented in the following documents:

- Solid Waste Management Unit 1, 2019 Annual Status Report, Groundwater Long-Term Monitoring and Operations and Maintenance, Atlantic Fleet Weapons Training Area – Vieques, Former Vieques Naval Training Range, Vieques, Puerto Rico (CH2M, 2019d)
- Solid Waste Management Unit 1, 2020 Annual Status Report, Groundwater Long-Term Monitoring and Operations and Maintenance, Atlantic Fleet Weapons Training Area – Vieques, Former Vieques Naval Training Range, Vieques, Puerto Rico (CH2M, 2020a)
- Solid Waste Management Unit 1, 2021 Annual Status Report, Groundwater Long-Term Monitoring and Operations and Maintenance, Atlantic Fleet Weapons Training Area – Vieques, Former Vieques Naval Training Range, Vieques, Puerto Rico (CH2M, 2021b)
- Solid Waste Management Unit 1, 2022 Annual Status Report, Groundwater Long-Term Monitoring and Operations and Maintenance, Atlantic Fleet Weapons Training Area – Vieques, Former Vieques Naval Training Range, Vieques, Puerto Rico (CH2M, 2022h)

Evaluation of the results of the four annual LTM and O&M event activities found:

- In general, groundwater levels beneath the site have declined since Hurricanes Irma and Maria to levels above, but closer, to historical averages.

- Figure 3-3 provides the concentrations of every constituent for which there has been at least one detection above a regulatory screening level (i.e., PRWQS or MCL [and background for metals]) during the annual groundwater LTM events as well as historical sampling events. These are the same data that have been shown and discussed in the various annual reports. All groundwater samples were analyzed for VOCs, SVOCs, pesticides, polychlorinated biphenyls (PCBs), and metals during each LTM event. Key observations based on these data are:
 - No VOCs, pesticides, or PCBs have been detected in groundwater during LTM.
 - SVOCs have been primarily not detected in groundwater and when detected, the long-term data suggest their detections are low (i.e., near reporting limits), anomalous (i.e., generally non-detect in the preceding and succeeding events), and do not demonstrate increasing trends and other patterns. For example:
 - bis(2-Ethylhexyl)phthalate was detected in intra-landfill well MW-08 (1.4 µg/L, below the regulatory screening levels) in 2020, but not before or since.
 - bis(2-Ethylhexyl)phthalate was detected in downgradient well MW-02 (1.3 µg/L, below the regulatory screening levels) in 2021 for the first time since 2016, when it was detected at a similar concentration (0.88 µg/L). It was not detected in this well in 2022 or 2023.
 - bis(2-Ethylhexyl)phthalate was detected in downgradient well MW-11 (6.8 µg/L, above the regulatory screening levels) in 2020, but not before or since.
 - Five SVOCs were detected in downgradient well MW-10 (concentrations between about 0.08 and 0.1 µg/L, above the PRWQS) in 2021, but not before or since.
 - In 2022, di-n-butylphthalate was the only SVOC detected in SWMU 1 groundwater (in intra-landfill well MW-08), but it was below the regulatory screening levels.
 - Mercury is the only metal that has been detected above a regulatory screening level (i.e., PRWQS) during LTM. Chromium was detected above regulatory screening levels (PRWQS and MCL) in downgradient well MW-03 in 2016, but not before or since. With respect to mercury:
 - Its concentrations in the two wells where it is most frequently detected (i.e., intra-landfill well MW-08 and downgradient well MW-02) have been relatively consistent since LTM monitoring began and as far back as 2004 and demonstrate no increasing trend.
- Data collected during the 2016 through 2022 groundwater annual events support the historical conclusions for groundwater in the RI and documented in the ROD that leaching from the landfill is not a concern. Specifically, no increasing trends of chemical concentrations have been observed and comparison of the annual data suggest that groundwater conditions beneath the landfill have remained consistent over the last 18 years.
- All fencing and signs are in place and functioning as anticipated.

3.6 Technical Assessment

3.6.1 Question A: Is the remedy functioning as intended by the decision documents?

Remedial Action Performance

The remedial action at SWMU 1 has been and remains functioning as intended and continues to meet the RAOs established in the ROD because inspections indicate direct contact with debris and associated contamination that would potentially pose an unacceptable risk to exposed receptors is not occurring, the potential for erosion has been minimized, and land use within the landfill boundaries is controlled.

The results of long-term groundwater sampling events support the historical conclusions drawn for groundwater in the ROD that leaching from the landfill is not a concern. A comparison of groundwater data collected during the

current FYR period to historic data collected at SWMU 1 demonstrate the groundwater conditions beneath the landfill have remained relatively consistent over the last two decades of monitoring.

System Operations/Operations and Maintenance

Current O&M procedures, as implemented, will maintain the effectiveness of the remedial action, specifically related to the verification and, if necessary, maintenance of the vegetative cover.

According to Region 2 Guidance for Incorporating Climate Change Considerations in Five Year Reviews, three climate change tools were utilized to assess SWMU 1 (Appendix G). Potential site impacts from climate change have been assessed, and the performance of the remedy is currently not at risk due to potential effects of climate change in the region. While hurricanes and named tropical storms may have the ability to impact the remedy (e.g., storms damage/destroy vegetation or promote erosion), the remedy in place already addresses this contingency as it requires post storm LUC inspections and associated repairs, as warranted.

Implementation of Institutional Controls and Other Measures

LUCs are a component of the SWMU 1 remedial action to discourage trespassing and minimize the potential for exposure to subsurface landfill debris. The LUC boundary and the physical LUCs (fencing) at SWMU 1 are shown in Figure 3-2.

No observations were observed during the SWMU 1 Second Five-Year Inspection that would affect overall remedy protectiveness. The vegetative cover, signs, fencing, boundary demarcation monuments, and gates are all in place and functioning as anticipated.

3.6.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

The exposure assumptions and RAOs used at the time of remedy selection are still valid. The ERA contained in the Streamlined RI/FS Report (CH2M, 2011) and the revised HHRA contained in the After Action Report following the surface debris removal (CH2M, 2015c) did not identify any COCs for SWMU 1 and concluded there was no unacceptable risk to human health and the environment. This determination is predicated upon the land use as a wildlife refuge remaining the same and access to subsurface debris and associated contamination being restricted. The current and reasonably anticipated future land use is to remain as a wildlife refuge and the presence of a vegetative cover and periodic inspections are sufficient to ensure exposure to subsurface landfill debris is not occurring. Further, the data collected during the 2019, 2020, 2021, and 2022 groundwater LTM events continues to support the historical conclusions drawn for groundwater in the RI and documented in the ROD that leaching from the landfill is not a concern.

3.6.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has come to light that yields uncertainty in the remedy protectiveness.

3.6.4 Technical Assessment Summary

Based on the information presented herein, the remedy for SWMU 1 is functioning as intended by the ROD, exposure assumptions remain valid and there is no new information that affects the protectiveness of the remedy.

3.7 Issues/Recommendations

No issues were identified during the Second FYR that would inhibit the ability of the remedy to be protective and continue to achieve the associated RAOs.

In 2022, groundwater sampling for per- and polyfluoroalkyl substances (PFAS) analysis was conducted at SWMU 1 given historical records indicating aqueous film-forming foam (AFFF) was potentially available for firefighting use at the former base. The results of the sampling are provided in the draft Site Inspection for Per- and

Polyfluoroalkyl Substances Report (CH2M, 2023b). While PFAS were detected in groundwater, the concentrations were below risk-based levels available at the time the draft report was prepared. Recognizing the report is still under regulator consideration and because screening levels continue to be updated, discussion of PFAS data evaluation is not included herein, but will be presented in the final PFAS Site Inspection Report and used to make decisions regarding whether further investigation or action is warranted. However, as with other contaminants potentially attributable to the SWMU 1 landfill, monitoring and maintenance of SWMU 1 LUCs and that potable water for Vieques is from the main island of Puerto Rico are effective mechanisms to prevent potable groundwater use at SWMU 1.

3.8 Other Findings

The following information was identified during the FYR and does not affect current or future protectiveness but is relevant to long-term site management.

A fly over of the area with a UAV was recommended for a future annual inspection, for which the Navy will make the necessary arrangements and include the results in the associated annual report.

While there are no protectiveness issues that would warrant corrective actions, because the remedial action was implemented approximately 10 years ago, findings and observations made during performance monitoring conducted since that time provide a strong foundation for the following optimization opportunities:

- The data collected during the 2016 - 2022 groundwater LTM events support the historical conclusions drawn for groundwater in the RI and documented in the ROD that leaching from the landfill is not a concern. No increasing trends of chemicals were observed in 2022. Specifically, groundwater data collected during LTM, as well as historical groundwater data collected back to 2004, demonstrate groundwater conditions beneath the landfill have remained relatively consistent over the last two decades. This long-term consistency in groundwater data, together with the demonstration of relatively insignificant leaching (i.e., absence of organics, low metals concentrations wholly or substantially attributable to background or below drinking water standards), supports a reduced groundwater monitoring frequency. Therefore, the Navy intends to reduce groundwater monitoring frequency to once every 5 years to coincide with the year each five-year report is produced.

While a groundwater monitoring frequency reduction is warranted, the Navy will continue annual inspections, O&M, and maintaining LUCs in accordance with Revised Operations and Maintenance, Land Use Control, and Long-Term Monitoring Work Plan, Solid Waste Management Unit 1 (CH2M, 2016).

- As shown in Figure 3-2, a 3-wire fence was installed along the section of road that traverses the southern portion of the landfill. The fence was installed primarily to discourage access into the landfill area while the vegetation naturally recovered following the remedy implementation. Given that the fencing was designed more as a visual demarcation rather than a physical barrier and because the landfill surface has naturally revegetated, the vegetation now provides sufficient visual demarcation and deterrence, making the 3-wire fence superfluous. Therefore, the Navy intends to remove the fence. This will also alleviate the difficulty associated with fence maintenance given that the dense vegetation grows quickly around and through the fence. Removing the fence will also facilitate maintaining the vegetation line along the road. Where signs are currently located on the fencing, sign posts will be installed and the existing signs affixed to the posts.

3.9 Protectiveness Statement

Protectiveness Statement(s)		
<i>Operable Unit:</i> SWMU 1	<i>Protectiveness Determination:</i> Protective	<i>Planned Addendum Completion Date:</i> Not applicable
<p><i>Protectiveness Statement:</i></p> <p>The remedy at SWMU 1 is currently and is anticipated to remain protective of human health and the environment. Remedy implementation included surficial debris removal across the landfill surface followed by natural revegetation of the landfill surface. In addition, LUCs were implemented, are monitored/maintained, and have been shown to effectively control land use within the site boundaries and reduce the potential for exposure to landfilled debris and associated contamination that would potentially pose an unacceptable risk to exposed receptors.</p>		

TABLE 3-1

SWMU 1 Previous Investigations and Document Summaries*Second Five-Year Review Report**Atlantic Fleet Weapons Training Area - Vieques**Vieques, Puerto Rico*

Previous Investigation*	Date	Investigation Activities/Document Summaries
Environmental Impact Statement	1979	An Environmental Impact Statement was conducted from 1978 to 1979 to evaluate the environmental impacts of the continued use of the Naval facilities on Vieques (Tippetts et al., 1979). The EIS Report presents the history of military use and the types and quantities of munitions used on the VNTR. SWMU 1 is discussed briefly; the EIS notes <i>"The Navy has submitted an application for a permit and an operating plan for the sanitary landfill at Camp Garcia; however, a permit for this facility has not yet been issued by the PREQB."</i>
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 the environment. It was determined that SWMU 1 did not include hazardous materials and that the wastes did not present a threat to groundwater and wildlife at the site (Greenleaf/Telesca, 1984).
Phase II RCRA Facility Assessment	1988	A Phase II RCRA Facility Assessment was conducted in 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). Although historical information suggested hazardous materials were not disposed of at SWMU 1, the Phase II RFA Report recommended soil sampling at the site.
Revised RCRA Facility Assessment	1995	A Revised RFA, prepared by the Land Pollution Control Area Hazardous Waste Bureau of the PREQB (1995), identified SWMUs and AOCs that could have potential releases of hazardous wastes or hazardous constituents at the former VNTR. Like the previous report, the revised report recommended soil sampling at SWMU 1.
Current Conditions Evaluation	2001	The Current Conditions Report (CH2M, 2001) summarizes the Aerial Photographic Analysis study (ERI, 2000) and discusses the conditions at SWMU 1 and other sites, based on an archive records search and interviews with former employees. The aerial photographic analysis of the landfill indicated that the fill area extended over an area of approximately 55 acres. The analysis of aerial photographs from 1959, 1962, 1964, and 1970 identified several apparent trenches and landfill cells, as well as ground scarring and cleared vegetation. It is important to note that the size of the landfill and features identified by ERI on the aerial photographs are not necessarily accurate because a site visit was not performed to substantiate the features noted in the aerial photographs, and the photographic analysis was done many years after the aerial photographs were taken. However, the information garnered from the aerial photographs does provide a general indication of past practices associated with the landfill.
Environmental Baseline Survey	2003	An EBS was conducted in 2003 to disclose relevant information regarding the conditions of the former VNTR prior to property transfer (NAVFAC, 2003). SWMU 1 was identified as requiring further investigation.
Phase I RCRA Facility Investigation	2004	During the Phase I RFI, a geophysical survey was conducted to identify where waste material was likely buried within SWMU 1. In addition, 50 surface soil samples were collected throughout the landfill, focusing primarily on the areas where geophysical anomalies were identified, and analyzed for VOCs, SVOCs, pesticides, herbicides, PCBs, dioxins/ furans, inorganics, and explosives. Five monitoring wells were installed at SWMU 1 to characterize groundwater conditions immediately downgradient of the landfill. Delineation of the northern and southern landfill boundaries was not completed during the Phase I RFI. The analytical results of the Phase I RFI were documented in a PA/SI report (CH2M, 2008) because Vieques was placed on the NPL between the time the Phase I RFI

TABLE 3-1

SWMU 1 Previous Investigations and Document Summaries*Second Five-Year Review Report**Atlantic Fleet Weapons Training Area - Vieques**Vieques, Puerto Rico*

Previous Investigation*	Date	Investigation Activities/Document Summaries
		was completed and the report was finalized. Additional data was recommended within and beneath the landfill and to delineate the northern and southern boundaries of the landfill.
Background Investigation	2007	A background study was conducted in 2007 in the eastern portion of Vieques to develop a set of background values for inorganic constituents in soil to help distinguish inorganic concentrations that may be present as a result of a site-related release from those not attributable to a site-related release (CH2M, 2007). The background data were collected specifically from the eastern portion of Vieques to represent soil types similar to those where environmental sites are located in the former VNTR. The background inorganic constituent concentrations were used for comparison with the soil inorganic constituent concentrations collected during the environmental investigations at SWMU 1.
Site Inspection/ Expanded Site Inspection	2009	An SI/ESI was conducted from 2008 to 2009 to delineate the nature and extent of the landfill waste and if there had been contaminant release(s) at the site (CH2M, 2010). A geophysical survey and 49 exploratory excavations resulted in a conclusion that the landfill is approximately 41 acres in size with landfill debris extending to varying depths of up to 10 feet bgs. Soil samples were collected within the landfill soil cover, within the landfill debris, beneath the landfill debris to assess the potential for leaching to groundwater, and within potential migration pathways such as the ephemeral stream. Seven additional monitoring wells were installed within, upgradient, and downgradient of the landfill. Samples were analyzed for VOCs, SVOCs, pesticides, PCBs, explosives, and inorganics. A presumptive remedy was recommended for the site.
Streamlined Remedial Investigation/ Feasibility Study	2011	A Streamlined RI/FS was conducted to assess the nature and extent of contamination, assess potential risks to human health and the environment, and evaluate presumptive remedial alternatives** at SWMU 1. Data collected as part of the Phase I RFI and the SI/ESI sufficiently characterized the site and were therefore used in the Streamlined RI/FS. No other environmental sample media were collected during the RI. The conclusion of the RI was that the landfill debris is primarily municipal-type debris overlain by a 2-foot thick soil cover with a few localized areas that have landfill debris exposed at the ground surface, and that there were no unacceptable risks to human health or the environment posed by contaminant levels identified at the site. However, this conclusion relied upon maintaining the current land use and controlling access to subsurface landfill debris and associated contamination. The findings of the SWMU 1 RI/FS were presented by the Navy to the Vieques RAB in April 2011.
Proposed Remedial Action Plan	2011	The proposed remedial action was documented in the PRAP, which was offered for public comment between August 1 and September 15, 2011.
Record of Decision	2011	The selected remedial action for SWMU 1 was Enhanced Native Soil Cover and Institutional Controls. The components of the remedial action include inspecting the landfill cover conditions, adding soil cover in any areas of exposed debris, implementing physical barriers and institutional controls, long-term monitoring of groundwater, and operation and maintenance.
Remedial Action Implementation, Operations and Maintenance, Land Use	2012	The RAWP details how the RAOs will be inspected and measured in (a) the Soil Cover and Operations and Maintenance Plan, (b) Land Use Control Plan and (c) the Groundwater Long-Term Monitoring Plan; with specified documentation and reporting intervals for

TABLE 3-1

SWMU 1 Previous Investigations and Document Summaries*Second Five-Year Review Report**Atlantic Fleet Weapons Training Area - Vieques**Vieques, Puerto Rico*

Previous Investigation*	Date	Investigation Activities/Document Summaries
Control, and Long-Term, Monitoring Work Plan		Remedial Action Construction Completion Report, Annual O&M Inspection Logs and Status Report, and Five-Year Review Report.
Work Plan for Pre-Design Surface Debris Removal and Landfill Boundary Refinement	2013	This WP describes the pre-design activities to implement removal of the surface debris and provides specifications for field collection of geophysical data in order to refine the SWMU 1 landfill boundary and allow for an estimate of the quantity of soil required to ensure a minimum 2-foot (ft) thick vegetated soil cover across the entire landfill footprint. The purpose of the pre-design activities was to ensure the best implementation of the selected ROD remedy, Enhanced Native Soil Cover and Institutional Controls.
Technical Memorandum, "Summary of Findings: Surface Debris Clearance, Landfill Boundary Refinement, and Supplemental HHRA"	2015	During an initial attempt to implement the remedy in September 2012, more surface debris was encountered than was anticipated on the landfill surface (i.e., 0.5 acre) and MPPEH was encountered. Based on this, the Navy and regulatory agencies concurred on removing the vegetation across the landfill in order to ensure all debris at the landfill surface could be removed. A sitewide geophysical surveying was completed in April 2014 to refine the boundary of the landfill. The surface clearance was completed with approximately 10,960 pounds of RRD and 671 pounds of MD being removed. This additional work was completed in November 2015 and the geophysics confirmed the landfill to be approximately 51 acres in size. The human health risk assessment for soil beneath the landfill included in the RI/FS Report was also revised to include subsurface soil, which demonstrated human health risks from exposure to landfill soil are acceptable under current and anticipated future land use.
Record of Decision Explanation of Significant Differences	2016	As jointly determined by the Navy and regulatory agencies, removal of surface debris across the landfill was preferable to covering the debris. This action, and a revised risk assessment considering both surface and subsurface soil, demonstrated that there are no unacceptable risks remaining, thereby obviating the need for additional soil cover in order to meet the objectives set forth in the remedy selected for the 2011 ROD. None of the other aspects of the 2011 ROD (i.e., long-term groundwater monitoring, the institutional controls, and O&M requirements) are changed by this ESD.
Remedial Action Completion Report	2017	Documentation that the construction phase of the selected final remedy documented in the ROD (NAVFAC, 2011) and ESD (NAVFAC, 2016) is complete and the remedy is operating as planned to meet the RAOs (Achievement of the response complete and remedy in place milestones).
Annual Status Report, Groundwater Long-Term Monitoring and Land Use Control Monitoring and Maintenance	2016-2022 (2023 in progress)	Summarizes annual LUC inspection findings and groundwater sampling activities. Documents include presentation of inspection and ground water sample analytical results, provides recommendations for corrective actions where appropriate and conclusions about potential releases from the landfill based on concentration trends for constituents of concern.

TABLE 3-1

SWMU 1 Previous Investigations and Document Summaries*Second Five-Year Review Report**Atlantic Fleet Weapons Training Area - Vieques**Vieques, Puerto Rico*

Previous Investigation*	Date	Investigation Activities/Document Summaries
After Action Report	2022	This construction completion report for the actions authorized to be taken as a remedy at SWMU 1, including (1) manual vegetation removal, (2) detector-aided visual surface removal of munitions and explosives of concern (MEC)/material potentially presenting an explosive hazard (MPPEH), (3) management and disposal of MEC/MPPEH, and (4) digital geophysical mapping to confirm and refine the landfill boundary. The report documents the total poundage of general trash and construction debris items removed from the surface, the installation of the 3-strand barbed wire fence, four corner monuments and the 14 signs in (English and Spanish) pairs placarded along the fence boundary. Confirmation that historic debris-filled trenches do not extend beyond the landfill boundary is presented. Further, the results of the initial/baseline inspection revealed no surface debris present and no evidence of site erosion. Departures from the original ROD (2011) in the Record of Decision Explanation of Significant Differences (2016).
<p>* Documentation associated with the listed activities is available in the Administrative Record and provides detailed information used to support the remedy selection for SWMU 1.</p> <p>** Presumptive remedy guidance can be found at http://www.epa.gov/superfund/policy/remedy/presump/clms.htm and http://www.epa.gov/fedfac/pdf/1296mem.pdf.</p> <p>AOC = Area of Concern Bgs = below ground surface EBS = Environmental Baseline Survey ESD = Explanation of Significant Difference(s) IAS = Initial Assessment Study MD = munitions debris MPPEH = material potentially presenting an explosive hazard NPL = National Priorities List O&M = operations and maintenance PA/SI = Preliminary Assessment/Site Inspection PCB = polychlorinated biphenyls PRAP = Proposed Remedial Action Plan RAB = Restoration Advisory Board RAO = remedial action objective RCRA = Resource Conservation and Recovery Act RFA = RCRA Facility Assessment RFI = RCRA Facility Investigation RI/FS = Remedial Investigation/Feasibility Study ROD = Record of Decision RRD = range related debris SI/ESI = Site Inspection/Expanded Site Inspection SVOC = semi-volatile organic compound SWMU = Solid Waste Management Unit VNTR = Vieques Naval Training Range VOC = volatile organic compound</p>		

TABLE 3-2
SWMU 1 Groundwater Detections and Exceedances
Second Five-Year Review Report
Atlantic Fleet Weapons Training Area - Vieques
Vieques, Puerto Rico

Station ID	Background Well							Background Values	EPA MCLs	PR Water Quality Class SG	CGW1MW02									
Sample ID Sample Date	VEW01-MW13-0116 01/07/16	VEW01-MW13-0117 01/17/17	VEW01-MW13-0118 01/11/18	VEW01-MW13-0119 01/09/19	VEW01-MW13-0120 01/09/20	VEW01-MW13-0121 01/25/21	VEW01-MW13-0122 01/17/22				CGW1GW02-R01 02/05/04	VEW01-MW02-0509 05/04/09	VEW01-MW02-0116 01/11/16	VEW01-MW02-0117 01/17/17	VEW01-MW02-0118 01/10/18	VEW01-MW02-0119 01/08/19	VEW01-MW02-0120 01/15/20	VEW01-MW02-0121 01/28/21	VEW01-MW02-0122 01/19/22	
Chemical Name																				
Volatile Organic Compounds (UG/L)																				
Benzene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	5	5	1 U	0.05 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U			
Trichloroethene	0.12 J	0.12 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.12 J	5	5	1 U	1 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U			
Vinyl chloride	0.02 U	0.02 U	0.014 J	0.02 U	0.02 U	0.02 U	0.02 U	0.014 J	2	0.22	1 U	0.15 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U			
Semivolatile Organic Compounds (UG/L)																				
2,4,6-Trichlorophenol	0.11 U	0.12 U	0.12 U	0.12 U	0.11 U	0.11 U	0.11 U	0.11U	-	15	10.1 U	9 U	0.11 U	0.12 J	0.11 U	0.1 U	0.11 U			
Benzo(a)anthracene	0.0094 U	0.01 U	0.011 U	0.012 UJ	0.0098 U	0.011 U	0.011 U	0.0094 U	-	0.012	10.1 U	0.19 UJ	0.0099 U	0.01 U	0.0099 U	0.012 U	0.011 U			
Benzo(a)pyrene	0.0094 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.011 U	0.011 U	0.0094 U	0.2	0.0012	10.1 U	0.19 UJ	0.0099 U	0.01 U	0.0099 U	0.012 U	0.011 U			
Benzo(b)fluoranthene	0.0094 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.011 U	0.011 U	0.0094 U	-	0.012	10.1 U	0.25 UJ	0.0099 U	0.01 U	0.0099 U	0.012 U	0.011 U			
Benzo(k)fluoranthene	0.0094 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.011 U	0.011 U	0.0094 U	-	0.12	10.1 U	0.19 UJ	0.0099 U	0.01 U	0.0099 U	0.012 U	0.011 U			
bis(2-Ethylhexyl)phthalate	1.3 U	1.4 U	1.6 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	6.0	0.3	10.1 U	1.9 UJ	0.88 J	1.3 U	1.5 U	1.2 U	1.3 U			
Chrysene	0.0094 U	0.01 U	0.011 U	0.012 UJ	0.0098 U	0.011 U	0.011 U	0.0094 U	-	1.2	10.1 U	0.19 UJ	0.0099 U	0.01 U	0.0099 U	0.012 U	0.011 U			
Dibenz(a,h)anthracene	0.0094 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.011 U	0.011 U	0.0094 U	-	0.0012	10.1 U	0.2 UJ	0.0099 U	0.01 U	0.0099 U	0.012 U	0.011 U			
Di-n-butylphthalate	5.4 U	6 U	6 U	6 U	5.5 U	5.6 U	5.3 U	5.3 U	-	20	10.1 U	2.4 UJ	5.3 U	5.6 U	5.6 U	5.1 U	5.6 U			
Fluoranthene	5.4 U	6 U	6 U	6 U	5.5 U	5.6 U	5.3 U	5.3 U	-	20	10.1 U	0.21 UJ	5.3 U	5.6 U	5.6 U	5.1 U	5.6 U			
Indeno(1,2,3-cd)pyrene	0.0094 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.011 U	0.011 U	0.0094 U	-	0.012	10.1 U	0.19 UJ	0.0099 U	0.01 U	0.0099 U	0.012 U	0.011 U			
Pesticide/Polychlorinated Biphenyls (UG/L)																				
4,4'-DDD	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0012	0.1 U	0.094 U	0.01 U	0.011 U	0.011 U	0.011 U	0.0099 U			
4,4'-DDE	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.00018	0.1 U	0.094 U	0.01 U	0.011 U	0.011 U	0.011 U	0.0099 U			
4,4'-DDT	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0003	0.1 U	0.094 U	0.01 U	0.011 U	0.011 U	0.011 U	0.0099 U			
Aldrin	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0000077	0.05 U	0.1 U	0.01 U	0.011 U	0.011 U	0.011 U	0.0099 U			
alpha-BHC	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0036	0.05 U	0.066 U	0.01 U	0.011 U	0.011 U	0.011 U	0.0099 U			
alpha-Chlordane	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0031	0.05 UJ	0.085 U	0.01 U	0.011 U	0.011 U	0.011 U	0.0099 U			
beta-BHC	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.08	0.05 U	0.075 U	0.01 U	0.011 U	0.011 U	0.011 U	0.0099 U			
Dieldrin	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.000012	0.1 U	0.094 U	0.01 U	0.011 U	0.011 U	0.011 U	0.0099 U			
Endosulfan I	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	62	0.05 UJ	0.066 U	0.01 U	0.011 U	0.011 U	0.011 U	0.0099 U			
Endosulfan II	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	62	0.1 U	0.094 U	0.01 U	0.011 U	0.011 U	0.011 U	0.0099 U			
Endosulfan sulfate	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	20	0.1 U	0.094 U	0.01 U	0.011 U	0.011 U	0.011 U	0.0099 U			
Endrin	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	2	0.03	0.1 U	0.094 U	0.01 U	0.011 U	0.011 U	0.011 U	0.0099 U			
Endrin aldehyde	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	2	1	0.1 U	0.22 U	0.01 U	0.011 U	0.011 U	0.011 U	0.0099 U			
Endrin ketone	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	2	-	0.1 U	0.094 UJ	0.01 U	0.011 U	0.011 U	0.011 U	0.0099 U			
gamma-BHC (Lindane)	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.2	0.2	0.05 U	0.066 U	0.01 U	0.011 U	0.011 U	0.011 U	0.0099 U			
gamma-Chlordane	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0031	0.05 U	0.075 U	0.01 U	0.011 U	0.011 U	0.011 U	0.0099 U			
Heptachlor	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.4	0.000059	0.05 U	0.094 U	0.01 U	0.011 U	0.011 U	0.011 U	0.0099 U			
Heptachlor epoxide	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.2	0.00032	0.05 U	0.085 U	0.01 U	0.011 U	0.011 U	0.011 U	0.0099 U			
Methoxychlor	0.1 UJ	0.11 U	0.11 U	0.1 U	0.1 U	0.1 U	0.11 U	0.1 U	40	0.02	0.5 UJ	0.47 U	0.1 UJ	0.1 U	0.11 U	0.11 U	0.099 U			
Toxaphene	0.52 U	0.57 U	0.53 U	0.51 U	0.5 U	0.52 U	0.57 U	0.5 U	3	0.007	5 R	0.94 U	0.51 U	0.52 U	0.53 U	0.55 U	0.5 U			
Total Metals (UG/L)																				
Antimony	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	6	5.6	2.5 U	1 U	0.338 J	0.5 U	0.5 U	0.5 U	0.5 U			
Arsenic	0.292 J	0.302 J	0.22 J	0.26 J	0.2 U	0.145 J	0.2 U	0.302 J	10	10	2.04 U	5 U	0.425 J	0.483 J	0.366 J	0.167 J	0.203 J			
Barium	18.9	18.2	18.5	19.8	17.7	17.5	18.2	19.8	2000	-	47.8 J	34.4	28.4	28.2	25.7	24.1	21.4			
Beryllium	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1 U	0.1 U	1 U	4	-	0.0973 J	1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U			
Cadmium	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	5	5	0.492 J	1 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U			
Chromium	1.69	1.21 U	0.134 J	0.2 U	0.2 U	0.2 U	0.2 U	1.69	100	100	20.2	3 U	5.46	0.791 U	0.656 J	0.301 U	0.212 U			
Copper	0.984 U	0.624 U	0.361 J	0.495 J	0.5 U	0.5 U	0.438 U	0.495 J	1300	1300	3.83 J	1 U	1.17 U	3.72 U	0.624 J	0.5 U	0.5 U			
Lead	0.1 U	0.1 U	0.0618 J	0.1 U	0.1 U	0.1 U	0.0908 J	0.0908 J	15	15	1.76 U	1 UJ	0.202 U	0.123 U	0.1 U	0.053 J	0.1 U			
Mercury	0.062 J	0.11 U	0.55 U	0.11 U	0.108 J	1.1 U	0.55 U	0.108 J	2	0.05	1.29	1.9	0.269 J	0.201 J	0.35 J	0.242 J	0.11 U			
Nickel	1.06	0.877 J	0.2 U	0.276 U	0.2 U	0.2 U	0.2 U	1.06	-	610	15.5 J	4.9	3.72	1.06	0.751 J	0.385 U	0.386 U			
Selenium	4.53	4.35	3.42	3.44	3.13	3.37	3.58	4.53	50	50	4.74 J	5 U	1.49	1.33	1.05	1.04	1.15			
Thallium	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	2	0.24	5.08 J	1 UJ	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U			
Inorganic Parameter (UG/L)																				
Cyanide	5 U	13.2	5 U	5 U	5 U	5 U	5 U	13.2	200	4	3.73 U	12 U	5 U	40.2	5 U	5 U	5 U			

TABLE 3-2
SWMU 1 Groundwater Detections and Exceedances
Second Five-Year Review Report
Atlantic Fleet Weapons Training Area - Vieques
Vieques, Puerto Rico

Station ID	Background Well							Background Values	EPA MCLs	PR Water Quality Class SG	CGW1MW03								
Sample ID	VEW01-MW13-0116	VEW01-MW13-0117	VEW01-MW13-0118	VEW01-MW13-0119	VEW01-MW13-0120	VEW01-MW13-0121	VEW01-MW13-0122				CGW1GW03-R01	VEW01-MW03-0409	VEW01-MW03-0116	VEW01-MW03P-0116	VEW01-MW03-0117	VEW01-MW03P-0117	VEW01-MW03-0118	VEW01-MW03P-0118	VEW01-MW03-0119
Sample Date	01/07/16	01/17/17	01/11/18	01/09/19	01/09/20	01/25/21	01/17/22				02/06/04	04/30/09	01/08/16	01/08/16	01/18/17	01/18/17	01/12/18	01/12/18	01/07/19
Chemical Name																			
Volatile Organic Compounds (UG/L)																			
Benzene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	5	5	1 U	0.05 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Trichloroethene	0.12 J	0.12 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.12 J	5	5	1 U	1 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Vinyl chloride	0.02 U	0.02 U	0.014 J	0.02 U	0.02 U	0.02 U	0.02 U	0.014 J	2	0.22	1 U	0.15 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Semivolatile Organic Compounds (UG/L)																			
2,4,6-Trichlorophenol	0.11 U	0.12 U	0.12 U	0.12 U	0.11 U	0.11 U	0.11 U	0.11U	-	15	10.1 U	10 U	0.11 U	0.1 U	0.11 U	0.1 U	0.11 U	0.11 U	0.1 U
Benzo(a)anthracene	0.0094 U	0.01 U	0.011 U	0.012 UJ	0.0098 U	0.011 U	0.011 U	0.0094 U	-	0.012	10.1 U	0.2 UJ	0.011 U	0.01 U	0.0098 U	0.0095 U	0.01 U	0.011 U	0.011 U
Benzo(a)pyrene	0.0094 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.011 U	0.011 U	0.0094 U	0.2	0.0012	10.1 U	0.2 UJ	0.011 U	0.01 U	0.0098 U	0.0095 U	0.01 U	0.011 U	0.011 U
Benzo(b)fluoranthene	0.0094 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.011 U	0.011 U	0.0094 U	-	0.012	10.1 U	0.26 UJ	0.011 U	0.01 U	0.0098 U	0.0095 U	0.01 U	0.011 U	0.011 U
Benzo(k)fluoranthene	0.0094 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.011 U	0.011 U	0.0094 U	-	0.12	10.1 U	0.2 UJ	0.011 U	0.01 U	0.0098 U	0.0095 U	0.01 U	0.011 U	0.011 U
bis(2-Ethylhexyl)phthalate	1.3 U	1.4 U	1.6 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	6.0	0.3	10.1 U	2 U	1.3 U	1.3 U	1.3 UJ	1.2 UJ	1.7 U	1.3 U	1.2 U
Chrysene	0.0094 U	0.01 U	0.011 U	0.012 UJ	0.0098 U	0.011 U	0.011 U	0.0094 U	-	1.2	10.1 U	0.2 UJ	0.011 U	0.01 U	0.0098 U	0.0095 U	0.01 U	0.011 U	0.011 U
Dibenz(a,h)anthracene	0.0094 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.011 U	0.011 U	0.0094 U	-	0.0012	10.1 U	0.2 UJ	0.011 U	0.01 U	0.0098 U	0.0095 U	0.01 U	0.011 U	0.011 U
Di-n-butylphthalate	5.4 U	6 U	6 U	6 U	5.5 U	5.6 U	5.3 U	5.3 U	-	20	10.1 U	2.4 UJ	5.6 U	5.2 U	5.3 U	5.1 U	5.5 U	5.4 U	5 U
Fluoranthene	5.4 U	6 U	6 U	6 U	5.5 U	5.6 U	5.3 U	5.3 U	-	20	10.1 U	0.22 UJ	5.6 U	5.2 U	5.3 U	5.1 U	5.5 U	5.4 U	5 U
Indeno(1,2,3-cd)pyrene	0.0094 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.011 U	0.011 U	0.0094 U	-	0.012	10.1 U	0.2 UJ	0.011 U	0.01 U	0.0098 U	0.0095 U	0.01 U	0.011 U	0.011 U
Pesticide/Polychlorinated Biphenyls (UG/L)																			
4,4'-DDD	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0012	0.12 U	0.095 U	0.0098 U	0.01 U	0.0097 U	0.0094 U	0.011 U	0.011 U	0.0096 U
4,4'-DDE	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.00018	0.12 U	0.095 U	0.0098 U	0.01 U	0.0097 U	0.0094 U	0.011 U	0.011 U	0.0096 U
4,4'-DDT	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0003	0.12 U	0.095 U	0.0098 U	0.01 U	0.0097 U	0.0094 U	0.011 U	0.011 U	0.0096 U
Aldrin	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0000077	0.06 U	0.1 U	0.0098 U	0.01 U	0.0097 U	0.0094 U	0.011 U	0.011 U	0.0096 U
alpha-BHC	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0036	0.06 U	0.067 U	0.0098 U	0.01 U	0.0097 U	0.0094 U	0.011 U	0.011 U	0.0096 U
alpha-Chlordane	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0031	0.06 U	0.086 U	0.0098 U	0.01 U	0.0097 U	0.0094 U	0.011 U	0.011 U	0.0096 U
beta-BHC	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.08	0.06 U	0.076 U	0.0098 U	0.01 U	0.0097 U	0.0094 U	0.011 U	0.011 U	0.0096 U
Dieldrin	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.000012	0.12 U	0.095 U	0.0098 U	0.01 U	0.0097 U	0.0094 U	0.011 U	0.011 U	0.0096 U
Endosulfan I	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	62	0.06 U	0.067 U	0.0098 U	0.01 U	0.0097 U	0.0094 U	0.011 U	0.011 U	0.0096 U
Endosulfan II	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	62	0.12 U	0.095 U	0.0098 U	0.01 U	0.0097 U	0.0094 U	0.011 U	0.011 U	0.0096 U
Endosulfan sulfate	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	20	0.12 U	0.095 U	0.0098 U	0.01 U	0.0097 U	0.0094 U	0.011 U	0.011 U	0.0096 U
Endrin	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	2	0.03	0.12 U	0.095 U	0.0098 U	0.01 U	0.0097 U	0.0094 U	0.011 U	0.011 U	0.0096 U
Endrin aldehyde	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	2	1	0.12 U	0.22 U	0.0098 U	0.01 U	0.0097 U	0.0094 U	0.011 U	0.011 U	0.0096 U
Endrin ketone	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	2	-	0.12 U	0.095 UJ	0.0098 U	0.01 U	0.0097 U	0.0094 U	0.011 U	0.011 U	0.0096 U
gamma-BHC (Lindane)	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.2	0.2	0.06 U	0.067 U	0.0098 U	0.01 U	0.0097 U	0.0094 U	0.011 U	0.011 U	0.0096 U
gamma-Chlordane	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0031	0.06 UJ	0.076 U	0.0098 U	0.01 U	0.0097 U	0.0094 U	0.011 U	0.011 U	0.0096 U
Heptachlor	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.4	0.000059	0.06 U	0.095 U	0.0098 U	0.01 U	0.0097 U	0.0094 U	0.011 U	0.011 U	0.0096 U
Heptachlor epoxide	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.2	0.00032	0.06 U	0.086 U	0.0098 U	0.01 U	0.0097 U	0.0094 U	0.011 U	0.011 U	0.0096 U
Methoxychlor	0.1 UJ	0.11 U	0.11 U	0.1 U	0.1 U	0.1 U	0.11 U	0.1 U	40	0.02	0.6 U	0.48 U	0.098 UJ	0.1 UJ	0.097 U	0.094 U	0.11 U	0.11 U	0.096 U
Toxaphene	0.52 U	0.57 U	0.53 U	0.51 U	0.5 U	0.52 U	0.57 U	0.5 U	3	0.007	6 U	0.95 U	0.49 U	0.52 U	0.49 U	0.47 U	0.55 U	0.55 U	0.48 U
Total Metals (UG/L)																			
Antimony	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	6	5.6	3.25 J	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Arsenic	0.292 J	0.302 J	0.22 J	0.26 J	0.2 U	0.145 J	0.2 U	0.302 J	10	10	2.04 U	5 U	1.29	0.843 J	0.472 J	0.501 J	0.233 J	0.282 J	0.363 J
Barium	18.9	18.2	18.5	19.8	17.7	17.5	18.2	19.8	2000	-	238	111	486	522	91.1	89.7	56.1	56.5	69.4
Beryllium	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1 U	0.1 U	1 U	4	-	0.0945 U	1 U	0.834 J	0.196 J	0.1 U	0.0508 J	0.1 U	0.1 U	0.1 U
Cadmium	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	5	5	0.356 U	1 U	0.351 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Chromium	1.69	1.21 U	0.134 J	0.2 U	0.2 U	0.2 U	0.2 U	1.69	100	100	0.774 J	3 U	54.9 J	137 J	3.36 U	3.15 U	0.239 U	0.271 U	0.361 U
Copper	0.984 U	0.624 U	0.361 J	0.495 J	0.5 U	0.5 U	0.438 U	0.495 J	1300	1300	1.74 J	1.2	48.7 J	21 J	4.29 U	3.87 U	0.5 U	0.5 U	0.5 U
Lead	0.1 U	0.1 U	0.0618 J	0.1 U	0.1 U	0.1 U	0.0908 J	0.0908 J	15	15	1.76 U	1 UJ	6.61	1.81	0.315 J	0.275 J	0.1 U	0.1 U	0.1 U
Mercury	0.062 J	0.11 U	0.55 U	0.11 U	0.108 J	1.1 U	0.55 U	0.108 J	2	0.05	0.0507 J	0.2 U	0.182 J	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U
Nickel	1.06	0.877 J	0.2 U	0.276 U	0.2 U	0.2 U	0.2 U	1.06	-	610	4.71 J	4.8	34.3 J	87.4 J	1.81 U	1.69 U	0.2 U	0.2 U	0.477 U
Selenium	4.53	4.35	3.42	3.44	3.13	3.37	3.58	4.53	50	50	2.1 U	5 U	0.956 J	0.924 J	1.06	1.01	1.08	1.11	1.13
Thallium	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	2	0.24	2.99 J	1 UJ	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Inorganic Parameter (UG/L)																			
Cyanide	5 U	13.2	5 U	5 U	5 U	5 U	5 U	13.2	200	4	NA	12 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U

TABLE 3-2
SWMU 1 Groundwater Detections and Exceedances
Second Five-Year Review Report
Atlantic Fleet Weapons Training Area - Vieques
Vieques, Puerto Rico

Station ID	Background Well							Background Values	EPA MCLs	PR Water Quality Class SG	CGW1MW03							CGW1MW08	
Sample ID	VEW01-MW13-0116	VEW01-MW13-0117	VEW01-MW13-0118	VEW01-MW13-0119	VEW01-MW13-0120	VEW01-MW13-0121	VEW01-MW13-0122				VEW01-MW03P-0118	VEW01-MW03-0120	VEW01-MW03P-0120	VEW01-MW03-0121	VEW01-MW03P-0121	VEW01-MW03-0122	VEW01-MW03P-0122	VEW01-MW08-0509	VEW01-MW08-0116
Sample Date	01/07/16	01/17/17	01/11/18	01/09/19	01/09/20	01/25/21	01/17/22				01/07/19	01/14/20	01/14/20	01/27/21	01/27/21	01/18/22	01/18/22	05/22/09	01/12/16
Chemical Name																			
Volatile Organic Compounds (UG/L)																			
Benzene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	5	5	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.05 U	0.2 U
Trichloroethene	0.12 J	0.12 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.12 J	5	5	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	1 U	0.2 U
Vinyl chloride	0.02 U	0.02 U	0.014 J	0.02 U	0.02 U	0.02 U	0.02 U	0.014 J	2	0.22	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.15 U	0.02 U
Semivolatile Organic Compounds (UG/L)																			
2,4,6-Trichlorophenol	0.11 U	0.12 U	0.12 U	0.12 U	0.11 U	0.11 U	0.11 U	0.11U	-	15	0.11 U	0.097 U	0.11 U	0.11 U	0.11 U	0.1 U	0.12 U	9 U	0.11 U
Benzo(a)anthracene	0.0094 U	0.01 U	0.011 U	0.012 UJ	0.0098 U	0.011 U	0.011 U	0.0094 U	-	0.012	0.0099 U	0.0096 U	0.011 U	0.012 U	0.012 U	0.011 U	0.012 U	0.19 UJ	0.01 U
Benzo(a)pyrene	0.0094 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.011 U	0.011 U	0.0094 U	0.2	0.0012	0.0099 U	0.0096 U	0.011 U	0.012 U	0.012 U	0.011 U	0.012 U	0.19 UJ	0.01 U
Benzo(b)fluoranthene	0.0094 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.011 U	0.011 U	0.0094 U	-	0.012	0.0099 U	0.0096 U	0.011 U	0.012 U	0.012 U	0.011 U	0.012 U	0.25 UJ	0.01 U
Benzo(k)fluoranthene	0.0094 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.011 U	0.011 U	0.0094 U	-	0.12	0.0099 U	0.0096 U	0.011 U	0.012 U	0.012 U	0.011 U	0.012 U	0.19 UJ	0.01 U
bis(2-Ethylhexyl)phthalate	1.3 U	1.4 U	1.6 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	6.0	0.3	1.3 U	1.2 U	1.3 U	1.3 U	1.3 U	1.2 U	1.4 U	1.9 UJ	1.3 U
Chrysene	0.0094 U	0.01 U	0.011 U	0.012 UJ	0.0098 U	0.011 U	0.011 U	0.0094 U	-	1.2	0.0099 U	0.0096 U	0.011 U	0.012 U	0.012 U	0.011 U	0.012 U	0.19 UJ	0.01 U
Dibenz(a,h)anthracene	0.0094 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.011 U	0.011 U	0.0094 U	-	0.0012	0.0099 U	0.0096 U	0.011 U	0.012 U	0.012 U	0.011 U	0.012 U	0.2 UJ	0.01 U
Di-n-butylphthalate	5.4 U	6 U	6 U	6 U	5.5 U	5.6 U	5.3 U	5.3 U	-	20	5.4 U	4.9 U	5.6 U	5.6 U	5.4 U	5.2 U	5.8 U	2.4 UJ	5.4 U
Fluoranthene	5.4 U	6 U	6 U	6 U	5.5 U	5.6 U	5.3 U	5.3 U	-	20	5.4 U	4.9 U	5.6 U	5.6 U	5.4 U	5.2 U	5.8 U	0.21 UJ	5.4 U
Indeno(1,2,3-cd)pyrene	0.0094 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.011 U	0.011 U	0.0094 U	-	0.012	0.0099 U	0.0096 U	0.011 U	0.012 U	0.012 U	0.011 U	0.012 U	0.19 UJ	0.01 U
Pesticide/Polychlorinated Biphenyls (UG/L)																			
4,4'-DDD	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0012	0.01 U	0.0097 U	0.0097 U	0.011 U	0.012 U	0.011 U	0.01 U	0.094 U	0.0095 U
4,4'-DDE	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.00018	0.01 U	0.0097 U	0.0097 U	0.011 U	0.012 U	0.011 U	0.01 U	0.094 U	0.0095 U
4,4'-DDT	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0003	0.01 U	0.0097 U	0.0097 U	0.011 U	0.012 U	0.011 U	0.01 U	0.094 U	0.0095 U
Aldrin	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0000077	0.01 U	0.0097 U	0.0097 U	0.011 U	0.012 U	0.011 U	0.01 U	0.1 U	0.0095 U
alpha-BHC	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0036	0.01 U	0.0097 U	0.0097 U	0.011 U	0.012 U	0.011 U	0.01 U	0.066 U	0.0095 U
alpha-Chlordane	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0031	0.01 U	0.0097 U	0.0097 U	0.011 U	0.012 U	0.011 U	0.01 U	0.085 U	0.0095 U
beta-BHC	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.08	0.01 U	0.0097 U	0.0097 U	0.011 U	0.012 U	0.011 U	0.01 U	0.075 U	0.0095 U
Dieldrin	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.000012	0.01 U	0.0097 U	0.0097 U	0.011 U	0.012 U	0.011 U	0.01 U	0.094 U	0.0095 U
Endosulfan I	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	62	0.01 U	0.0097 U	0.0097 U	0.011 U	0.012 U	0.011 U	0.01 U	0.066 U	0.014 J
Endosulfan II	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	62	0.01 U	0.0097 U	0.0097 U	0.011 U	0.012 U	0.011 U	0.01 U	0.094 U	0.0095 U
Endosulfan sulfate	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	20	0.01 U	0.0097 U	0.0097 U	0.011 U	0.012 U	0.011 U	0.01 U	0.094 U	0.0095 U
Endrin	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	2	0.03	0.01 U	0.0097 U	0.0097 U	0.011 U	0.012 U	0.011 U	0.01 U	0.094 U	0.0095 U
Endrin aldehyde	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	2	1	0.01 U	0.0097 U	0.0097 U	0.011 U	0.012 U	0.011 U	0.01 U	0.22 U	0.0095 U
Endrin ketone	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	2	-	0.01 U	0.0097 U	0.0097 U	0.011 U	0.012 U	0.011 U	0.01 U	0.094 U	0.0095 U
gamma-BHC (Lindane)	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.2	0.2	0.01 U	0.0097 U	0.0097 U	0.011 U	0.012 U	0.011 U	0.01 U	0.066 U	0.0095 U
gamma-Chlordane	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0031	0.01 U	0.0097 U	0.0097 U	0.011 U	0.012 U	0.011 U	0.01 U	0.075 U	0.0095 U
Heptachlor	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.4	0.000059	0.01 U	0.0097 U	0.0097 U	0.011 U	0.012 U	0.011 U	0.01 U	0.094 U	0.0095 U
Heptachlor epoxide	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.2	0.00032	0.01 U	0.0097 U	0.0097 U	0.011 U	0.012 U	0.011 U	0.01 U	0.085 U	0.0095 U
Methoxychlor	0.1 UJ	0.11 U	0.11 U	0.1 U	0.1 U	0.1 U	0.11 U	0.1 U	40	0.02	0.1 U	0.097 U	0.097 U	0.11 U	0.12 U	0.11 U	0.1 U	0.47 U	0.095 UJ
Toxaphene	0.52 U	0.57 U	0.53 U	0.51 U	0.5 U	0.52 U	0.57 U	0.5 U	3	0.007	0.51 U	0.49 U	0.49 U	0.53 U	0.58 U	0.55 U	0.51 U	0.94 U	0.48 U
Total Metals (UG/L)																			
Antimony	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	6	5.6	2.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	2.5 U	1 U	0.5 U
Arsenic	0.292 J	0.302 J	0.22 J	0.26 J	0.2 U	0.145 J	0.2 U	0.302 J	10	10	1 U	0.174 J	0.149 J	0.167 J	0.131 J	1 U	1 U	5 U	0.323 J
Barium	18.9	18.2	18.5	19.8	17.7	17.5	18.2	19.8	2000	-	67.2	66.7	64.6	65.6	67.3	65.1	65.2	46.2	36.5
Beryllium	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1 U	0.1 U	1 U	4	-	0.5 U	0.1 U	0.1 U	1 U	1 U	0.5 U	0.5 U	1 U	0.1 U
Cadmium	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	5	5	1 U	0.2 U	0.2 U	0.2 U	0.2 U	1 U	1 U	1 U	0.2 U
Chromium	1.69	1.21 U	0.134 J	0.2 U	0.2 U	0.2 U	0.2 U	1.69	100	100	1 U	0.2 U	0.2 U	0.2 U	0.2 U	1 U	1 U	3 U	0.399 U
Copper	0.984 U	0.624 U	0.361 J	0.495 J	0.5 U	0.5 U	0.438 U	0.495 J	1300	1300	2.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	2.5 U	7.7	0.5 U
Lead	0.1 U	0.1 U	0.0618 J	0.1 U	0.1 U	0.1 U	0.0908 J	0.0908 J	15	15	0.5 U	0.1 U	0.1 U	0.1 U	0.1 U	0.5 U	0.5 U	1 U	0.1 U
Mercury	0.062 J	0.11 U	0.55 U	0.11 U	0.108 J	1.1 U	0.55 U	0.108 J	2	0.05	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.2 U	0.201 J
Nickel	1.06	0.877 J	0.2 U	0.276 U	0.2 U	0.2 U	0.2 U	1.06	-	610	1 U	0.2 U	0.2 U	0.2 U	0.2 U	1 U	1 U	2.2	0.522 J
Selenium	4.53	4.35	3.42	3.44	3.13	3.37	3.58	4.53	50	50	1.22 J	1.04	1	1.13	1.08	1.45 J	1.04 J	2 J	2.49
Thallium	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	2	0.24	1 U	0.2 U	0.2 U	0.2 U	0.2 U	1 U	1 U	1 U	0.2 U
Inorganic Parameter (UG/L)																			
Cyanide	5 U	13.2	5 U	5 U	5 U	5 U	5 U	13.2	200	4	5 U	5 U	5 U	5 U	5 U	5 U	5 U	12 U	5 U

TABLE 3-2
SWMU 1 Groundwater Detections and Exceedances
Second Five-Year Review Report
Atlantic Fleet Weapons Training Area - Vieques
Vieques, Puerto Rico

Station ID	Background Well							Background Values	EPA MCLs	PR Water Quality Class SG	CGW1MW08						CGW1MW10		
Sample ID	VEW01-MW13-0116	VEW01-MW13-0117	VEW01-MW13-0118	VEW01-MW13-0119	VEW01-MW13-0120	VEW01-MW13-0121	VEW01-MW13-0122				VEW01-MW08-0117	VEW01-MW08-0118	VEW01-MW08-0119	VEW01-MW08-0120	VEW01-MW08-0121	VEW01-MW08-0122	VEW01-MW10-0509	VEW01-MW10-0116	VEW01-MW10-0117
Sample Date	01/07/16	01/17/17	01/11/18	01/09/19	01/09/20	01/25/21	01/17/22				01/17/17	01/10/18	01/08/19	01/15/20	01/27/21	01/21/22	05/18/09	01/11/16	01/18/17
Chemical Name																			
Volatile Organic Compounds (UG/L)																			
Benzene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	5	5	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.05 UJ	0.2 U	0.2 U
Trichloroethene	0.12 J	0.12 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.12 J	5	5	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	1 U	0.2 U	0.2 U
Vinyl chloride	0.02 U	0.02 U	0.014 J	0.02 U	0.02 U	0.02 U	0.02 U	0.014 J	2	0.22	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.15 UJ	0.02 U	0.02 U
Semivolatile Organic Compounds (UG/L)																			
2,4,6-Trichlorophenol	0.11 U	0.12 U	0.12 U	0.12 U	0.11 U	0.11 U	0.11 U	0.11U	-	15	0.1 J	0.12 U	0.11 U	0.12 U	0.11 U	0.12 U	9 U	0.11 U	0.11 U
Benzo(a)anthracene	0.0094 U	0.01 U	0.011 U	0.012 UJ	0.0098 U	0.011 U	0.011 U	0.0094 U	-	0.012	0.011 U	0.01 U	0.01 U	0.0097 U	0.011 U	0.0097 U	0.19 UJ	0.01 U	0.01 U
Benzo(a)pyrene	0.0094 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.011 U	0.011 U	0.0094 U	0.2	0.0012	0.011 U	0.01 U	0.01 U	0.0097 U	0.011 U	0.0097 U	0.19 UJ	0.01 U	0.01 U
Benzo(b)fluoranthene	0.0094 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.011 U	0.011 U	0.0094 U	-	0.012	0.011 U	0.01 U	0.01 U	0.0097 U	0.011 U	0.0097 U	0.25 UJ	0.01 U	0.01 U
Benzo(k)fluoranthene	0.0094 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.011 U	0.011 U	0.0094 U	-	0.12	0.011 U	0.01 U	0.01 U	0.0097 U	0.011 U	0.0097 U	0.19 UJ	0.01 U	0.01 U
bis(2-Ethylhexyl)phthalate	1.3 U	1.4 U	1.6 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	6.0	0.3	1.3 U	1.4 U	1.3 U	1.47 J	1.3 U	1.4 U	1.9 UJ	1.3 U	1.4 UJ
Chrysene	0.0094 U	0.01 U	0.011 U	0.012 UJ	0.0098 U	0.011 U	0.011 U	0.0094 U	-	1.2	0.011 U	0.01 U	0.01 U	0.0097 U	0.011 U	0.0097 UJ	0.19 UJ	0.01 U	0.01 U
Dibenz(a,h)anthracene	0.0094 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.011 U	0.011 U	0.0094 U	-	0.0012	0.011 U	0.01 U	0.01 U	0.0097 U	0.011 U	0.0097 U	0.2 UJ	0.01 U	0.01 U
Di-n-butylphthalate	5.4 U	6 U	6 U	6 U	5.5 U	5.6 U	5.3 U	5.3 U	-	20	5.5 U	5.8 U	5.6 U	5.7 U	5.4 U	5.8 U	2.4 UJ	5.4 U	5.7 U
Fluoranthene	5.4 U	6 U	6 U	6 U	5.5 U	5.6 U	5.3 U	5.3 U	-	20	5.5 U	5.8 U	5.6 U	5.7 U	5.4 U	5.8 U	0.21 UJ	5.4 U	5.7 U
Indeno(1,2,3-cd)pyrene	0.0094 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.011 U	0.011 U	0.0094 U	-	0.012	0.011 U	0.01 U	0.01 U	0.0097 U	0.011 U	0.0097 U	0.19 UJ	0.01 U	0.01 U
Pesticide/Polychlorinated Biphenyls (UG/L)																			
4,4'-DDD	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0012	0.011 U	0.0094 U	0.01 U	0.0097 U	0.011 U	0.0097 U	0.095 U	0.01 U	0.011 U
4,4'-DDE	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.00018	0.011 U	0.0094 U	0.01 U	0.0097 U	0.011 U	0.0097 U	0.095 U	0.01 U	0.011 U
4,4'-DDT	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0003	0.011 U	0.0094 U	0.01 U	0.0097 U	0.011 U	0.0097 U	0.095 U	0.01 U	0.011 U
Aldrin	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0000077	0.011 U	0.0094 U	0.01 U	0.0097 U	0.011 U	0.0097 U	0.1 U	0.01 U	0.011 U
alpha-BHC	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0036	0.011 U	0.0094 U	0.01 U	0.0097 U	0.011 U	0.0097 U	0.067 U	0.01 U	0.011 U
alpha-Chlordane	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0031	0.011 U	0.0094 U	0.01 U	0.0097 U	0.011 U	0.0097 U	0.086 U	0.01 U	0.011 U
beta-BHC	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.08	0.011 U	0.0094 U	0.01 U	0.0097 U	0.011 U	0.0097 U	0.076 U	0.01 U	0.011 U
Dieldrin	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.000012	0.011 U	0.0094 U	0.01 U	0.0097 U	0.011 U	0.0097 U	0.095 U	0.01 U	0.011 U
Endosulfan I	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	62	0.011 U	0.0094 U	0.01 U	0.0097 U	0.011 U	0.0097 U	0.067 U	0.01 U	0.011 U
Endosulfan II	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	62	0.011 U	0.0094 U	0.01 U	0.0097 U	0.011 U	0.0097 U	0.095 U	0.01 U	0.011 U
Endosulfan sulfate	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	20	0.011 U	0.0094 U	0.01 U	0.0097 U	0.011 U	0.0097 U	0.095 UJ	0.01 U	0.011 U
Endrin	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	2	0.03	0.011 U	0.0094 U	0.01 U	0.0097 U	0.011 U	0.0097 U	0.095 U	0.01 U	0.011 U
Endrin aldehyde	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	2	1	0.011 U	0.0094 U	0.01 U	0.0097 U	0.011 U	0.0097 U	0.22 U	0.01 U	0.011 U
Endrin ketone	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	2	-	0.011 U	0.0094 U	0.01 U	0.0097 U	0.011 U	0.0097 U	0.095 UJ	0.01 U	0.011 U
gamma-BHC (Lindane)	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.2	0.2	0.011 U	0.0094 U	0.01 U	0.0097 U	0.011 U	0.0097 U	0.067 U	0.01 U	0.011 U
gamma-Chlordane	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0031	0.011 U	0.0094 U	0.01 U	0.0097 U	0.011 U	0.0097 U	0.076 U	0.01 U	0.011 U
Heptachlor	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.4	0.000059	0.011 U	0.0094 U	0.01 U	0.0097 U	0.011 U	0.0097 U	0.095 U	0.01 U	0.011 U
Heptachlor epoxide	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.2	0.00032	0.011 U	0.0094 U	0.01 U	0.0097 U	0.011 U	0.0097 U	0.086 U	0.01 U	0.011 U
Methoxychlor	0.1 UJ	0.11 U	0.11 U	0.1 U	0.1 U	0.1 U	0.11 U	0.1 U	40	0.02	0.11 U	0.094 U	0.1 U	0.097 U	0.11 U	0.097 U	0.48 U	0.1 UJ	0.11 U
Toxaphene	0.52 U	0.57 U	0.53 U	0.51 U	0.5 U	0.52 U	0.57 U	0.5 U	3	0.007	0.56 U	0.47 U	0.52 U	0.49 U	0.57 U	0.49 U	0.95 U	0.51 U	0.57 U
Total Metals (UG/L)																			
Antimony	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	6	5.6	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	1 U	0.486 J	0.5 U
Arsenic	0.292 J	0.302 J	0.22 J	0.26 J	0.2 U	0.145 J	0.2 U	0.302 J	10	10	0.343 J	0.255 J	0.266 J	0.16 J	0.149 J	1 U	5 U	0.279 J	0.304 J
Barium	18.9	18.2	18.5	19.8	17.7	17.5	18.2	19.8	2000	-	39.8	39.5	34.6	30.8	30.3	31	39.4	51	48.2
Beryllium	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1 U	0.1 U	1 U	4	-	0.1 U	0.1 U	0.1 U	0.1 U	1 U	0.5 U	1 U	0.1 U	0.1 U
Cadmium	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	5	5	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	1 U	1 U	0.2 U	0.2 U
Chromium	1.69	1.21 U	0.134 J	0.2 U	0.2 U	0.2 U	0.2 U	1.69	100	100	0.488 U	0.205 J	0.415 U	0.2 U	0.2 U	1 U	3 U	2.62	0.721 U
Copper	0.984 U	0.624 U	0.361 J	0.495 J	0.5 U	0.5 U	0.438 U	0.495 J	1300	1300	0.5 U	0.5 U	1.17	0.5 U	0.5 U	5.38	6.3	1.7 U	1.66 U
Lead	0.1 U	0.1 U	0.0618 J	0.1 U	0.1 U	0.1 U	0.0908 J	0.0908 J	15	15	0.1 U	0.1 U	0.0637 J	0.1 U	0.1 U	0.5 U	0.21 J	0.194 U	0.0711 J
Mercury	0.062 J	0.11 U	0.55 U	0.11 U	0.108 J	1.1 U	0.55 U	0.108 J	2	0.05	0.11 U	0.53 J	0.69	0.276 J	0.133 J	1.02	0.2 U	0.11 U	0.11 U
Nickel	1.06	0.877 J	0.2 U	0.276 U	0.2 U	0.2 U	0.2 U	1.06	-	610	0.395 J	0.199 J	0.288 U	0.2 U	0.2 U	1 U	4.1	2.12	0.558 U
Selenium	4.53	4.35	3.42	3.44	3.13	3.37	3.58	4.53	50	50	1.88	2.48	2.27	2	2	2.05 J	2.9 J	2.92	2.93
Thallium	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	2	0.24	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	1 U	1 U	0.2 U	0.2 U
Inorganic Parameter (UG/L)																			
Cyanide	5 U	13.2	5 U	5 U	5 U	5 U	5 U	13.2	200	4	5 U	5 U	5 U	5 U	5 U	5 U	12 U	5 U	14.9

TABLE 3-2
SWMU 1 Groundwater Detections and Exceedances
Second Five-Year Review Report
Atlantic Fleet Weapons Training Area - Vieques
Vieques, Puerto Rico

Station ID	Background Well							Background Values	EPA MCLs	PR Water Quality Class SG	CGW1MW10					CGW1MW11			
Sample ID	VEW01-MW13-0116	VEW01-MW13-0117	VEW01-MW13-0118	VEW01-MW13-0119	VEW01-MW13-0120	VEW01-MW13-0121	VEW01-MW13-0122				VEW01-MW10-0118	VEW01-MW10-0119	VEW01-MW10-0120	VEW01-MW10-0121	VEW01-MW10-0122	VEW01-MW11-0509	VEW01-MW11-0116	VEW01-MW11-0117	VEW01-MW11-0118
Sample Date	01/07/16	01/17/17	01/11/18	01/09/19	01/09/20	01/25/21	01/17/22				01/15/18	01/08/19	01/08/20	01/26/21	01/18/22	05/12/09	01/12/16	01/18/17	01/12/18
Chemical Name																			
Volatile Organic Compounds (UG/L)																			
Benzene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	5	5	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.014 J	0.2 U	0.2 U	0.2 U
Trichloroethene	0.12 J	0.12 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.12 J	5	5	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	1 U	0.2 U	0.2 U	0.2 U
Vinyl chloride	0.02 U	0.02 U	0.014 J	0.02 U	0.02 U	0.02 U	0.02 U	0.014 J	2	0.22	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.15 UJ	0.02 U	0.02 U	0.02 U
Semivolatile Organic Compounds (UG/L)																			
2,4,6-Trichlorophenol	0.11 U	0.12 U	0.12 U	0.12 U	0.11 U	0.11 U	0.11 U	0.11U	-	15	0.099 U	0.1 U	0.098 U	0.11 U	0.12 U	9 R	0.1 U	0.11 U	0.11 U
Benzo(a)anthracene	0.0094 U	0.01 U	0.011 U	0.012 UJ	0.0098 U	0.011 U	0.011 U	0.0094 U	-	0.012	0.011 U	0.01 U	0.01 U	0.078	0.012 U	0.19 UJ	0.0098 U	0.0097 U	0.011 U
Benzo(a)pyrene	0.0094 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.011 U	0.011 U	0.0094 U	0.2	0.0012	0.011 U	0.01 U	0.01 U	0.08	0.012 U	0.19 UJ	0.0098 U	0.0097 U	0.011 U
Benzo(b)fluoranthene	0.0094 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.011 U	0.011 U	0.0094 U	-	0.012	0.011 U	0.01 U	0.01 U	0.096	0.012 U	0.25 UJ	0.0098 U	0.0097 U	0.011 U
Benzo(k)fluoranthene	0.0094 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.011 U	0.011 U	0.0094 U	-	0.12	0.011 U	0.01 U	0.01 U	0.096	0.012 U	0.19 UJ	0.0098 U	0.0097 U	0.011 U
bis(2-Ethylhexyl)phthalate	1.3 U	1.4 U	1.6 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	6.0	0.3	1.3 U	1.3 U	1.2 U	1.3 U	1.4 U	1.9 UJ	1.2 U	1.3 UJ	1.5 U
Chrysene	0.0094 U	0.01 U	0.011 U	0.012 UJ	0.0098 U	0.011 U	0.011 U	0.0094 U	-	1.2	0.011 U	0.01 U	0.01 U	0.089	0.012 U	0.19 UJ	0.0098 U	0.0097 U	0.011 U
Dibenz(a,h)anthracene	0.0094 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.011 U	0.011 U	0.0094 U	-	0.0012	0.011 U	0.01 U	0.01 U	0.076	0.012 U	0.2 UJ	0.0098 U	0.0097 U	0.011 U
Di-n-butylphthalate	5.4 U	6 U	6 U	6 U	5.5 U	5.6 U	5.3 U	5.3 U	-	20	4.9 U	5.2 U	4.9 U	5.4 U	5.9 U	2.4 UJ	5.1 U	5.6 U	5.6 U
Fluoranthene	5.4 U	6 U	6 U	6 U	5.5 U	5.6 U	5.3 U	5.3 U	-	20	4.9 U	5.2 U	4.9 U	5.4 U	5.9 U	0.21 UJ	5.1 U	5.6 U	5.6 U
Indeno(1,2,3-cd)pyrene	0.0094 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.011 U	0.011 U	0.0094 U	-	0.012	0.011 U	0.01 U	0.01 U	0.079	0.012 U	0.19 UJ	0.0098 U	0.0097 U	0.011 U
Pesticide/Polychlorinated Biphenyls (UG/L)																			
4,4'-DDD	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0012	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.094 U	0.011 U	0.011 U	0.011 U
4,4'-DDE	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.00018	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.094 U	0.011 U	0.011 U	0.011 U
4,4'-DDT	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0003	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.094 U	0.011 U	0.011 U	0.011 U
Aldrin	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0000077	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.1 U	0.011 U	0.011 U	0.011 U
alpha-BHC	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0036	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.066 U	0.011 U	0.011 U	0.011 U
alpha-Chlordane	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0031	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.085 U	0.011 U	0.011 U	0.011 U
beta-BHC	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.08	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.075 U	0.011 U	0.011 U	0.011 U
Dieldrin	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.000012	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.094 U	0.011 U	0.011 U	0.011 U
Endosulfan I	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	62	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.066 U	0.011 U	0.011 U	0.011 U
Endosulfan II	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	62	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.094 U	0.011 U	0.011 U	0.011 U
Endosulfan sulfate	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	20	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.094 U	0.011 U	0.011 U	0.011 U
Endrin	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	2	0.03	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.094 U	0.011 U	0.011 U	0.011 U
Endrin aldehyde	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	2	1	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.22 U	0.011 U	0.011 U	0.011 U
Endrin ketone	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	2	-	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.094 U	0.011 U	0.011 U	0.011 U
gamma-BHC (Lindane)	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.2	0.2	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.066 U	0.011 U	0.011 U	0.011 U
gamma-Chlordane	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0031	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.075 U	0.011 U	0.011 U	0.011 U
Heptachlor	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.4	0.000059	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.094 U	0.011 U	0.011 U	0.011 U
Heptachlor epoxide	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.2	0.00032	0.011 U	0.011 U	0.011 U	0.01 U	0.011 U	0.085 U	0.011 U	0.011 U	0.011 U
Methoxychlor	0.1 UJ	0.11 U	0.11 U	0.1 U	0.1 U	0.1 U	0.11 U	0.1 U	40	0.02	0.11 U	0.1 U	0.1 U	0.1 U	0.11 U	0.47 U	0.11 UJ	0.11 U	0.11 U
Toxaphene	0.52 U	0.57 U	0.53 U	0.51 U	0.5 U	0.52 U	0.57 U	0.5 U	3	0.007	0.55 U	0.52 U	0.52 U	0.52 U	0.55 U	0.94 U	0.54 U	0.53 U	0.55 U
Total Metals (UG/L)																			
Antimony	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	6	5.6	0.325 J	0.5 U	0.5 U	0.5 U	2.5 U	2 U	0.332 J	0.5 U	0.5 U
Arsenic	0.292 J	0.302 J	0.22 J	0.26 J	0.2 U	0.145 J	0.2 U	0.302 J	10	10	0.188 J	0.298 J	0.2 U	0.172 J	1 U	10 U	1.01	0.725 J	0.471 J
Barium	18.9	18.2	18.5	19.8	17.7	17.5	18.2	19.8	2000	-	41	45.5	42.6	41.3	41.9	410	121	130	95.4
Beryllium	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1 U	0.1 U	1 U	4	-	0.1 U	0.1 U	0.1 U	1 U	0.5 U	2 U	0.1 U	0.5 U	0.1 U
Cadmium	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	5	5	0.2 U	0.2 U	0.2 U	0.2 U	1 U	2 U	0.239 J	0.2 U	0.444 J
Chromium	1.69	1.21 U	0.134 J	0.2 U	0.2 U	0.2 U	0.2 U	1.69	100	100	0.272 U	0.569 U	0.2 U	0.388 U	1 U	6 U	6.29	0.59 U	0.504 U
Copper	0.984 U	0.624 U	0.361 J	0.495 J	0.5 U	0.5 U	0.438 U	0.495 J	1300	1300	0.33 J	0.696 J	0.5 U	0.5 U	2.5 U	2.8	2.4 U	2.1 U	0.577 J
Lead	0.1 U	0.1 U	0.0618 J	0.1 U	0.1 U	0.1 U	0.0908 J	0.0908 J	15	15	0.099 J	0.1 U	0.1 U	0.1 U	0.5 U	2 U	0.135 J	0.0649 J	0.11 J
Mercury	0.062 J	0.11 U	0.55 U	0.11 U	0.108 J	1.1 U	0.55 U	0.108 J	2	0.05	0.11 U	0.11 U	0.06 J	0.11 U	0.11 U	0.2 U	0.11 U	0.11 U	0.11 U
Nickel	1.06	0.877 J	0.2 U	0.276 U	0.2 U	0.2 U	0.2 U	1.06	-	610	0.2 U	0.304 U	0.2 U	0.2 U	1 U	21.6	4.43	2.09 U	1.41
Selenium	4.53	4.35	3.42	3.44	3.13	3.37	3.58	4.53	50	50	3.06	2.93	2.82	3.19	3.38 J	10 U	0.171 J	0.3 U	0.225 J
Thallium	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	2	0.24	0.2 U	0.2 U	0.2 U	0.2 U	1 U	2 U	0.2 U	0.2 U	0.2 U
Inorganic Parameter (UG/L)																			
Cyanide	5 U	13.2	5 U	5 U	5 U	5 U	5 U	13.2	200	4	5 U	5 U	5 U	5 U	3.53 J	12 U	5 U	5 U	5 U

TABLE 3-2
SWMU 1 Groundwater Detections and Exceedances
Second Five-Year Review Report
Atlantic Fleet Weapons Training Area - Vieques
Vieques, Puerto Rico

Station ID	Background Well							Background Values	EPA MCLs	PR Water Quality Class SG	CGW1MW11				CGW1MW13				
Sample ID	VEW01-MW13-0116	VEW01-MW13-0117	VEW01-MW13-0118	VEW01-MW13-0119	VEW01-MW13-0120	VEW01-MW13-0121	VEW01-MW13-0122				VEW01-MW11-0119	VEW01-MW11-0120	VEW01-MW11-0121	VEW01-MW11-0122	VEW01-MW13-0509	VEW01-MW13P-0509	VEW01-MW13-0116	VEW01-MW13-0117	VEW01-MW13-0118
Sample Date	01/07/16	01/17/17	01/11/18	01/09/19	01/09/20	01/25/21	01/17/22				01/10/19	01/08/20	01/26/21	01/18/22	05/20/09	05/20/09	01/07/16	01/17/17	01/11/18
Chemical Name																			
Volatile Organic Compounds (UG/L)																			
Benzene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	5	5	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.05 U	0.2 U	0.2 U	0.2 U
Trichloroethene	0.12 J	0.12 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.12 J	5	5	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	1 U	0.12 J	0.12 J	0.2 U
Vinyl chloride	0.02 U	0.02 U	0.014 J	0.02 U	0.02 U	0.02 U	0.02 U	0.014 J	2	0.22	0.05 U	0.02 U	0.02 U	0.02 U	0.02 U	0.012 J	0.02 U	0.02 U	0.014 J
Semivolatile Organic Compounds (UG/L)																			
2,4,6-Trichlorophenol	0.11 U	0.12 U	0.12 U	0.12 U	0.11 U	0.11 U	0.11 U	0.11U	-	15	0.11 U	0.11 U	0.1 U	0.1 U	9 U	9 U	0.11 U	0.12 U	0.12 U
Benzo(a)anthracene	0.0094 U	0.01 U	0.011 U	0.012 UJ	0.0098 U	0.011 U	0.011 U	0.0094 U	-	0.012	0.011 U	0.011 U	0.012 U	0.011 U	0.19 UJ	0.19 UJ	0.0094 U	0.01 U	0.011 U
Benzo(a)pyrene	0.0094 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.011 U	0.011 U	0.0094 U	0.2	0.0012	0.011 U	0.011 U	0.012 U	0.011 U	0.19 UJ	0.19 UJ	0.0094 U	0.01 U	0.011 U
Benzo(b)fluoranthene	0.0094 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.011 U	0.011 U	0.0094 U	-	0.012	0.011 U	0.011 U	0.012 U	0.011 U	0.25 UJ	0.25 UJ	0.0094 U	0.01 U	0.011 U
Benzo(k)fluoranthene	0.0094 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.011 U	0.011 U	0.0094 U	-	0.12	0.011 U	0.011 U	0.012 U	0.011 U	0.19 UJ	0.19 UJ	0.0094 U	0.01 U	0.011 U
bis(2-Ethylhexyl)phthalate	1.3 U	1.4 U	1.6 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	6.0	0.3	1.3 U	6.8	1.3 U	1.2 U	1.9 UJ	1.9 UJ	1.3 U	1.4 U	1.6 U
Chrysene	0.0094 U	0.01 U	0.011 U	0.012 UJ	0.0098 U	0.011 U	0.011 U	0.0094 U	-	1.2	0.011 U	0.011 U	0.012 U	0.011 U	0.19 UJ	0.19 UJ	0.0094 U	0.01 U	0.011 U
Dibenz(a,h)anthracene	0.0094 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.011 U	0.011 U	0.0094 U	-	0.0012	0.011 U	0.011 U	0.012 U	0.011 U	0.2 UJ	0.2 UJ	0.0094 U	0.01 U	0.011 U
Di-n-butylphthalate	5.4 U	6 U	6 U	6 U	5.5 U	5.6 U	5.3 U	5.3 U	-	20	5.4 U	5.5 U	5.2 U	4.9 J	2.4 UJ	2.4 UJ	5.4 U	6 U	6 U
Fluoranthene	5.4 U	6 U	6 U	6 U	5.5 U	5.6 U	5.3 U	5.3 U	-	20	5.4 U	5.5 U	5.2 U	5.2 U	0.21 UJ	0.21 UJ	5.4 U	6 U	6 U
Indeno(1,2,3-cd)pyrene	0.0094 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.011 U	0.011 U	0.0094 U	-	0.012	0.011 U	0.011 U	0.012 U	0.011 U	0.19 UJ	0.19 UJ	0.0094 U	0.01 U	0.011 U
Pesticide/Polychlorinated Biphenyls (UG/L)																			
4,4'-DDD	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0012	0.0099 U	0.01 U	0.0098 U	0.011 U	0.094 U	0.094 U	0.011 U	0.011 U	0.011 U
4,4'-DDE	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.00018	0.0099 U	0.01 U	0.0098 U	0.011 U	0.094 U	0.094 U	0.011 U	0.011 U	0.011 U
4,4'-DDT	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0003	0.0099 U	0.01 U	0.0098 U	0.011 U	0.094 U	0.094 U	0.011 U	0.011 U	0.011 U
Aldrin	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0000077	0.0099 U	0.01 U	0.0098 U	0.011 U	0.1 U	0.1 U	0.011 U	0.011 U	0.011 U
alpha-BHC	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0036	0.0099 U	0.01 U	0.0098 U	0.011 U	0.0096 U	0.066 U	0.011 U	0.011 U	0.011 U
alpha-Chlordane	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0031	0.0099 U	0.01 U	0.0098 U	0.011 U	0.085 U	0.085 U	0.011 U	0.011 U	0.011 U
beta-BHC	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.08	0.0099 U	0.01 U	0.0098 U	0.011 U	0.075 U	0.075 U	0.011 U	0.011 U	0.011 U
Dieldrin	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.000012	0.0099 U	0.01 U	0.0098 U	0.011 U	0.094 U	0.094 U	0.011 U	0.011 U	0.011 U
Endosulfan I	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	62	0.0099 U	0.01 U	0.0098 U	0.011 U	0.066 U	0.066 U	0.011 U	0.011 U	0.011 U
Endosulfan II	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	62	0.0099 U	0.01 U	0.0098 U	0.011 U	0.094 U	0.094 U	0.011 U	0.011 U	0.011 U
Endosulfan sulfate	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	20	0.0099 U	0.01 U	0.0098 U	0.011 U	0.094 U	0.094 U	0.011 U	0.011 U	0.011 U
Endrin	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	2	0.03	0.0099 U	0.01 U	0.0098 U	0.011 U	0.094 U	0.094 U	0.011 U	0.011 U	0.011 U
Endrin aldehyde	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	2	1	0.0099 U	0.01 U	0.0098 U	0.011 U	0.22 U	0.22 U	0.011 U	0.011 U	0.011 U
Endrin ketone	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	2	-	0.0099 U	0.01 U	0.0098 U	0.011 U	0.094 U	0.094 U	0.011 U	0.011 U	0.011 U
gamma-BHC (Lindane)	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.2	0.2	0.0099 U	0.01 U	0.0098 U	0.011 U	0.066 U	0.066 U	0.011 U	0.011 U	0.011 U
gamma-Chlordane	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0031	0.0099 U	0.01 U	0.0098 U	0.011 U	0.075 U	0.075 U	0.011 U	0.011 U	0.011 U
Heptachlor	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.4	0.000059	0.0099 U	0.01 U	0.0098 U	0.011 U	0.094 U	0.094 U	0.011 U	0.011 U	0.011 U
Heptachlor epoxide	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.2	0.00032	0.0099 U	0.01 U	0.0098 U	0.011 U	0.085 U	0.085 U	0.011 U	0.011 U	0.011 U
Methoxychlor	0.1 UJ	0.11 U	0.11 U	0.1 U	0.1 U	0.1 U	0.11 U	0.1 U	40	0.02	0.099 U	0.11 U	0.098 U	0.1 U	0.47 U	0.47 U	0.1 UJ	0.11 U	0.11 U
Toxaphene	0.52 U	0.57 U	0.53 U	0.51 U	0.5 U	0.52 U	0.57 U	0.5 U	3	0.007	0.5 U	0.52 U	0.49 U	0.52 U	0.94 U	0.94 U	0.52 U	0.57 U	0.53 U
Total Metals (UG/L)																			
Antimony	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	6	5.6	5 U	0.5 U	0.5 U	2.5 U	1 U	1 U	0.5 U	0.5 U	0.5 U
Arsenic	0.292 J	0.302 J	0.22 J	0.26 J	0.2 U	0.145 J	0.2 U	0.302 J	10	10	1.36 J	0.203 J	0.235 J	1 U	5 U	5 U	0.292 J	0.302 J	0.22 J
Barium	18.9	18.2	18.5	19.8	17.7	17.5	18.2	19.8	2000	-	98.4	93.6	106	104	19.2	18.7	18.9	18.2	18.5
Beryllium	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1 U	0.1 U	1 U	4	-	1 U	0.1 U	1 U	0.5 U	1 U	1 U	0.1 U	0.1 U	0.1 U
Cadmium	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	5	5	2 U	0.2 U	0.2 U	1 U	1 U	1 U	0.2 U	0.2 U	0.2 U
Chromium	1.69	1.21 U	0.134 J	0.2 U	0.2 U	0.2 U	0.2 U	1.69	100	100	2 U	0.2 U	0.307 U	1 U	3 U	3 U	1.69	1.21 U	0.134 J
Copper	0.984 U	0.624 U	0.361 J	0.495 J	0.5 U	0.5 U	0.438 U	0.495 J	1300	1300	5 U	0.5 U	0.5 U	2.5 U	1 U	7.8 R	0.984 U	0.624 U	0.361 J
Lead	0.1 U	0.1 U	0.0618 J	0.1 U	0.1 U	0.1 U	0.0908 J	0.0908 J	15	15	1 U	0.1 U	0.1 U	0.5 U	1 U	0.08 J	0.1 U	0.1 U	0.0618 J
Mercury	0.062 J	0.11 U	0.55 U	0.11 U	0.108 J	1.1 U	0.55 U	0.108 J	2	0.05	0.11 U	0.11 U	0.11 U	0.11 U	0.2 U	0.2 U	0.062 J	0.11 U	0.55 U
Nickel	1.06	0.877 J	0.2 U	0.276 U	0.2 U	0.2 U	0.2 U	1.06	-	610	2.07 U	0.896 U	0.72 J	1 U	1.8 J	2	1.06	0.877 J	0.2 U
Selenium	4.53	4.35	3.42	3.44	3.13	3.37	3.58	4.53	50	50	3 U	0.3 U	0.3 U	1.5 U	4.2 J	3.4 J	4.53	4.35	3.42
Thallium	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	2	0.24	2 U	0.2 U	0.2 U	1 U	1 U	1 U	0.2 U	0.2 U	0.2 U
Inorganic Parameter (UG/L)																			
Cyanide	5 U	13.2	5 U	5 U	5 U	5 U	5 U	13.2	200	4	5 U	5 U	5 U	5 U	12 U	12 U	5 U	13.2	5 U

TABLE 3-2
SWMU 1 Groundwater Detections and Exceedances
Second Five-Year Review Report
Atlantic Fleet Weapons Training Area - Vieques
Vieques, Puerto Rico

Station ID	Background Well							Background Values	EPA MCLs	PR Water Quality Class SG	CGW1MW13			
Sample ID	VEW01-MW13-0116	VEW01-MW13-0117	VEW01-MW13-0118	VEW01-MW13-0119	VEW01-MW13-0120	VEW01-MW13-0121	VEW01-MW13-0122				VEW01-MW13-0119	VEW01-MW13-0120	VEW01-MW13-0121	VEW01-MW13-0122
Sample Date	01/07/16	01/17/17	01/11/18	01/09/19	01/09/20	01/25/21	01/17/22				01/09/19	01/09/20	01/25/21	01/17/22
Chemical Name														
Volatile Organic Compounds (UG/L)														
Benzene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	5	5	0.2 U	0.2 U	0.2 U	0.2 U
Trichloroethene	0.12 J	0.12 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.12 J	5	5	0.2 U	0.2 U	0.2 U	0.2 U
Vinyl chloride	0.02 U	0.02 U	0.014 J	0.02 U	0.02 U	0.02 U	0.02 U	0.014 J	2	0.22	0.02 U	0.02 U	0.02 U	0.02 U
Semivolatile Organic Compounds (UG/L)														
2,4,6-Trichlorophenol	0.11 U	0.12 U	0.12 U	0.12 U	0.11 U	0.11 U	0.11 U	0.11U	-	15	0.12 U	0.11 U	0.11 U	0.11 U
Benzo(a)anthracene	0.0094 U	0.01 U	0.011 U	0.012 UJ	0.0098 U	0.011 U	0.011 U	0.0094 U	-	0.012	0.012 UJ	0.0098 U	0.011 U	0.011 U
Benzo(a)pyrene	0.0094 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.011 U	0.011 U	0.0094 U	0.2	0.0012	0.012 U	0.0098 U	0.011 U	0.011 U
Benzo(b)fluoranthene	0.0094 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.011 U	0.011 U	0.0094 U	-	0.012	0.012 U	0.0098 U	0.011 U	0.011 U
Benzo(k)fluoranthene	0.0094 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.011 U	0.011 U	0.0094 U	-	0.12	0.012 U	0.0098 U	0.011 U	0.011 U
bis(2-Ethylhexyl)phthalate	1.3 U	1.4 U	1.6 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	6.0	0.3	1.4 U	1.3 U	1.3 U	1.3 U
Chrysene	0.0094 U	0.01 U	0.011 U	0.012 UJ	0.0098 U	0.011 U	0.011 U	0.0094 U	-	1.2	0.012 UJ	0.0098 U	0.011 U	0.011 U
Dibenz(a,h)anthracene	0.0094 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.011 U	0.011 U	0.0094 U	-	0.0012	0.012 U	0.0098 U	0.011 U	0.011 U
Di-n-butylphthalate	5.4 U	6 U	6 U	6 U	5.5 U	5.6 U	5.3 U	5.3 U	-	20	6 U	5.5 U	5.6 U	5.3 U
Fluoranthene	5.4 U	6 U	6 U	6 U	5.5 U	5.6 U	5.3 U	5.3 U	-	20	6 U	5.5 U	5.6 U	5.3 U
Indeno(1,2,3-cd)pyrene	0.0094 U	0.01 U	0.011 U	0.012 U	0.0098 U	0.011 U	0.011 U	0.0094 U	-	0.012	0.012 U	0.0098 U	0.011 U	0.011 U
Pesticide/Polychlorinated Biphenyls (UG/L)														
4,4'-DDD	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0012	0.01 U	0.01 U	0.011 U	0.011 U
4,4'-DDE	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.00018	0.01 U	0.01 U	0.011 U	0.011 U
4,4'-DDT	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0003	0.01 U	0.01 U	0.011 U	0.011 U
Aldrin	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0000077	0.01 U	0.01 U	0.011 U	0.011 U
alpha-BHC	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0036	0.01 U	0.01 U	0.011 U	0.011 U
alpha-Chlordane	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0031	0.01 U	0.01 U	0.011 U	0.011 U
beta-BHC	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.08	0.01 U	0.01 U	0.011 U	0.011 U
Dieldrin	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.000012	0.01 U	0.01 U	0.011 U	0.011 U
Endosulfan I	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	62	0.01 U	0.01 U	0.011 U	0.011 U
Endosulfan II	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	62	0.01 U	0.01 U	0.011 U	0.011 U
Endosulfan sulfate	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	20	0.01 U	0.01 U	0.011 U	0.011 U
Endrin	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	2	0.03	0.01 U	0.01 U	0.011 U	0.011 U
Endrin aldehyde	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	2	1	0.01 U	0.01 U	0.011 U	0.011 U
Endrin ketone	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	2	-	0.01 U	0.01 U	0.011 U	0.011 U
gamma-BHC (Lindane)	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.2	0.2	0.01 U	0.01 U	0.011 U	0.011 U
gamma-Chlordane	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	-	0.0031	0.01 U	0.01 U	0.011 U	0.011 U
Heptachlor	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.4	0.000059	0.01 U	0.01 U	0.011 U	0.011 U
Heptachlor epoxide	0.011 U	0.011 U	0.011 U	0.01 U	0.01 U	0.011 U	0.011 U	0.01 U	0.2	0.00032	0.01 U	0.01 U	0.011 U	0.011 U
Methoxychlor	0.1 UJ	0.11 U	0.11 U	0.1 U	0.1 U	0.1 U	0.11 U	0.1 U	40	0.02	0.1 U	0.1 U	0.1 U	0.11 U
Toxaphene	0.52 U	0.57 U	0.53 U	0.51 U	0.5 U	0.52 U	0.57 U	0.5 U	3	0.007	0.51 U	0.5 U	0.52 U	0.57 U
Total Metals (UG/L)														
Antimony	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	6	5.6	0.5 U	0.5 U	0.5 U	0.5 U
Arsenic	0.292 J	0.302 J	0.22 J	0.26 J	0.2 U	0.145 J	0.2 U	0.302 J	10	10	0.26 J	0.2 U	0.145 J	0.2 U
Barium	18.9	18.2	18.5	19.8	17.7	17.5	18.2	19.8	2000	-	19.8	17.7	17.5	18.2
Beryllium	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1 U	0.1 U	1 U	4	-	0.1 U	0.1 U	1 U	0.1 U
Cadmium	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	5	5	0.2 U	0.2 U	0.2 U	0.2 U
Chromium	1.69	1.21 U	0.134 J	0.2 U	0.2 U	0.2 U	0.2 U	1.69	100	100	0.2 U	0.2 U	0.2 U	0.2 U
Copper	0.984 U	0.624 U	0.361 J	0.495 J	0.5 U	0.5 U	0.438 U	0.495 J	1300	1300	0.495 J	0.5 U	0.5 U	0.438 U
Lead	0.1 U	0.1 U	0.0618 J	0.1 U	0.1 U	0.1 U	0.0908 J	0.0908 J	15	15	0.1 U	0.1 U	0.1 U	0.0908 J
Mercury	0.062 J	0.11 U	0.55 U	0.11 U	0.108 J	1.1 U	0.55 U	0.108 J	2	0.05	0.11 U	0.108 J	1.1 U	0.55 U
Nickel	1.06	0.877 J	0.2 U	0.276 U	0.2 U	0.2 U	0.2 U	1.06	-	610	0.276 U	0.2 U	0.2 U	0.2 U
Selenium	4.53	4.35	3.42	3.44	3.13	3.37	3.58	4.53	50	50	3.44	3.13	3.37	3.58
Thallium	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	2	0.24	0.2 U	0.2 U	0.2 U	0.2 U
Inorganic Parameter (UG/L)														
Cyanide	5 U	13.2	5 U	5 U	5 U	5 U	5 U	13.2	200	4	5 U	5 U	5 U	5 U

TABLE 3-2
SWMU 1 Groundwater Detections and Exceedances
Second Five-Year Review Report
Atlantic Fleet Weapons Training Area - Vieques
Vieques, Puerto Rico

Station ID	Background Well							Background Values	EPA MCLs	PR Water Quality Class SG	CGW1MW02								
Sample ID	VEW01-MW13-0116	VEW01-MW13-0117	VEW01-MW13-0118	VEW01-MW13-0119	VEW01-MW13-0120	VEW01-MW13-0121	VEW01-MW13-0122				CGW1GW02-R01	VEW01-MW02-0509	VEW01-MW02-0116	VEW01-MW02-0117	VEW01-MW02-0118	VEW01-MW02-0119	VEW01-MW02-0120	VEW01-MW02-0121	VEW01-MW02-0122
Sample Date	01/07/16	01/17/17	01/11/18	01/09/19	01/09/20	01/25/21	01/17/22				02/05/04	05/04/09	01/11/16	01/17/17	01/10/18	01/08/19	01/15/20	01/28/21	01/19/22
Chemical Name																			
Dissolved Metals (UG/L)																			
Antimony, Dissolved	0.453 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.453 J	6	5.6	2.5 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U
Arsenic, Dissolved	0.336 J	0.298 J	0.25 J	0.253 J	0.2 U	0.152 J	0.128 J	0.336 J	10	10	2.04 U	5 U	0.385 J	0.417 J	0.347 J	0.309 J	0.206 J	0.227 J	1 U
Barium, Dissolved	20.9	17.9	18.3	19	17	18.2	18.3	20.9	2000	-	39.6 J	33.3	25.5	23.7	24.5	23.7	20.3	25.8	29
Beryllium, Dissolved	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1 U	0.1 U	1 U	4	-	0.0945 U	1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1 U	0.5 U
Cadmium, Dissolved	0.259 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.259 J	5	5	0.356 U	1 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	1 U
Chromium, Dissolved	11.4	0.441 U	0.2 U	0.2 U	0.101 J	0.2 U	0.212 U	11.4	100	100	9.93 J	3 U	0.901 J	0.259 U	0.109 J	0.26 U	0.2 U	0.2 U	1 U
Copper, Dissolved	12	0.5 U	0.5 U	0.5 U	0.5 U	0.491 J	0.533 U	12	1300	1300	3.25 J	1.3	0.5 U	1.14 U	0.716 J	0.764 J	1.34	0.5 U	2.5 U
Lead, Dissolved	1.64	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1.64	15	15	1.76 U	1 UJ	0.0722 J	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.5 U
Mercury, Dissolved	0.11 U	0.11 U	0.55 U	0.11 U	0.11 U	1.1 U	0.55 U	1.1 U	2	0.05	0.461	0.09 J	0.087 J	0.11 U	0.55 U	0.121 J	0.11 U	0.11 U	0.11 U
Nickel, Dissolved	38.8	0.372 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	38.8	-	610	10.4 J	4.7	1.91 U	0.556 J	0.226 J	0.772 U	0.302 U	0.329 J	0.514 J
Selenium, Dissolved	4.38	4.27	3.58	3.39	3.09	3.36	3.45	4.38	50	50	3.62 J	5 U	1.54	1.28	1.17	0.99 J	1.11	1.17	0.967 J
Thallium, Dissolved	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	2	0.24	2.99 J	1 UJ	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	1 U

Notes:
Bolded indicates detection
Grey shading indicates a detection above background values
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Pink shading indicates a detection above the PRWQS and background
Blue shading indicates a detection above the MCL and PRWQS
Green shading indicates a detection above MCL, PRWQS, and background

J = analyte present, value may or may not be accurate or precise
MG/L = milligrams per liter
NA = not analyzed
NG/L = nanograms per liter
R = unreliable result
U = the material was analyzed for, but not detected
UG/L = micrograms per liter
UJ - analyte not detected, quantitation limit may be inaccurate

TABLE 3-2
SWMU 1 Groundwater Detections and Exceedances
Second Five-Year Review Report
Atlantic Fleet Weapons Training Area - Vieques
Vieques, Puerto Rico

Station ID	Background Well							Background Values	EPA MCLs	PR Water Quality Class SG	CGW1MW03								
Sample ID	VEW01-MW13-0116	VEW01-MW13-0117	VEW01-MW13-0118	VEW01-MW13-0119	VEW01-MW13-0120	VEW01-MW13-0121	VEW01-MW13-0122				CGW1GW03-R01	VEW01-MW03-0409	VEW01-MW03-0116	VEW01-MW03P-0116	VEW01-MW03-0117	VEW01-MW03P-0117	VEW01-MW03-0118	VEW01-MW03P-0118	VEW01-MW03-0119
Sample Date	01/07/16	01/17/17	01/11/18	01/09/19	01/09/20	01/25/21	01/17/22				02/06/04	04/30/09	01/08/16	01/08/16	01/18/17	01/18/17	01/12/18	01/12/18	01/07/19
Chemical Name																			
Dissolved Metals (UG/L)																			
Antimony, Dissolved	0.453 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.453 J	6	5.6	2.83 J	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Arsenic, Dissolved	0.336 J	0.298 J	0.25 J	0.253 J	0.2 U	0.152 J	0.128 J	0.336 J	10	10	2.04 U	6.8	1.1	1.14	0.372 J	0.367 J	0.25 J	0.292 J	0.368 J
Barium, Dissolved	20.9	17.9	18.3	19	17	18.2	18.3	20.9	2000	-	236	110	232	259	79.9	80.3	55.5	55.8	67.3
Beryllium, Dissolved	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1 U	0.1 U	1 U	4	-	0.0945 U	1 U	0.317 J	0.395 J	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Cadmium, Dissolved	0.259 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.259 J	5	5	0.356 U	1 U	0.132 J	0.165 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Chromium, Dissolved	11.4	0.441 U	0.2 U	0.2 U	0.101 J	0.2 U	0.212 U	11.4	100	100	0.595 J	3 U	26	28.7	0.761 U	0.8 U	0.2 U	0.2 U	0.335 U
Copper, Dissolved	12	0.5 U	0.5 U	0.5 U	0.5 U	0.491 J	0.533 U	12	1300	1300	1.96 J	1.2	22.7	27.6	1.35 U	1.73 U	0.5 U	0.5 U	1.98
Lead, Dissolved	1.64	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1.64	15	15	1.76 U	1 UJ	2.76	3.11	0.1 U	0.0638 J	0.1 U	0.1 U	0.0708 J
Mercury, Dissolved	0.11 U	0.11 U	0.55 U	0.11 U	0.11 U	1.1 U	0.55 U	1.1 U	2	0.05	0.0162 U	0.2 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U
Nickel, Dissolved	38.8	0.372 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	38.8	-	610	4.36 J	4.3	14.8	16.2	0.449 U	0.485 U	0.26 J	0.2 U	0.441 U
Selenium, Dissolved	4.38	4.27	3.58	3.39	3.09	3.36	3.45	4.38	50	50	2.1 U	5 U	0.93 J	0.817 J	0.955 J	0.972 J	1.04	1.04	1.12
Thallium, Dissolved	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	2	0.24	2.54 U	1 UJ	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U

Notes:

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TABLE 3-2
SWMU 1 Groundwater Detections and Exceedances
Second Five-Year Review Report
Atlantic Fleet Weapons Training Area - Vieques
Vieques, Puerto Rico

Station ID	Background Well							Background Values	EPA MCLs	PR Water Quality Class SG	CGW1MW03							CGW1MW08	
Sample ID	VEW01-MW13-0116	VEW01-MW13-0117	VEW01-MW13-0118	VEW01-MW13-0119	VEW01-MW13-0120	VEW01-MW13-0121	VEW01-MW13-0122				VEW01-MW03P-0119	VEW01-MW03-0120	VEW01-MW03P-0120	VEW01-MW03-0121	VEW01-MW03P-0121	VEW01-MW03-0122	VEW01-MW03P-0122	VEW01-MW08-0509	VEW01-MW08-0116
Sample Date	01/07/16	01/17/17	01/11/18	01/09/19	01/09/20	01/25/21	01/17/22				01/07/19	01/14/20	01/14/20	01/27/21	01/27/21	01/18/22	01/18/22	05/22/09	01/12/16
Chemical Name																			
Dissolved Metals (UG/L)																			
Antimony, Dissolved	0.453 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.453 J	6	5.6	2.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	2.5 U	1 U	0.315 J
Arsenic, Dissolved	0.336 J	0.298 J	0.25 J	0.253 J	0.2 U	0.152 J	0.128 J	0.336 J	10	10	1 U	0.137 J	0.172 J	0.138 J	0.157 J	1 U	1 U	5 U	0.344 J
Barium, Dissolved	20.9	17.9	18.3	19	17	18.2	18.3	20.9	2000	-	63	59.4	59.7	67.7	65.3	63	64.9	44.3	46.9
Beryllium, Dissolved	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1 U	0.1 U	1 U	4	-	0.5 U	0.1 U	0.1 U	1 U	1 U	0.5 U	0.5 U	1 U	0.1 U
Cadmium, Dissolved	0.259 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.259 J	5	5	1 U	0.2 U	0.2 U	0.2 U	0.2 U	1 U	1 U	1 U	0.2 U
Chromium, Dissolved	11.4	0.441 U	0.2 U	0.2 U	0.101 J	0.2 U	0.212 U	11.4	100	100	1 U	0.2 U	0.2 U	0.258 U	0.205 U	1 U	1 U	3 U	3
Copper, Dissolved	12	0.5 U	0.5 U	0.5 U	0.5 U	0.491 J	0.533 U	12	1300	1300	2.51 U	0.73 J	1.25	0.5 U	0.5 U	2.5 U	2.5 U	1.4	5.17
Lead, Dissolved	1.64	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1.64	15	15	0.5 U	0.1 U	0.1 U	0.1 U	0.1 U	0.5 U	0.5 U	1 U	0.445 U
Mercury, Dissolved	0.11 U	0.11 U	0.55 U	0.11 U	0.11 U	1.1 U	0.55 U	1.1 U	2	0.05	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.2 U	0.11 U
Nickel, Dissolved	38.8	0.372 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	38.8	-	610	1 U	0.2 U	0.2 U	0.2 U	0.2 U	1 U	1 U	2.4	4.14
Selenium, Dissolved	4.38	4.27	3.58	3.39	3.09	3.36	3.45	4.38	50	50	1.22 J	0.986 J	1.02	1.17	1.13	1.31 J	1.19 J	2.6 J	2.6
Thallium, Dissolved	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	2	0.24	1 U	0.2 U	0.2 U	0.2 U	0.2 U	1 U	1 U	1 U	0.2 U

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TABLE 3-2
SWMU 1 Groundwater Detections and Exceedances
Second Five-Year Review Report
Atlantic Fleet Weapons Training Area - Vieques
Vieques, Puerto Rico

Station ID	Background Well							Background Values	EPA MCLs	PR Water Quality Class SG	CGW1MW08						CGW1MW10		
Sample ID	VEW01-MW13-0116	VEW01-MW13-0117	VEW01-MW13-0118	VEW01-MW13-0119	VEW01-MW13-0120	VEW01-MW13-0121	VEW01-MW13-0122				VEW01-MW08-0117	VEW01-MW08-0118	VEW01-MW08-0119	VEW01-MW08-0120	VEW01-MW08-0121	VEW01-MW08-0122	VEW01-MW10-0509	VEW01-MW10-0116	VEW01-MW10-0117
Sample Date	01/07/16	01/17/17	01/11/18	01/09/19	01/09/20	01/25/21	01/17/22				01/17/17	01/10/18	01/08/19	01/15/20	01/27/21	01/21/22	05/18/09	01/11/16	01/18/17
Chemical Name																			
Dissolved Metals (UG/L)																			
Antimony, Dissolved	0.453 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.453 J	6	5.6	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5 U	1 U	0.375 J	0.5 U
Arsenic, Dissolved	0.336 J	0.298 J	0.25 J	0.253 J	0.2 U	0.152 J	0.128 J	0.336 J	10	10	0.322 J	0.27 J	0.24 J	0.153 J	0.161 J	1 U	5 U	0.256 J	0.306 J
Barium, Dissolved	20.9	17.9	18.3	19	17	18.2	18.3	20.9	2000	-	33.8	35.5	33.5	29.1	30.1	31.6	38.1	48.7	46.3
Beryllium, Dissolved	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1 U	0.1 U	1 U	4	-	0.1 U	0.1 U	0.1 U	0.1 U	1 U	0.5 U	1 U	0.1 U	0.1 U
Cadmium, Dissolved	0.259 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.259 J	5	5	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	1 U	1 U	0.2 U	0.2 U
Chromium, Dissolved	11.4	0.441 U	0.2 U	0.2 U	0.101 J	0.2 U	0.212 U	11.4	100	100	0.348 U	0.2 U	0.2 U	0.2 U	0.2 U	1 U	3 U	0.425 J	0.385 U
Copper, Dissolved	12	0.5 U	0.5 U	0.5 U	0.5 U	0.491 J	0.533 U	12	1300	1300	0.5 U	0.271 J	0.5 U	0.5 U	0.5 U	2.5 U	1.6	0.837 U	1.9 U
Lead, Dissolved	1.64	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1.64	15	15	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.5 U	0.06 J	0.0654 J	0.1 U
Mercury, Dissolved	0.11 U	0.11 U	0.55 U	0.11 U	0.11 U	1.1 U	0.55 U	1.1 U	2	0.05	0.11 U	0.55 U	0.081 J	0.11 U	0.11 U	0.75	0.2 U	0.11 U	0.11 U
Nickel, Dissolved	38.8	0.372 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	38.8	-	610	0.34 J	0.2 U	0.316 U	0.2 U	0.2 U	1 U	4	0.673 U	0.39 U
Selenium, Dissolved	4.38	4.27	3.58	3.39	3.09	3.36	3.45	4.38	50	50	1.86	2.5	2.3	2.06	2.02	2.13 J	2.6 J	2.9	2.85
Thallium, Dissolved	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	2	0.24	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	1 U	1 U	0.2 U	0.2 U

Notes:

Bolded indicates detection

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Blue shading indicates a detection above the MCL and PRWQS

Green shading indicates a detection above MCL, PRWQS, and background

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NA = not analyzed

NG/L = nanograms per liter

R = unreliable result

U = the material was analyzed for, but not detected

UG/L = micrograms per liter

UJ - analyte not detected, quantitation limit may be inaccurate

TABLE 3-2
SWMU 1 Groundwater Detections and Exceedances
Second Five-Year Review Report
Atlantic Fleet Weapons Training Area - Vieques
Vieques, Puerto Rico

Station ID	Background Well							Background Values	EPA MCLs	PR Water Quality Class SG	CGW1MW10					CGW1MW11			
Sample ID	VEW01-MW13-0116	VEW01-MW13-0117	VEW01-MW13-0118	VEW01-MW13-0119	VEW01-MW13-0120	VEW01-MW13-0121	VEW01-MW13-0122				VEW01-MW10-0118	VEW01-MW10-0119	VEW01-MW10-0120	VEW01-MW10-0121	VEW01-MW10-0122	VEW01-MW11-0509	VEW01-MW11-0116	VEW01-MW11-0117	VEW01-MW11-0118
Sample Date	01/07/16	01/17/17	01/11/18	01/09/19	01/09/20	01/25/21	01/17/22				01/15/18	01/08/19	01/08/20	01/26/21	01/18/22	05/12/09	01/12/16	01/18/17	01/12/18
Chemical Name																			
Dissolved Metals (UG/L)																			
Antimony, Dissolved	0.453 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.453 J	6	5.6	0.401 J	0.5 U	0.5 U	0.5 U	2.5 U	2 U	0.348 J	0.5 U	0.5 U
Arsenic, Dissolved	0.336 J	0.298 J	0.25 J	0.253 J	0.2 U	0.152 J	0.128 J	0.336 J	10	10	0.264 J	0.273 J	0.2 U	0.155 J	1 U	10 U	0.857 J	0.793 J	0.526 J
Barium, Dissolved	20.9	17.9	18.3	19	17	18.2	18.3	20.9	2000	-	40.9	45.7	40.5	40.3	39.2	400	111	129	91.2
Beryllium, Dissolved	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1 U	0.1 U	1 U	4	-	0.1 U	0.1 U	0.1 U	1 U	0.5 U	2 U	0.1 U	0.5 U	0.1 U
Cadmium, Dissolved	0.259 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.259 J	5	5	0.2 U	0.2 U	0.2 U	0.2 U	1 U	2 U	0.228 J	0.2 U	0.219 J
Chromium, Dissolved	11.4	0.441 U	0.2 U	0.2 U	0.101 J	0.2 U	0.212 U	11.4	100	100	0.29 U	0.393 U	0.2 U	0.293 U	1 U	6 U	0.62 J	1.08 U	0.2 U
Copper, Dissolved	12	0.5 U	0.5 U	0.5 U	0.5 U	0.491 J	0.533 U	12	1300	1300	3.72 U	0.5 U	1 J	0.5 U	2.5 U	2.8 R	2.93	3.68 U	1.4 U
Lead, Dissolved	1.64	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1.64	15	15	0.164 U	0.1 U	0.1 U	0.1 U	0.5 U	2 U	0.1 U	0.0733 J	0.1 U
Mercury, Dissolved	0.11 U	0.11 U	0.55 U	0.11 U	0.11 U	1.1 U	0.55 U	1.1 U	2	0.05	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.2 U	0.11 U	0.11 U	0.11 U
Nickel, Dissolved	38.8	0.372 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	38.8	-	610	0.759 J	0.709 U	0.2 U	0.2 U	1 U	22.5	2.19	2.31 U	1.25
Selenium, Dissolved	4.38	4.27	3.58	3.39	3.09	3.36	3.45	4.38	50	50	3.11	3.03	2.71	3.03	3.22 J	10 U	0.18 J	0.162 J	0.213 J
Thallium, Dissolved	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	2	0.24	0.2 U	0.2 U	0.2 U	0.2 U	1 U	2 U	0.2 U	0.2 U	0.2 U

Notes:

Bolded indicates detection

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NA = not analyzed

NG/L = nanograms per liter

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UJ - analyte not detected, quantitation limit may be inaccurate

TABLE 3-2
SWMU 1 Groundwater Detections and Exceedances
Second Five-Year Review Report
Atlantic Fleet Weapons Training Area - Vieques
Vieques, Puerto Rico

Station ID	Background Well							Background Values	EPA MCLs	PR Water Quality Class SG	CGW1MW11				CGW1MW13				
Sample ID	VEW01-MW13-0116	VEW01-MW13-0117	VEW01-MW13-0118	VEW01-MW13-0119	VEW01-MW13-0120	VEW01-MW13-0121	VEW01-MW13-0122				VEW01-MW11-0119	VEW01-MW11-0120	VEW01-MW11-0121	VEW01-MW11-0122	VEW01-MW13-0509	VEW01-MW13P-0509	VEW01-MW13-0116	VEW01-MW13-0117	VEW01-MW13-0118
Sample Date	01/07/16	01/17/17	01/11/18	01/09/19	01/09/20	01/25/21	01/17/22				01/10/19	01/08/20	01/26/21	01/18/22	05/20/09	05/20/09	01/07/16	01/17/17	01/11/18
Chemical Name																			
Dissolved Metals (UG/L)																			
Antimony, Dissolved	0.453 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.453 J	6	5.6	5 U	0.5 U	0.5 U	2.5 U	1 U	1 U	0.453 J	0.5 U	0.5 U
Arsenic, Dissolved	0.336 J	0.298 J	0.25 J	0.253 J	0.2 U	0.152 J	0.128 J	0.336 J	10	10	1.26 J	0.202 J	0.233 J	1 U	5 U	5 U	0.336 J	0.298 J	0.25 J
Barium, Dissolved	20.9	17.9	18.3	19	17	18.2	18.3	20.9	2000	-	101	91.4	101	99.9	18.4	18.8	20.9	17.9	18.3
Beryllium, Dissolved	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1 U	0.1 U	1 U	4	-	1 U	0.1 U	1 U	0.5 U	1 U	1 U	0.1 U	0.1 U	0.1 U
Cadmium, Dissolved	0.259 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.259 J	5	5	2 U	0.2 U	0.2 U	1 U	1 U	1 U	0.259 J	0.2 U	0.2 U
Chromium, Dissolved	11.4	0.441 U	0.2 U	0.2 U	0.101 J	0.2 U	0.212 U	11.4	100	100	2 U	0.2 U	0.417 U	1 U	3 U	3 U	11.4	0.441 U	0.2 U
Copper, Dissolved	12	0.5 U	0.5 U	0.5 U	0.5 U	0.491 J	0.533 U	12	1300	1300	5 U	0.376 J	0.5 U	2.5 U	1.1 R	1 R	12	0.5 U	0.5 U
Lead, Dissolved	1.64	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1.64	15	15	1 U	0.1 U	0.1 U	0.5 U	1 U	1 U	1.64	0.1 U	0.1 U
Mercury, Dissolved	0.11 U	0.11 U	0.55 U	0.11 U	0.11 U	1.1 U	0.55 U	1.1 U	2	0.05	0.11 U	0.11 U	0.11 U	0.11 U	0.2 U	0.2 U	0.11 U	0.11 U	0.55 U
Nickel, Dissolved	38.8	0.372 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	38.8	-	610	2.04 U	0.878 U	0.736 J	1 U	2.5 J	1.9	38.8	0.372 J	0.2 U
Selenium, Dissolved	4.38	4.27	3.58	3.39	3.09	3.36	3.45	4.38	50	50	3 U	0.3 U	0.3 U	1.5 U	5.1 J	5	4.38	4.27	3.58
Thallium, Dissolved	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	2	0.24	2 U	0.2 U	0.2 U	1 U	1 U	1 U	0.2 U	0.2 U	0.2 U

Notes:

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NG/L = nanograms per liter

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TABLE 3-2
SWMU 1 Groundwater Detections and Exceedances
Second Five-Year Review Report
Atlantic Fleet Weapons Training Area - Vieques
Vieques, Puerto Rico

Station ID	Background Well							Background Values	EPA MCLs	PR Water Quality Class SG	CGW1MW13			
Sample ID	VEW01-MW13-0116	VEW01-MW13-0117	VEW01-MW13-0118	VEW01-MW13-0119	VEW01-MW13-0120	VEW01-MW13-0121	VEW01-MW13-0122				VEW01-MW13-0119	VEW01-MW13-0120	VEW01-MW13-0121	VEW01-MW13-0122
Sample Date	01/07/16	01/17/17	01/11/18	01/09/19	01/09/20	01/25/21	01/17/22				01/09/19	01/09/20	01/25/21	01/17/22
Chemical Name														
Dissolved Metals (UG/L)														
Antimony, Dissolved	0.453 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.453 J	6	5.6	0.5 U	0.5 U	0.5 U	0.5 U
Arsenic, Dissolved	0.336 J	0.298 J	0.25 J	0.253 J	0.2 U	0.152 J	0.128 J	0.336 J	10	10	0.253 J	0.2 U	0.152 J	0.128 J
Barium, Dissolved	20.9	17.9	18.3	19	17	18.2	18.3	20.9	2000	-	19	17	18.2	18.3
Beryllium, Dissolved	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1 U	0.1 U	1 U	4	-	0.1 U	0.1 U	1 U	0.1 U
Cadmium, Dissolved	0.259 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.259 J	5	5	0.2 U	0.2 U	0.2 U	0.2 U
Chromium, Dissolved	11.4	0.441 U	0.2 U	0.2 U	0.101 J	0.2 U	0.212 U	11.4	100	100	0.2 U	0.101 J	0.2 U	0.212 U
Copper, Dissolved	12	0.5 U	0.5 U	0.5 U	0.5 U	0.491 J	0.533 U	12	1300	1300	0.5 U	0.5 U	0.491 J	0.533 U
Lead, Dissolved	1.64	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1.64	15	15	0.1 U	0.1 U	0.1 U	0.1 U
Mercury, Dissolved	0.11 U	0.11 U	0.55 U	0.11 U	0.11 U	1.1 U	0.55 U	1.1 U	2	0.05	0.11 U	0.11 U	1.1 U	0.55 U
Nickel, Dissolved	38.8	0.372 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	38.8	-	610	0.2 U	0.2 U	0.2 U	0.2 U
Selenium, Dissolved	4.38	4.27	3.58	3.39	3.09	3.36	3.45	4.38	50	50	3.39	3.09	3.36	3.45
Thallium, Dissolved	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	2	0.24	0.2 U	0.2 U	0.2 U	0.2 U

Notes:

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Blue shading indicates a detection above the MCL and PRWQS

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MG/L = milligrams per liter

NA = not analyzed

NG/L = nanograms per liter

R = unreliable result

U = the material was analyzed for, but not detected

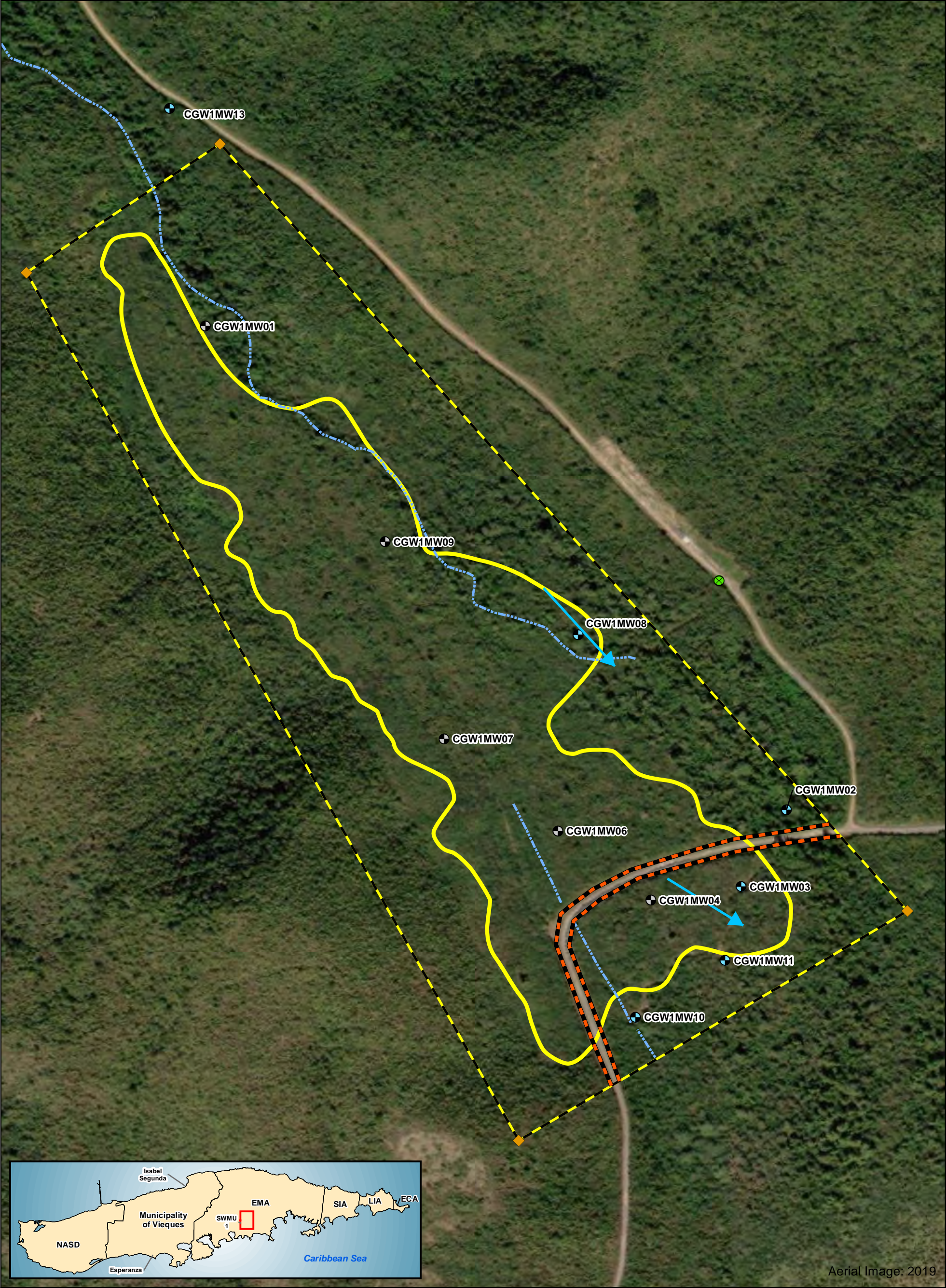
UG/L = micrograms per liter

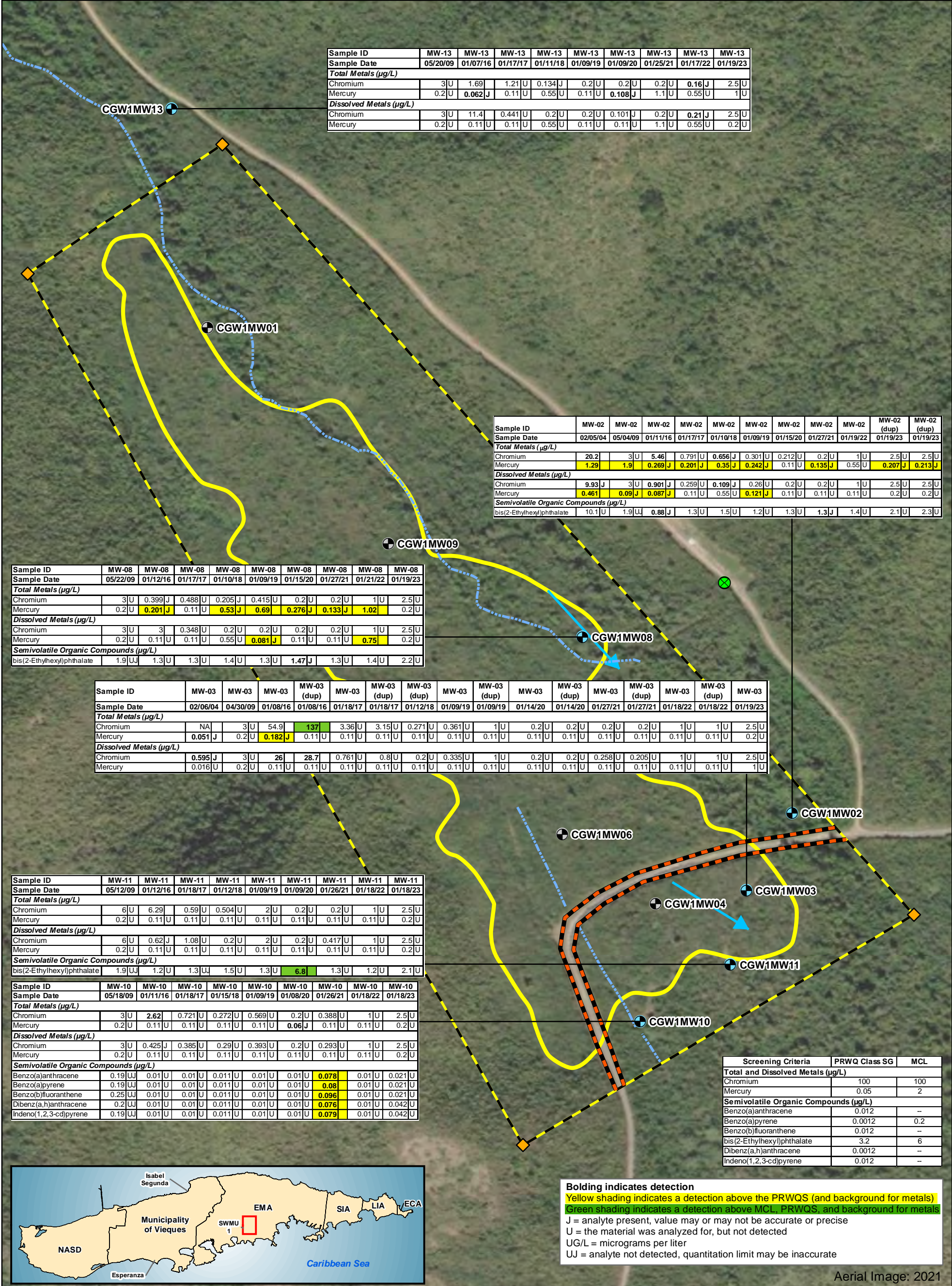
UJ - analyte not detected, quantitation limit may be inaccurate

TABLE 3-3

SWMU 1 Risk Assessment Results*Second Five-Year Review Report**Atlantic Fleet Weapons Training Area - Vieques**Vieques, Puerto Rico*

Media	Human Health Risk	
	Current/Future Trespasser	Current/Future USFWS Worker
Ephemeral Stream Surface Soil	ELCR = 1×10^{-6} and HI = 0.1 Acceptable	ELCR = 5×10^{-7} and HI = 0.003 Acceptable
Landfill Cover Surface Soil	ELCR = 6×10^{-7} and HI = 0.04 Acceptable	ELCR = 1×10^{-7} and HI = 0.001 Acceptable
Subsurface Soil	No Exposure Pathway ^a	ELCR = 3×10^{-5} and HI = 1.0 Acceptable ¹
Groundwater	No Exposure Pathway ^a	No Exposure Pathway ¹
<p>ELCR – excess lifetime cancer risk</p> <p>HI – hazard index</p> <p>^a A Land Use Control will be implemented to restrict debris and subsurface soil disturbance, occupied buildings, and potable use of groundwater (data supports that the site's impacts to groundwater are negligible). The Land Use Control is a legal or administrative mechanism that restricts the use of or limits access to prevent or reduce risks to human health and the environment. The Land Use Control and heavy vegetation at SWMU 1 will prevent unauthorized and uncontrolled subsurface excavation and groundwater use, which will result in no potential exposure to debris, contaminated subsurface soil, or groundwater at the site.</p>		
Media	Ecological Risk	
	All Receptors	
Surface Soil	Acceptable	





Bolding indicates detection
Yellow shading indicates a detection above the PRWQS (and background for metals)
Green shading indicates a detection above MCL, PRWQS, and background for metals
J = analyte present, value may or may not be accurate or precise
U = the material was analyzed for, but not detected
UG/L = micrograms per liter
UJ = analyte not detected, quantitation limit may be inaccurate

AOC E – Former Underground Storage Tank Area

4.1 Site Chronology

Previous removals, environmental investigations, pilot studies, and remedial action conducted at AOC E, beginning in 1996 are summarized in Table 4-1.

4.2 Site Background

4.2.1 Description and History

AOC E is the site of a former 500-gallon UST and former 500-gallon aboveground storage tank (AST) that stored used oil from vehicle maintenance activities. The site is less than a tenth of an acre located within the main operation area of the former NASD, which is now part of the Municipality of Vieques (MOV) Public Works facility (Figure 4-1). During its operation, oil was removed from vehicles on the vehicle service platform and drained to the UST via an underground pipe between the platform and the UST (Figures 4-2 and 4-3). The UST was used from about 1970 until its removal and replacement in 1996 by the AST, which was subsequently removed in 2001. Leaks from the former UST resulted in localized petroleum related groundwater contamination.

AOC E is located on property that was transferred to the MOV as part of a Quitclaim Deed that transferred the former NASD property to the MOV, DOI, and the PRCT. Access to the Public Works facility, where AOC E is located, is restricted from the public by the MOV.

4.2.2 Physical Characteristics

AOC E is approximately 43 feet amsl and relatively flat. No surface water bodies are located at or immediately adjacent to AOC E. The site is covered primarily with periodically mowed grass, weeds, and scrub brush. Prior to the 2017 hurricanes, there were several structures including Buildings 2015 and 2016 and a concrete vehicle maintenance ramp present at AOC E (Figure 4-2). However, Building 2016, the former vehicle maintenance and transportation shop, was destroyed and collapsed during the 2017 hurricanes. Building 2015, although also heavily damaged by the hurricanes, remains standing and is currently not occupied. The site is fenced to discourage trespassing. Because it is developed and periodically maintained, the site has no significant ecological habitat.

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

4.2.3 Land and Resource Uses

The site is vacant except for periodic (approximately once per year) maintenance of site vegetation. In addition, there is no continuous or daily human occupancy of the building located immediately adjacent to AOC E (i.e., Building 2015). As noted previously, because it is developed and periodically maintained, the site has no significant ecological habitat. The site is also located a significant distance from any of the established conservation zones and wildlife landing and nesting areas; therefore, ecological habitat in the area is insignificant.

Groundwater beneath AOC E 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 waters that support ecological communities of exceptional ecological value. However, groundwater at AOC E is not currently used as a potable water source. Once the groundwater RGs are met, future potable use of groundwater at AOC E is plausible. No archaeological or cultural resources are located within AOC E.

4.2.4 History of Contamination

Based on the historical activities and extent of contamination identified during the RI and related investigations, the release mechanism at the site was from subsurface leaks from the former UST and associated piping. Therefore, the primary route of contaminant migration is vertical leaching through soil to groundwater and subsequent transport with groundwater flow in the saprolite. Because the saprolite consists of relatively “tight” clay and the hydraulic gradient across the site is low, the rate of contaminant transport has been demonstrated to be very low, as evinced by the general absence of groundwater contamination within tens of feet downgradient of the former source.

Historically, groundwater contamination at AOC E was defined by six COCs: 1,2-dichloroethane (1,2-DCA), benzene, methyl tert butyl ether (MTBE), xylenes, 2-methylnaphthalene, and naphthalene. Groundwater contamination occurs within a small area and is localized to three monitoring wells (MW-01, MW-04, and MW-05); separate phase petroleum had been observed at these monitoring wells but was removed during the multi-phase extraction (MPE) and in situ chemical oxidation (ISCO) pilot studies. During the ISCO pilot study, concentrations of COCs declined to non-detect levels. However, concentrations of benzene, 1,2-DCA, and MTBE rebounded above RGs, necessitating implementation of additional ISCO treatment in accordance with the ROD, as discussed in Section 4.3.

4.2.5 Site Risks

The HHRA and ERA conducted for AOC E are described in the Remedial Investigation Report, Area of Concern (AOC) E (CH2M, 2008a), and are summarized in the following subsections and the results are presented in Table 4-2.

Human Health

The only unacceptable human health risk identified based on exposure scenarios at AOC E was for a hypothetical resident exposed to groundwater. Prior to implementation of the remedial action, the HHRA identified 1,2-DCA, 2-methylnaphthalene, MTBE, naphthalene, and xylenes as COCs. Benzene was included as a COC because its concentration in groundwater exceeded the federal MCL.

Ecological Risk

A Screening Ecological Risk Assessment (SERA), constituting Steps 1 and 2 of the ERA process, and the refinement step (Step 3A) of a Baseline Ecological Risk Assessment (BERA), were conducted at AOC E. Potentially complete pathways evaluated included lower-trophic level receptors (plants and soil invertebrates) and upper-trophic level receptors (birds and mammals) exposed to surface soil. Although some inorganic and organic COPCs were identified at Step 2, none were retained as COPCs following the Step 3A refinement. Thus, no unacceptable risks to potential ecological receptors were identified. Details of the ERA can be found in the RI Report (CH2M, 2008a).

4.3 Remedial Action Summary

4.3.1 Basis for Taking Action

Based on the results of previous investigations, pilot studies, and removal actions, remedial action was deemed warranted to protect public health, welfare, and the environment from actual or threatened releases of volatile organic compounds (VOCs) and SVOCs in groundwater at AOC E.

4.3.2 Response Action

The following RAO was developed for groundwater contamination and potential exposure routes and receptors at AOC E:

- Prevent exposure to COCs in groundwater at concentrations above remediation goals.

The remedy selected in the AOC E ROD (NAVFAC, 2015a) is Groundwater Monitoring and Institutional Controls with Contingency Plans to address the potential for persistent persulfate (Contingency Plan 2a) and COC rebound

(Contingency Plan 2b). The components of the remedy include groundwater monitoring to ensure persulfate concentrations decline, annual groundwater monitoring of COCs for a minimum of 3 years after persulfate levels decline to ensure COC concentrations remain below RGs, and implementing ICs to restrict potable groundwater use until the RAO is met. Contingency Plan 2a includes injection of a hydrogen peroxide solution to accelerate residual persulfate (above 500 mg/L) decline if an overall decline is not demonstrated after three successive monitoring events. Contingency Plan 2b includes injection of hydrogen peroxide-activated sodium persulfate in wells in which rebound is observed if COC concentrations above RGs are observed and persist after three successive annual monitoring events. Because the RGs are protective for drinking water consistent with the RAOs, achieving response complete will ensure groundwater has been restored to potential beneficial reuse as potable water.

Several pre-ROD cleanup activities and pilot studies were conducted at AOC E. The 500-gallon UST that stored used oil from vehicle maintenance activities and 110 cubic yards of contaminated soil adjacent to the UST were removed in 1996 (Reliable, 1997). The UST was replaced with a 500-gallon AST. The 500-gallon AST which replaced the former 500-gallon UST was removed when Navy operations at the site ceased in 2001.

In 2002, a total of approximately 11,000 gallons of free-phase product and groundwater were recovered at the site during an MPE pilot study to evaluate the effectiveness of this technology in removing free-phase contamination (CH2M, 2008b). The pilot study appears to have been effective because no appreciable free-phase product has been observed in site wells since that time.

In 2011, a soil denitrification-based bioremediation pilot study consisting of injecting calcium nitrate into the soil to ensure that the concentrations of petroleum hydrocarbons in the unsaturated zone remained below levels representing a soil- to-groundwater leaching concern was conducted to address potential soil-to-groundwater leaching (CH2M, 2012b). The conclusion of the soil pilot study was that both the pre- and post-pilot study soil data show the Synthetic Precipitation Leaching Procedure (SPLP) concentrations of COCs in soil are likely significantly below concentrations indicative of a soil-to-groundwater leaching concern (i.e., leaching that may result in groundwater concentrations above likely cleanup levels). Based on this and the risk assessments performed during the RI, no soil remedy was necessary at AOC E and soil was not included in the Focused FS remedial alternatives evaluation.

In 2010-2011, a groundwater ISCO pilot study was conducted using persulfate to evaluate whether the technology could reduce contaminant concentrations in groundwater below regulatory standards and reduce the time required to achieve those levels relative to the time it would take under natural conditions (CH2M, 2012b). Pilot Study goals were developed based upon the EPA MCLs or other standards for constituents without MCLs. The ISCO pilot test was effective in reducing the concentration of contaminants in groundwater to below regulatory standards.

4.3.3 Status of Implementation

As noted previously, a ROD was issued to monitor COC concentrations in response to the ISCO pilot treatment and to implement, monitor, and maintain LUCs until the groundwater RAO was achieved. Post-ROD performance groundwater monitoring demonstrated the concentrations of three COCs (i.e., naphthalene, 2-methylnaphthalene, and xylenes) were either not detected (xylenes) or were detected an order of magnitude or more below the RGs (naphthalene and 2-methylnaphthalene) during the three post-ROD groundwater monitoring events. Furthermore, none of these three was detected during the third event. Therefore, based on these COCs achieving and sustaining their RGs, they were eliminated from further monitoring, as documented in the Remedial Action Work Plan Addendum, Area of Concern E (CH2M, 2018a). However, concentrations of the three remaining COCs (i.e., benzene, 1,2-DCA, and MTBE) rebounded above RGs and persisted in wells MW-01 and MW-05 after three successive years of annual monitoring. Therefore, Contingency Plan 2 was implemented in October/November 2018 and annual groundwater sampling resumed in accordance with the Remedial Action Work Plan Addendum (CH2M, 2018a).

Following implementation of Contingency Plan 2, two informational sampling events were performed in 2019 and 2020 while persulfate levels remained elevated. Once residual persulfate concentrations returned to normal,

three sampling events were conducted in 2021, 2022, and 2023 to provide definitive COC concentrations. The results of these three events demonstrated the concentrations of two of the three remaining COCs (i.e., benzene and 1,2-DCA) were either non-detect or were below their RGs for three consecutive events. The concentrations of the remaining COC (i.e., MTBE), while above its RG in one well (i.e., MW-05) during two of the three events, was observed to be below its RG during the 2023 event. The results of the remedial action implementation and achievement of the RIP milestone are documented in the Interim Remedial Action Completion Report (IRACR) (CH2M, 2019e).

Implementation and monitoring and maintenance details for LUCs as detailed in the Remedial Action Work Plan, Groundwater Monitoring and Institutional Controls with Contingency Plans, Area of Concern E (CH2M, 2015a) are:

- The AOC E boundary shown in Figure 4-2 is from the April 30, 2001 Quitclaim Deed between the Navy and the MOV. Potable use of groundwater within this boundary will be prevented until the RAO is met via both engineering controls (e.g., fencing) and administrative controls (e.g., signage, terms within the quitclaim deed). The RAO will have been achieved once groundwater data from three consecutive groundwater sampling events indicate COC concentrations in groundwater are below RGs in all wells. When this is achieved, a Remedial Action Completion Report (RACR) will be prepared to document RC.
- Bilingual (Spanish and English) signs prohibiting trespassing were installed along the fence, including on the gate, at the approximate locations shown in Figure 4-2.
- During each annual groundwater monitoring event, the fence (including gate and lock) along and within the LUC boundary, the associated signs, and the LTM wells are inspected. Repairs/replacements are made as necessary to ensure structural integrity. In addition, the area is inspected for signs of trespassing. As needed, vegetation along and within the LUC boundary is cut to facilitate sign/fence inspection and groundwater sampling. Additional inspections will be conducted if unusual events occur that may threaten the integrity of the LUCs (e.g., hurricanes). The inspection forms are filled out during each inspection (completed inspection forms can be found in Appendix D).
- The Navy shall notify EPA and PRDNER as soon as practicable, but within one week, of the discovery of any activity at AOC E inconsistent with the LUC objective stated previously, and the corrective action that has or will be implemented, including the anticipated timeframe.
- The Navy shall certify during each monitoring event that the LUCs remain properly implemented and any deficiencies or inconsistent uses have been addressed. The LUCs shall be maintained until the RAO is met. The Navy shall not modify or terminate LUCs, implement actions, or modify land use without approval from both EPA and PRDNER. The Navy shall seek prior concurrence before any anticipated action that may disrupt the effectiveness of the LUCs or any action that may alter or negate the needs of LUCs.

4.4 Progress Since the Last Review

The 2018 FYR Report (CH2M, 2018b) protectiveness determination for AOC E stated: "The remedy for AOC E is expected to be protective of human health and the environment upon completion of Contingency Plan 2. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks. Implementation of Contingency Plan 2b in accordance with the ROD is intended to reduce rebounded COC concentrations to below the RGs and accelerate progress toward meeting the RGs and eventual site closure. The LUCs associated with the AOC E remedy are effective in protecting human health and the environment by controlling exposure pathways that could result in unacceptable risks and will remain in place as part of the long-term management of AOC E until the COC RGs are met."

The previous FYR did not include any issues and recommendations related to AOC E. However, as stated in Section 4.3.3, implementation of Contingency Plan 2 has demonstrated a decline in benzene and 1,2-DCA to levels below the RGs. MTBE has also exhibited a decrease and will continue to be monitored.

4.5 Five-Year Review Process

4.5.1 Site Inspection

A FYR inspection was performed for AOC E on August 23, 2022 (Appendix D). Observations did not find anything that affected the overall remedy protectiveness.

4.5.2 Data Review

Four annual monitoring events (2020 through 2023) were completed since the first FYR. In addition to evaluating the condition of LUCs, LTM included groundwater level monitoring and groundwater sampling at the wells shown in Figure 4-2. All eight monitoring wells were used for groundwater level monitoring and wells MW-01, MW-04, and MW-05 were used for groundwater sampling. This approach was deemed appropriate by the Navy and regulatory agency because the area of contamination is confined to a very localized area and historical data have shown contamination has not migrated further downgradient, likely due to the relatively low permeability of the saturated zone. Results of AOC E annual monitoring are presented in the following documents:

- Area of Concern E Remedial Action Annual Status Report 2020, Atlantic Fleet Weapons Training Area – Vieques, Former Vieques Naval Ammunition Support Detachment, Vieques, Puerto Rico (CH2M, 2020b)
- Area of Concern E Remedial Action Annual Status Report 2021, Groundwater Monitoring, Land Use Control Monitoring and Maintenance, Atlantic Fleet Weapons Training Area – Vieques, Former Vieques Naval Ammunition Support Detachment, Vieques, Puerto Rico (CH2M, 2022a)
- Area of Concern E Remedial Action Annual Status Report 2022, Groundwater Monitoring, Land Use Control Monitoring and Maintenance, Atlantic Fleet Weapons Training Area – Vieques, Former Vieques Naval Ammunition Support Detachment, Vieques, Puerto Rico (CH2M, 2022g)
- Area of Concern E Remedial Action Annual Status Report 2023, Groundwater Monitoring, Land Use Control Monitoring and Maintenance, Atlantic Fleet Weapons Training Area – Vieques, Former Vieques Naval Ammunition Support Detachment, Vieques, Puerto Rico (CH2M, 2023e)

Evaluation of the results of the four annual event activities found:

- Figure 4-3 provides the concentrations of the three remaining COCs (benzene, 1,2-DCA, and MTBE) during the 2020 through 2023 annual sampling events as well as historical sampling events. These are the same data that have been shown and discussed in the various annual reports. Pertinent information regarding groundwater monitoring at AOC E are:
 - As conventionally interpreted, there is no groundwater “plume” at AOC E. The area of contamination is very small and localized, delimited by three monitoring wells spaced 20 feet or less apart. Historical sampling of wells located further downgradient of these three wells (i.e., MW-02, MW-07, and MW-08), as well as those located upgradient (MW-03) and side-gradient (MW-06) historically showed no impact from site-related contamination over a decade or more of monitoring. These wells were either never included in LTM sampling (MW-02 and MW-06) or subsequently eliminated from LTM sampling (MW-03, MW-07, and MW-08) with regulatory concurrence based on continued demonstration of no impact from site-related contamination.
 - 1,2-DCA (PRWQS-based RG = 3.8 µg/L)
 - 1,2-DCA was non-detect in the most down-gradient well currently included in the LTM sampling program (MW-04) in the two informational events conducted in 2019 and 2020, the three subsequent events conducted in 2021 through 2023, and as far back as 2008.

- Within the original source area (represented by wells MW-01 [former tank location] and MW-05 [former piping location]), 1,2-DCA has been mostly non-detect, with sporadic detections below the reporting limit and an order of magnitude below the RG since the contingency ISCO injection was performed in 2018.
- Benzene (MCL and PRWQS-based RG = 5 µg/L)
 - Benzene has been non-detect in downgradient well MW-04 in each sampling event performed since the 2018 ISCO injection.
 - Similarly, benzene has been consistently below the MCL/PRWQS RG in the two source area wells, with no indication of increasing concentrations, since the 2018 ISCO injection.
- MTBE (risk-based RG = 120 µg/L)
 - Following the first applications of ISCO at the site in 2010, MTBE concentrations have been about an order of magnitude or more below the RG in downgradient well MW-04 during each sampling event. The same is true of source area well MW-01.
 - Following the 2010 ISCO injection, MTBE concentrations declined in source area well MW-05 by about 100 µg/L or more, but remained above the RG until the 2023 sampling event, when the concentration in the well was measured as 42 µg/L.
- The concentrations of two of the three remaining COCs (benzene and 1,2-DCA) were already below their respective RGs or were remediated to concentrations below their respective RGs in the three performance monitoring wells MW-01, MW-04, and MW-05 and remained there. Therefore, like three previous COCs (naphthalene, 2-methylnaphthalene, and xylenes) whose concentrations reached and maintained concentrations below their respective RGs, benzene and 1,2-DCA were eliminated from further monitoring.
- Because the concentration of MTBE in well MW-05 was below the RG in 2023, a minimum of two additional annual groundwater sampling events will be performed to determine if it sustains levels below the RG.
- LUCs are in place and functioning as intended. Routine maintenance has been performed to ensure they remain viable. Groundwater at the site is not being utilized by the MOV. Therefore, no changes to LUCs are warranted under the current remedial action.

4.6 Technical Assessment

This section presents the answers to the three questions defined for the Technical Assessment for AOC E based on the evaluation information gathered for this FYR.

4.6.1 Question A: Is the remedy functioning as intended by the decision documents?

Remedial Action Performance

The remedial action, including implementing Contingency Plan 2b, at AOC E has been and remains functioning as intended and continues to meet the RAO established in the ROD because exposure to COCs in groundwater at concentrations remaining above RGs is being prevented through the ongoing inspection and maintenance of site LUCs. As noted previously, the concentrations of five of the six COCs have met and sustained concentrations below their RGs and no longer require monitoring. The concentration of the remaining COC (MTBE) has declined to below its RG, as demonstrated by the 2023 measured concentration, and a minimum of two additional annual events will be performed to determine if it sustains levels below the RG.

System Operations/O&M

According to Region 2 Guidance for Incorporating Climate Change Considerations in Five Year Reviews, three climate change tools were utilized to assess AOC E (Appendix G). Potential site impacts from climate change have been assessed, and the performance of the remedy is currently not at risk due to potential effects of climate change in the region. While hurricanes and named tropical storms may have the ability to impact the remedy

(e.g., storms damage/destroy physical LUCs), the remedy in place already addresses this contingency as it requires post-storm LUC inspections and associated repairs, as warranted.

Implementation of Institutional Controls and Other Measures

LUCs are a component of the AOC E remedial Action, designed to prevent exposure to COCs in groundwater at concentrations above RGs. The location of the physical LUCs (i.e., signage and fencing) for AOC E are shown in Figure 4-2.

No observations were observed during the AOC E Second Five-Year Inspections that would affect overall remedy protectiveness. LUCs are in place and functioning as intended. Routine maintenance has been performed to ensure they remain viable. Groundwater at the site is not being used by the MOV.

4.6.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

Since the AOC E remedy was selected in its ROD, two RGs were considered for modification in the Recommended AOC E Performance Monitoring Optimization memo (CH2M, 2021a) The 1,2-DCA RG is based on the 2010 PRWQS of 3.8 µg/L. In 2019, the PRWQS for 1,2-DCA was revised to 5 µg/L. While it otherwise would be recommended to update the RG to 5 µg/L, because the concentrations of 1,2-DCA have met and sustained the original RG, rendering continued monitoring unnecessary, formal modification of the RG is likewise no longer necessary.

For MTBE, the memo referenced above recommended a revision to the RG based on current groundwater conditions relative to the conditions upon which the RG was originally established. However, no changes to the RG will be made at this time.

Notwithstanding the above information regarding the RGs, the current and reasonably anticipated future land use remains industrial, with no existing, planned, or likely groundwater use. With or without modification to RG(s), the RAO remains applicable, which requires no exposure to groundwater COCs at concentrations above RGs. Furthermore, revisions that have occurred to standards or toxicity values associated with various COCs would result in less conservative RGs. While MTBE is still undergoing evaluation with respect to sustaining concentrations below its RG, fencing present at AOC E that prevents potential receptor exposure to contaminated groundwater remains effective. For the ERA, the ecological exposure assumptions and toxicity data used to support the assessment are still valid.

4.6.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has come to light that yields uncertainty in the remedy protectiveness. The remedy at AOC E remains protective of human health and the environment with continuing LUC maintenance and monitoring to prevent receptor exposure to contaminated groundwater above the RG.

4.6.4 Technical Assessment Summary

Based on the information presented herein, the remedy for AOC E is functioning as intended by the ROD.

4.7 Issues/Recommendations

No issues were identified during the Second FYR that would inhibit the ability of the remedy to be protective and achieve the associated RAO. Therefore, because no issues were identified that affect remedy protectiveness, no recommendations for follow-up actions are necessary.

4.8 Other Findings

No other findings were identified.

4.9 Protectiveness Statement

Protectiveness Statement(s)		
<i>Operable Unit:</i> AOC E	<i>Protectiveness Determination:</i> Protective	<i>Planned Addendum Completion Date:</i> N/A
<i>Protectiveness Statement:</i> <p>The remedy at AOC E is currently and is anticipated to remain protective of human health and the environment. LUCs were implemented, are monitored/maintained, and have been shown to effectively reduce the potential for exposure to groundwater COCs at concentrations above RGs. In addition, groundwater LTM has demonstrated a decline in all COC concentrations to below RGs, pending at least two additional rounds of annual sampling to demonstrate stable or further declining concentrations of the remaining COC (MTBE) below its RG.</p>		

TABLE 4-1
AOC E Previous Investigations and Document Summaries
Second Five-Year Review Report
Atlantic Fleet Weapons Training Area-Vieques
Vieques, Puerto Rico

Previous Investigation*	Date	Investigation Activities
UST Removal	1996	The 500-gallon UST that stored used oil from vehicle maintenance activities and 110 cubic yards of contaminated soil adjacent to the UST were removed (Reliable, 1997). The UST was replaced with a 500-gallon AST.
Site Characterization	1998	A site characterization was conducted in 1998 and included collecting 8 soil samples and the installation and sampling of 3 monitoring wells. At that time, the site was designated Site 2016. Laboratory results showed exceedances of regulatory standards for several soil and groundwater samples (CH2M, 1999).
Expanded Preliminary Assessment/Site Inspection	2000	An Expanded PA/SI was conducted to assess impacts to site groundwater from releases from the former UST. It included installing and sampling 3 monitoring wells and sampling 2 existing monitoring wells. The Expanded PA/SI indicated that there had been a release of petroleum hydrocarbons to groundwater and recommended an RI/FS (CH2M, 2000).
AST Removal	2001	The 500-gallon AST which replaced the former 500-gallon UST in 1996 was removed when Navy operations ceased in 2001. There were no documented releases from the AST.
Initial Remedial Investigation	2002, 2003	An initial RI was conducted in 2002 and 2003. The RI field work included collecting 20 soil samples to help characterize the horizontal and vertical extent of soil contamination. In addition, 2 additional monitoring wells were installed and sampled and 4 existing monitoring wells were sampled (CH2M, 2008).
Multiphase Extraction Pilot Study	2002	An MPE pilot study was conducted in 2002 to evaluate the effectiveness of this technology in removing free-phase contamination. A total of approximately 11,000 gallons of free-phase product and groundwater were recovered at a cost of approximately \$113,000 (CH2M, 2008). The pilot study was shown to be successful because no appreciable free-phase product has been observed in site wells since that time.
Supplemental Remedial Investigation	2004, 2005	A Supplemental RI was conducted in 2004-2005 and included collecting groundwater samples from all 8 monitoring wells and additional soil samples (CH2M, 2008). The Supplemental RI also included conducting human health and ecological risk assessments, which are summarized in Section 3.2.5.
Soil Denitrification-Based Bioremediation Pilot Study	2010, 2011	It was concluded based on the RI that there was no unacceptable risk associated with exposure to AOC E soil; therefore, no COCs were identified (CH2M, 2008). However, a soil DBB pilot study was conducted to address potential soil-to-groundwater leaching (CH2M, 2012). The pilot study consisted of injecting calcium nitrate into the soil to ensure that the concentrations of petroleum hydrocarbons in the unsaturated zone remained below levels representing a soil-to-groundwater leaching concern.
Groundwater In Situ Chemical Oxidation Pilot Study	2010, 2011	A groundwater ISCO pilot study was conducted in 2010-2011 using persulfate to evaluate whether the technology could reduce contaminant concentrations in groundwater below regulatory standards and reduce the time required to achieve those levels relative to the time it would take under natural conditions (CH2M, 2012). Pilot Study goals were developed based upon the EPA MCLs or other

TABLE 4-1

AOC E Previous Investigations and Document Summaries*Second Five-Year Review Report**Atlantic Fleet Weapons Training Area-Vieques**Vieques, Puerto Rico*

Previous Investigation*	Date	Investigation Activities
		standards for constituents without MCLs. The ISCO pilot test indicated ISCO to be effective in reducing the concentration of contaminants in groundwater below remedial goals.
Focused Feasibility Study	2012	Because of the presence of residual persulfate levels, an FFS was conducted in 2012 to evaluate groundwater remedial alternatives at AOC E.
Record of Decision	2015	A ROD for AOC E was signed in which the Navy and EPA jointly selected the remedy of groundwater monitoring and institutional controls for the site, with concurrence of PREQB in 2014 (NAVFAC, 2015).
Remedial Action Work Plan, Groundwater Monitoring and Institutional Controls with Contingency Plans	2015	This document describes how the remedial action will be implemented in order to meet the RAO to prevent exposure to COCs in groundwater at concentrations above remedial goals (RGs) by addressing the residual persulfate from the ISCO pilot study and the potential for “rebound” of COCs above regulatory levels once the persulfate levels return to normal.
Area of Concern E, Remedial Action Annual Status Report	2017-2023	These status reports present the 2015 through 2017 and 2020 through 2023 annual groundwater monitoring events and land use control (LUC) inspection activities at AOC E. These documents include summary results of the persulfate screening and groundwater sampling, conclusions based on the analytical results each year, and, recommendations for further site activities based on the ROD (2015). Benzene, 1,2-dichloroethane (1,2-DCA) and methyl tert-butyl ether (MTBE) were detected above their respective RGs during each of the three consecutive post-ROD sampling events (2015-2017). Therefore, in compliance with the ROD Contingency Plan 2 (CP-2) (NAVFAC, 2015), an additional ISCO injection using activated persulfate was conducted for wells in which rebound was observed. The ISCO injection was performed in accordance with the RAWP Addendum (CH2M, 2018) from October to November 2018. The groundwater sampling results from events occurring in February 2019, January 2020 were deemed for “informational purposes only” due to the persulfate field screening results. The February 2021 event serves as the first post-ISCO performance monitoring event because all persulfate concentrations were either non-detect or at a level that could be quenched by 10 mg/L ascorbic acid preservative.
Remedial Action Work Plan Addendum	2018	This RAWP Addendum presents the in situ chemical oxidation (ISCO) injection procedures for implementing hydrogen peroxide-activated sodium persulfate (Contingency Plan 2) to address persistent remedial goal (RG) exceedances in groundwater, in accordance with the ROD (2015) and the RAWP (2015).
Area of Concern E Interim Remedial Action Completion Report	2019	This IRACR documents the implementation of Contingency Plan 2 remedial action, injection of hydrogen peroxide-activated sodium persulfate to stimulate COC degradation in the Contamination Area, per the RAWP (2015) and RAWP Addendum (2018). The report summarizes the ISCO injection activities, during which both a 4.7% sodium persulfate mixture and a 2 % solution of hydrogen peroxide was injected into MW-01 and MW-05. Documents achievement of the remedy in place milestone.

TABLE 4-1

AOC E Previous Investigations and Document Summaries*Second Five-Year Review Report**Atlantic Fleet Weapons Training Area-Vieques**Vieques, Puerto Rico*

Previous Investigation*	Date	Investigation Activities
Recommended AOC E Groundwater Performance Monitoring Optimization	2021	This document is a technical memorandum which proposes optimization of the Area of Concern (AOC) E performance groundwater monitoring in consideration of the (a) current groundwater conditions documented, (b) changes to regulatory standards since the ROD and (c) the reduced number of chemicals of concern (COCs) remaining in groundwater resulting from remedial action implemented at AOC E.
Recommended AOC E Groundwater Performance Monitoring Optimization Technical Memorandum	2022	Letter documenting discussion with EPA on February 1, 2022 regarding the review comments and responses associated with the <i>Recommended AOC E Groundwater Performance Monitoring Optimization Technical Memorandum</i> submitted as part of the 2021 AOC E Annual Status Report. The initial comments were provided to the Navy on October 20, 2021, with subsequent follow up comments provided in various emails. Document memorializes EPA concurrence to continue groundwater monitoring in accordance with the RAWP Addendum (2015).

* Documentation associated with the listed activities is available in the Administrative Record and provides detailed information used to support the remedy selection for AOC E.

AOC = Area of Concern

AST = aboveground storage tank

COC = contaminant of concern

DDB = denitrification-based bioremediation

FFS = Focused Feasibility Study

ISCO = in situ chemical oxidation

MCL = maximum contaminant level

MPE = Multiphase Extraction

PA/SI = Preliminary Assessment/Site Inspection

PREQB = Puerto Rico Environmental Quality Board

RI/FS = Remedial Investigation/Feasibility Study

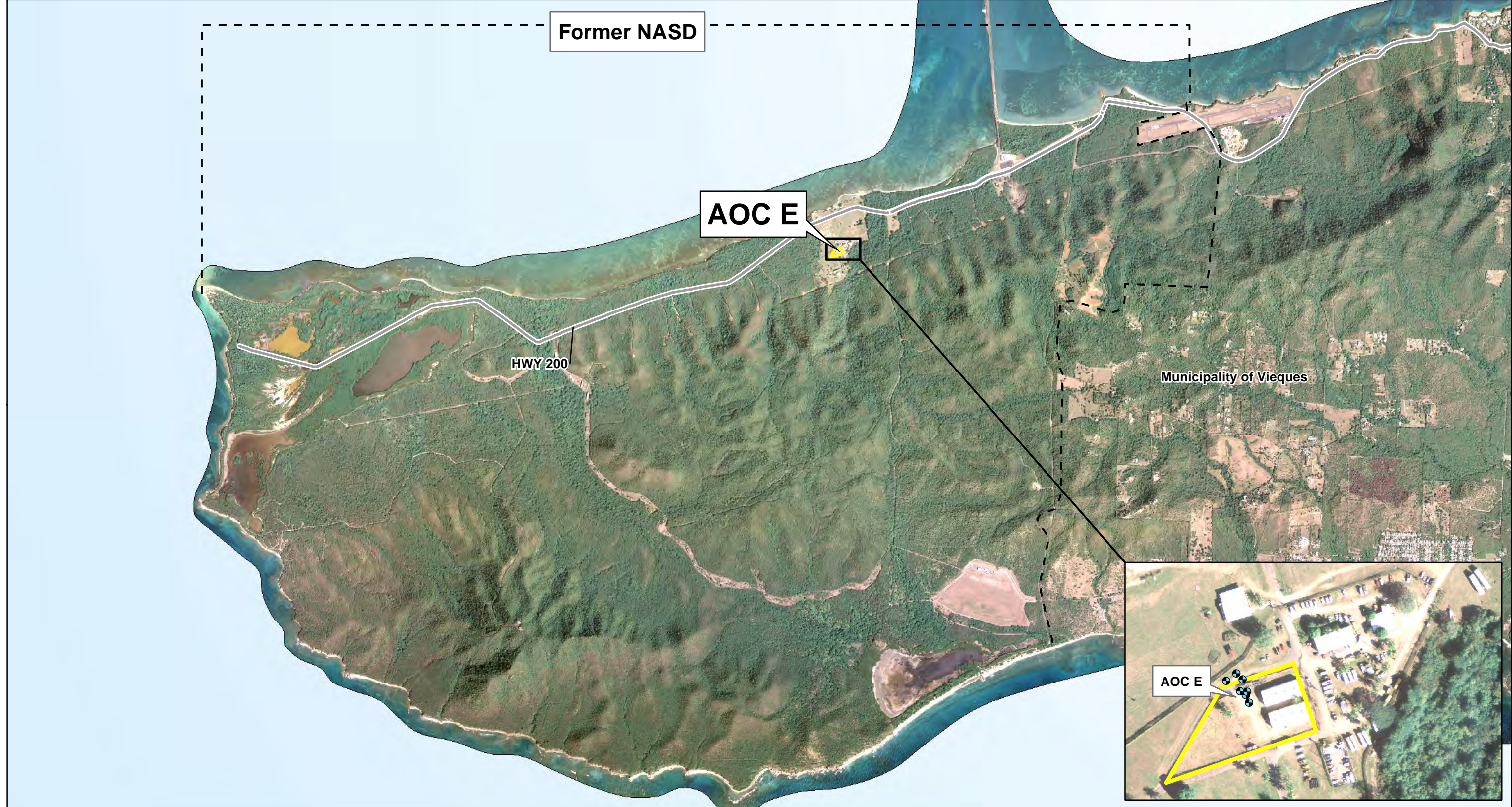
ROD = Record of Decision

UST = underground storage tank

TABLE 4-2

AOC E Risk Assessment Results*Second Five-Year Review Report**Atlantic Fleet Weapons Training Area-Vieques**Vieques, Puerto Rico*

Media	Human Health Risk				
	Maintenance Workers	Recreational Users¹	Construction Workers	Industrial Workers¹	Residents
Surface Soil (0-2 feet)	No COPCs	ELCR = 3×10^{-7} and HI = 0.2 Acceptable	No COPCs	No COPCs	ELCR = 1×10^{-6} and HI = 0.7 Acceptable
Total Soil (0-6 feet)	No Exposure Pathway	No Exposure Pathway	No COPCs	No COPCs	ELCR = 1×10^{-6} and HI = 0.7 Acceptable
Groundwater	No Exposure Pathway	No Exposure Pathway	No Exposure Pathway	ELCR = 6×10^{-5} and HI = 1.0 Acceptable	ELCR = 3×10^{-7} and HI = 7 Unacceptable
COPC – chemical of potential concern ELCR – excess lifetime cancer risk; unacceptable ELCR > 1×10^{-4} HI – hazard index; unacceptable HI > 1 ¹ ELCR and HI values based on pre-ISCO pilot study data; all COC concentrations reduced to below regulatory standards during subsequent ISCO pilot study.					
Media	Ecological Risk				
	All Receptors				
Soil	Acceptable				



Legend

- LTM Monitoring Well
- Road
- AOC E Land Use Control Boundary

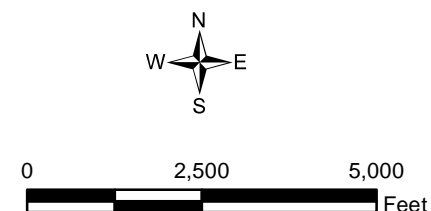


Figure 4-1
AOC E Site Location Map
Second Five-Year Review Report
Atlantic Fleet Weapons Training Area - Vieques
Former Naval Ammunition Support Detachment
Vieques, Puerto Rico



- Legend**
- Sign
 - Performance Monitoring Well
 - Water-Level Monitoring Well
 - Estimated Direction of Groundwater Flow
 - × Fence
 - AOC E Land Use Control Boundary

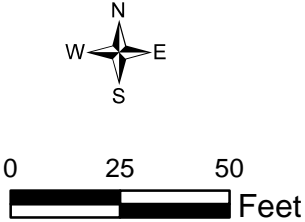
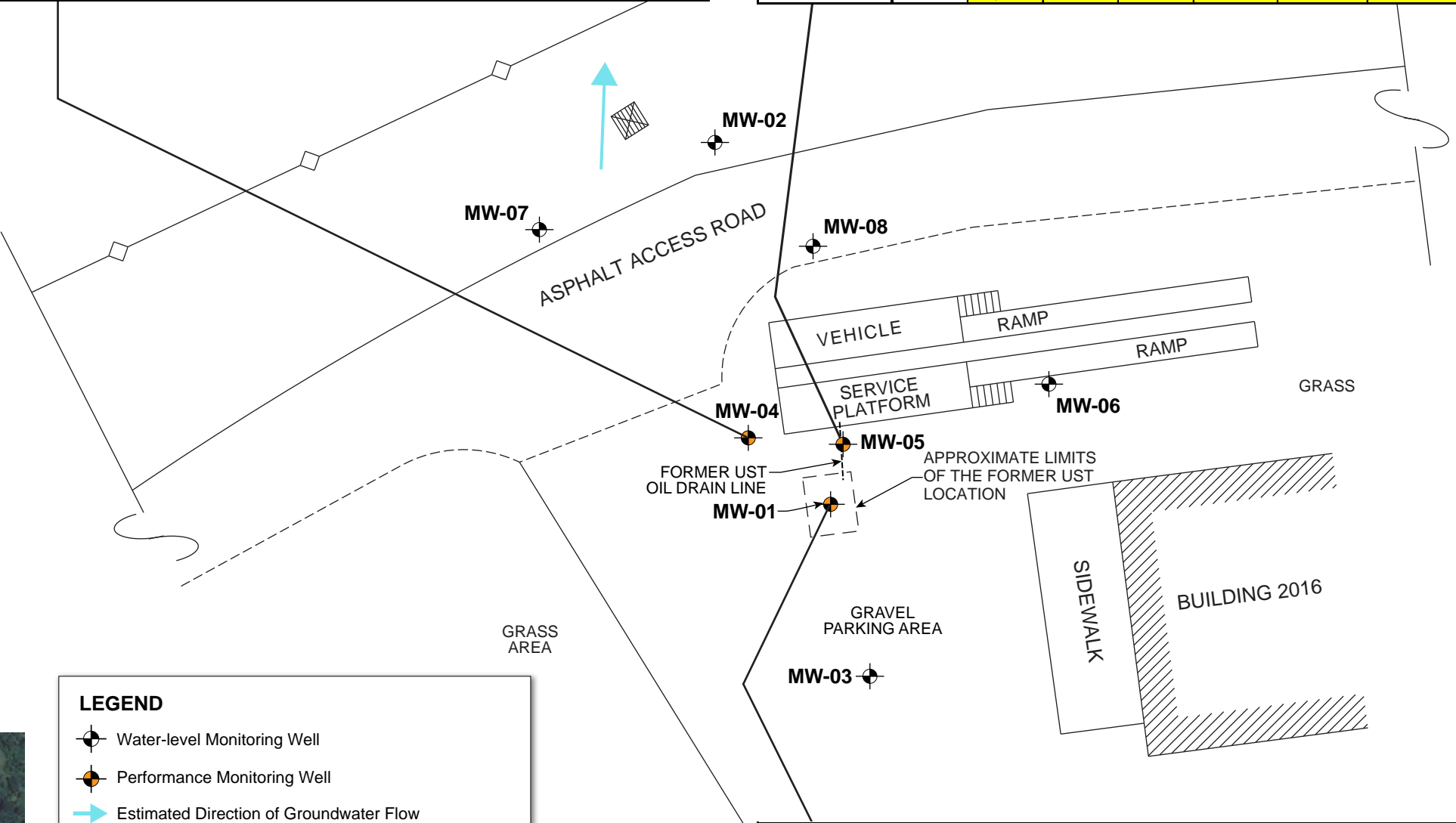


Figure 4-2
AOC E Land Use Controls
Second Five-Year Review Report
Former Naval Ammunition Support Detachment
Vieques, Puerto Rico

Sample ID	MW04	MW04	MW04	MW04	MW04	MW04	MW04	MW04	MW04	MW04	MW04	MW04
Sample Date	05/01/00	08/30/04	07/29/08	03/17/10	04/01/15	01/06/16	01/13/17	02/20/19	01/14/20	02/03/21	1/13/22	1/16/23
Volatile Organic Compounds (µg/L)					Post-ROD 1st Round	Post-ROD 2nd Round	Post-ROD 3rd Round	Infor- mational	Infor- mational	1st Round	2nd Round	3rd Round
1,2-DCA	<1	4.6	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzene	2	0.72 J	<0.5	<5	<0.5	0.53 J	0.51 J	<0.5	<0.5	<0.5	<0.5	<0.5
MTBE	NA	234	110	130	14	26	12	8 J	12	14	15	7.5

Sample ID	MW05	MW05	MW05	MW05	MW05	MW05	MW05	MW05	MW05	MW05	MW05	MW05
Sample Date	5/1/00	8/30/04	7/29/08	3/17/10	4/1/15	1/6/16	1/13/17	2/20/19	1/14/20	2/2/21	1/13/22	1/17/23
Volatile Organic Compounds (µg/L)					Post-ROD 1st Round	Post-ROD 2nd Round	Post-ROD 3rd Round	Infor- mational	Infor- mational	1st Round	2nd Round	3rd Round
1,2-DCA	32	7.2	<0.5	<0.5	0.85 J	0.85 J	<0.5	<0.5	0.36 J	<0.5	<0.5	<0.5
Benzene	6	1.2 J	16	4.5 J	9.8	7.8	7.9	2.7	0.45 J	0.78 J	0.71 J	<0.5
MTBE	NA	1,220	560	520	350	380	340	140	230	140	210	42



LEGEND

- Water-level Monitoring Well
- Performance Monitoring Well
- Estimated Direction of Groundwater Flow

Notes:

- * Informational use only, not to be used for decisions.
- All concentrations are in micrograms per liter (µg/L).
- Bold** results indicate a detection.
- Bold/highlighted** results indicate RG exceedance.
- µg/L microgram(s) per liter
- < Non-detected results (below detection limit)
- J Estimated result
- NA Not analyzed

CONTAMINANT OF CONCERN	RG (µg/L)
1,2-Dichloroethane (1,2-DCA)	3.8
Benzene	5
Methyl-tert-butyl ether (MTBE)	120

Sample ID	MW01	MW01	MW01	MW01	MW01	MW01	MW01	MW01	MW01	MW01	MW01	MW01
Sample Date	9/11/98	9/1/04	7/29/08	3/17/10	3/31/15	1/6/16	1/13/17	2/20/19	1/14/20	2/2/21	1/13/22	1/17/23
Volatile Organic Compounds (µg/L)					Post-ROD 1st Round	Post-ROD 2nd Round	Post-ROD 3rd Round	Infor- mational	Infor- mational	1st Round	2nd Round	3rd Round
1,2-DCA	NA	<0.5	<0.5	<0.5	4.4	7.5	6.6	<0.5	<0.5	<0.5	<0.5	0.42 J
Benzene	17	4.1	3.8	6.4	2.1	3.2	6.6	1.4 J	1.3	0.88 J	1.2	0.67 J
MTBE	NA	260	150	120	23	18	21	<0.5	0.93 J	2.6	4.6	5.7

Figure 4-3
Pre-ROD and Post-ROD Sampling Results
Second Five-Year Review Report
Atlantic Fleet Weapons Training Area – Vieques
Vieques, Puerto Rico

UXO 1 – Eastern Conservation Area

5.1 Site Chronology

Previous removals and environmental investigations conducted at UXO 1 beginning in 2002 are summarized in Table 5-1.

5.2 Site Background

5.2.1 Description and History

UXO 1 is approximately 133 acres size and located along the easternmost portion of Vieques within the former VNTR (Figure 5-1). UXO 1 was established as a conservation area in 1983 and not used as an operational area for munitions; however, the site is located adjacent to the LIA where former artillery and air-to-ground bombing targets and OB/OD activities were located. Munitions and explosives of concern (MEC) identified in UXO 1 were most likely a result of missing intended targets and/or from OB/OD activities in the adjacent LIA.

5.2.2 Physical Characteristics

The northern, eastern, and southwestern portions of UXO 1 are topographically high areas (up to 60 feet amsl) that slope toward an inland lagoon and the ocean. Large cliff faces separate the ocean from the land, except at Bahia Playa Blanca. A nine-acre inland lagoon is located within the western portion of the site; the lagoon is not tidally influenced and observations of the temporal presences of surface water suggest it is wholly or mostly the result of precipitation. No streams occur within UXO 1.

The site is relatively undisturbed and provides suitable terrestrial habitat for a variety of plant, invertebrate, reptile, bird, and mammal communities. The beach along Bahia Playa Blanca serves as a sea turtle nesting area. The dominant vegetation type is low-growing, mostly native evergreen scrub along the eastern, southern, and northwestern portions of UXO 1. The large, low-lying area southwest of Bahia Playa Blanca contains an inland lagoon and supports an extensive forested scrub community with a greater abundance of invasive plant species, though mangroves occur along the narrow lagoon fringe.

The geology of UXO 1 is characterized as limestone, either near or exposed at the ground surface, and beach sand at Bahia Playa Blanca. The upland areas generally contain limestone bedrock exposed at the surface, with a very thin layer of soil in some locations. Within the lowland areas, beach sands intermixed with limestone are encountered at the surface. Groundwater within UXO 1 primarily occurs within the bedrock and is likely influenced by seawater.

5.2.3 Land and Resource Uses

UXO 1 is located on property managed by the DOI (through USFWS) that has been designated as the Vieques National Wildlife Refuge. Public Law 106-398, also referred to as the Floyd D. Spence National Defense Authorization Act for Fiscal Year 2001, required the LIA to be managed as a wilderness area and to prohibit public access. USFWS performs refuge management activities within UXO 1, including sea turtle nesting areas along Playa Blanca and planting of native plant species. Additionally, the United States Coast Guard (USCG) maintains a navigation “light post” at the eastern end of UXO 1. There is currently no planned public access or groundwater use within UXO 1. Due to the physical characteristics of UXO 1 and adjacent areas (i.e., high cliffs and shallow coral reefs), the potential route of access to UXO 1 is through the LIA. Therefore, the potential for trespassing at UXO 1 is low; however, documentation of trespassing within the LIA and vandalism of the fences within the LIA (which are considered part of the LUCs of UXO 1 as the “Physical Demarcation Boundary”) have been observed and discussed in this Second FYR.

5.2.4 History of Contamination

Due to its adjacent location to the LIA, explosive hazards (i.e., MEC) identified in UXO 1 are likely a result of military activities within the LIA as UXO 1 was not used as an operational area for munitions. Munitions removal actions were completed in 2009 and 2011 to address explosive hazards present on site. As detailed in Table 5-1 and in Section 5.2.5, an RI was completed in 2011 to assess the nature and extent of MEC and environmental media contamination to assess potential risks to human health and the environment at UXO 1.

5.2.5 Site Risks

The HHRA and ERA conducted for UXO 1 are described in the *Remedial Investigation Report, UXO 1, Eastern Conservation Area* (CH2M, 2012a) and summarized in the following subsections. The results are also presented in Table 5-2.

Human Health

No unacceptable human health risks were identified based on anticipated exposure scenarios at UXO 1 for USFWS workers to soil, sediment, and surface water. Additionally, the exposure scenarios of USFWS workers were also used to conservatively estimate potential risks for trespassers and USCG workers, since both of the populations are assumed to have less exposure based on their limited activities and time within the UXO 1 area. Potential exposure pathways comprised ingestion, dermal contact, and/or inhalation of chemicals in the soil, surface water, and sediment. However, there is the potential for explosive hazard posed by MEC that may remain at the site.

Ecological Risk

No unacceptable ecological risks were identified for ecological receptors at UXO 1, which included an assessment of plant and animal receptor exposure to surface soil, surface water, sediment, and food web exposures.

5.3 Remedial Action Summary

5.3.1 Basis for Taking Action

Based on the results of previous investigations and removal actions, a remedial action was deemed warranted to address potential explosive hazards that may remain at the site in areas not addressed by previous removal actions (e.g., steep cliff areas) or where it may become exposed over time from erosion.

5.3.2 Response Actions

Two RAOs were developed to address the potential explosive hazards posed by MEC that may remain within UXO 1. These RAOs presented in the UXO 1 ROD (NAVFAC, 2015b) are as follows:

- Lessen the explosive hazards associated with MEC by reducing the potential for uncontrolled human contact with MEC potentially present in site soil and the lagoon.
- Maintain land use that is consistent with reasonably anticipated future use of the site as set forth in the Memorandum of Agreement between the Navy and DOI concerning the transfer of Department of Defense properties on the Eastern End of Vieques (DON/DOI, 2003). The Memorandum of Agreement sets forth the terms of Public Law 106-398, as amended by Public Law 107-107, which require the land containing the ECA to be managed by USFWS as a National Wildlife Refuge.

The selected remedy for UXO 1 is Focused Additional MEC Removal and LUCs (NAVFAC, 2015b), the elements of which are as follows:

- Focused Additional MEC Removal to provide protection against direct contact with MEC to workers performing maintenance activities. Specifically, this element of the remedial action comprises removing MEC identified along any additional trails identified by USFWS as needed for their turtle nesting monitoring or other management activities, as well as any MEC identified during LTM/O&M.

- Physical Demarcation and ICs to maintain land use as wildlife refuge and deter unauthorized access to the ECA.
- Vegetation Restoration carried out in accordance with a plan developed by USFWS to reduce invasive species populations and increase native vegetation and favorable turtle nesting habitats.
- LTM and O&M identify and remove MEC that becomes exposed due to erosion, observe indications of trespassing, and to repair any damage to boundary demarcations.

5.3.3 Status of Implementation

Remedial action implementation was initiated in August 2018. The UXO 1 Remedial Action Completion Report (CH2M, 2019b) represents achievement of the RC milestone and also documents the RIP milestone, as described in the subsections below. Key features and locations of the remedial action are shown in Figure 5-2. LTM is still ongoing and the applicable checklists and representative photographs are provided in Appendix E.

Focused Additional MEC Removal

No additional access paths (trails) for USFWS monitoring of turtle nesting habitats or other management activities were identified by USFWS since the implementation of the ROD (NAVFAC, 2015b). While discussed further in the LTM subsection below, no MEC has been identified during any of the LTM events or otherwise reported to the Navy.

Physical Demarcation and Institutional Controls

Physical demarcation boundary markers and three swing gates are shown in Figure 5-2. The physical demarcation boundary markers consist of rebar-enforced concrete markers connected using repurposed former electrical power cables. The swing gates are constructed of galvanized steel and cover all roads leading to the ECA. Both the markers and the gates are painted red to align with the Navy and regulatory agencies Vieques specific color code scheme for boundary markers and other LUC mechanisms. No MEC was identified during installations.

Institutional controls that have been implemented and maintained are USFWS' Comprehensive Conservation Plan that includes no public use or access to UXO 1 and access restriction and explosive safety educational messaging that is made available to the public through the Navy's Vieques cleanup website, social media postings, public outreach events (e.g., RAB meetings, public school student awareness training, etc.), and educational kiosks posted in various public-use areas within the Vieques National Wildlife Refuge.

Vegetation Restoration

Although not necessary to satisfy the RAOs, completed vegetation restoration on Playa Blanca conducted in August 2018 with no MEC identified. As detailed in the UXO 1 Remedial Action Completion Report and associated memo to file (CH2M, 2019b) (Table 5-1); the upland dry forest vegetation restoration is also independent of RAOs and therefore not applicable to assessing remedy protectiveness.

LTM

LTM activities include an annual inspection to determine if MEC has become exposed by erosion (and associated removal), evaluate the conditions of the boundary demarcation and other physical controls, and to make any necessary repairs.

LTM inspections were completed in 2020, 2021, and 2022 (Appendix E). Additionally, inspections were conducted after named tropical storms/hurricanes, comprising tropical storms Isaias (July 2020), Laura (August 2020), and Grace (August 2021) and hurricane Fiona (Category I, September 2022). For all LTM inspections, no MEC was encountered and all LUCs were determined to be functioning as intended with no defects.

In the UXO 1 2020 Annual Status Report, PRDNER suggested the preparation of an SOP for MEC inspections. As such, the Procedure for Terrestrial Munitions and Explosives of Concern Inspections as part of Long-term Monitoring (CH2M, 2022d) was finalized and is currently being utilized for the annual/post-named-storm inspections.

5.4 Progress Since the Last Review

UXO 1 was not included in the First FYR Report (CH2M, 2018b).

5.5 Five-Year Review Process

5.5.1 Site Inspection

A FYR inspection was performed for UXO 1 on August 23, 2022 (Appendix E). Observations did not find anything that affected the overall remedy protectiveness.

5.5.2 Data Review

A total of three annual monitoring events (2020 through 2022) have been conducted since remedy implementation and the results are presented in the following documents:

- UXO 1 Eastern Conservation Area, 2020 Annual Status Report, Land Use Control Monitoring and Maintenance, Atlantic Fleet Weapons Training Area – Vieques, Former Vieques Naval Training Range, Vieques, Puerto Rico (CH2M, 2020c).
- UXO 1 Eastern Conservation Area, 2021 Annual Status Report, Land Use Control Monitoring and Maintenance, Atlantic Fleet Weapons Training Area – Vieques, Former Vieques Naval Training Range, Vieques, Puerto Rico (CH2M, 2022b).
- UXO 1 Eastern Conservation Area, 2022 Annual Status Report, Land Use Control Monitoring and Maintenance, Atlantic Fleet Weapons Training Area – Vieques, Former Vieques Naval Training Range, Vieques, Puerto Rico (CH2M, 2022e).

Evaluation of the results of the three annual event activities found:

- No MEC were found, nor were there any observations of erosion likely to expose MEC.
- All LUCs are functioning as intended with no defects that would threaten their intended protectiveness.
- A few incidents of trespassing were documented; however, the UXO 1 remedy accounts for trespassing in terms of monitoring, reporting, and repairs of any damage done to physical LUCs.

5.6 Technical Assessment

5.6.1 Question A: Is the remedy functioning as intended by the decision documents?

Remedial Action Performance

Yes. The remedial action at UXO 1 has been and remains functioning as intended and continues to meet the RAOs established in the UXO 1 ROD (NAVFAC, 2015b).

System Operations/Operations and Maintenance

According to Region 2 Guidance for Incorporating Climate Change Considerations in Five Year Reviews, three climate change tools were utilized to assess UXO 1 (Appendix G). Potential site impacts from climate change have been assessed, and the performance of the remedy is currently not at risk due to potential effects of climate change in the region. While hurricanes and named tropical storms may have the ability to impact the remedy (e.g., storms expose an explosive hazard or damage/destroy physical LUCs), the remedy in place already addresses this contingency as it requires post storm LUC and MEC inspections and associated repair, as warranted.

Implementation of Institutional Controls and Other Measures

The location of the physical LUCs (i.e., demarcation boundaries and gates) for UXO 1 are shown in Figure 5-2. The access controls such as the demarcation boundary and gates are in working order and maintenance is performed as needed to ensure they remain operating as intended.

As noted on a copy of the 5-year review checklist used by USFWS during the 5-year review site visit (Appendix E), a few incidents of trespassing were documented from 2020 through 2022. However, not affecting protectiveness because the UXO 1 remedy accounts for trespassing functioning as intended to identify trespassing incidents through monitoring, reporting, and repairs of any damage done to physical LUCs.

5.6.2 **Question B:** Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

Yes. Although there are no toxicity data or cleanup levels applicable to the UXO 1 remedy, the current and reasonably anticipated future land use remains the same as that considered in the UXO 1 ROD, which is to be managed as part of the Vieques National Wildlife Refuge with potential access limited to USFWS workers and potential trespassers, for which the remedial action was designed.

5.6.3 **Question C:** Has any other information come to light that could call into question the protectiveness of the remedy?

No. As noted above, periodic trespassing has been observed by NAVFAC, USFWS, and law enforcement. However, damage to physical LUCs was repaired and observed trespassers were apprehended and removed. Other LUC and MEC inspections did not observe evidence of trespassing or damage associated with UXO 1. This collective information indicates LUCs, including restrictions placed on public access to UXO 1 via Vieques National Wildlife Refuge management policy, educational mechanisms such as kiosks associated with other sites, and access restriction enforcement, are effective in deterring unapproved access.

5.7 Issues/Recommendations

No issues were identified during the Second FYR that would inhibit the ability of the remedy to be protective and achieve the associated RAOs. Therefore, because no issues were identified that affect remedy protectiveness, no recommendations for follow-up actions are necessary.

5.8 Other Findings

No other findings were identified.

5.9 Protectiveness Statement

Protectiveness Statement(s)		
<i>Operable Unit:</i> UXO 1	<i>Protectiveness Determination:</i> Protective	<i>Planned Addendum Completion Date:</i> N/A
<i>Protectiveness Statement:</i> The remedy at UXO 1 is currently and is anticipated to remain protective of human health and the environment. LUCs were implemented, are monitored/maintained, and have been shown to effectively ensure land use remains as planned by DOI and to reduce the potential for uncontrolled human contact with explosive hazards at the site.		

TABLE 5-1

UXO 1 Previous Investigations and Document Summaries*Second Five-Year Review Report**Atlantic Fleet Weapons Training Area - Vieques**Vieques, Puerto Rico*

Previous Investigation*	Date	Investigation Activities
Environmental Baseline Survey	2003	An Environmental Baseline Survey (NAVFAC) was completed in 2003 to disclose information regarding the environmental condition of the Navy property. The information was used as a basis for determining the environmental suitability of the property for transfer.
Preliminary Range Assessment	2002	The Preliminary Range Assessment (CH2M HILL, 2003) was conducted in 2002 to provide information about the types, quantities, and other factors related to the military munitions used, and to identify the types and locations of any targets that may have been used at the VNTR. The information was used to help identify areas for further consideration.
Expanded Range Assessment/Site Inspection	2005-2008	The ERA/SI was conducted from 2005 through 2008 to determine the presence of and estimate the quantity of munitions at 17 UXO sites within the former VNTR (CH2M HILL, 2010). Activities within UXO 1 included a handheld magnetometer survey along beaches that identified subsurface anomalies, an aerial light detection and radar (LIDAR) survey that used orthophotography to identify craters, and an aerial magnetometer survey to identify elevated anomaly density areas. The ERA/SI resulted in the identification of munitions within UXO 1.
Time Critical Removal Action	2005-2009	A TCRA was conducted from 2005 through 2009 to remove MEC present or exposed on the ground surface in accessible areas within both the LIA and ECA (CH2M HILL, 2010). MEC was removed from the surface within 125 acres of UXO 1 including the lagoon, leaving only several acres of steep slopes and cliff edges not cleared, primarily because of inaccessibility and instability. In total, 1,308 MEC and 784 munitions debris (MD) items, along with numerous other debris, were removed from the surface at a cost of approximately \$5,800,000.
Non-Time Critical Removal Action	2011	An NTCRA was conducted in 2011 to remove MEC within the subsurface at the beaches (to a maximum depth of 4 feet) and along roads (to a maximum depth of 2 feet) within UXO 1 (CH2M HILL, 2013). In total, 97 MEC and 792 MD items, along with numerous other debris, were removed from the subsurface at a cost of approximately \$1,400,000.
Remedial Investigation	2011	An RI (CH2M HILL, 2011) was conducted to assess the nature and extent of MEC and environmental media contamination and to assess potential risks to human health and the environment at UXO 1. There were no unacceptable risks to human health or the environment posed by environmental contaminant levels identified at the site, so no action is required for environmental media. However, an FS was warranted to address potential explosive hazards associated with the possible presence of MEC in the subsurface, with surface MEC in inaccessible and unstable areas, and from MEC that may become exposed on the surface due to erosion.
Feasibility Study	2012	The FS analyzed remedial alternatives to address the potential explosive hazards remaining at UXO 1, in accordance with EPA guidance.
Proposed Remedial Action Plan (PRAP)	2014	The proposed remedial action was documented in the PRAP (NAVFAC, 2014), which was offered for public comment between July 30 and September 12, 2014. The preferred alternative for UXO 1 was Alternative 2, Focused Additional MEC Removal and LUCs.
Record of Decision	2015	The selected remedial action for UXO 1 was Alternative 2, Focused Additional MEC removal and LUCs. The components of the remedial action include vegetation restoration, implementing physical demarcation and ICs to maintain land use as wildlife

TABLE 5-1

UXO 1 Previous Investigations and Document Summaries*Second Five-Year Review Report**Atlantic Fleet Weapons Training Area - Vieques**Vieques, Puerto Rico*

Previous Investigation*	Date	Investigation Activities
		refuge, deter future access by trespassers, and perform LTM to identify any MEC that may become exposed and proper disposal of MEC, if identified.
Memo to Site File, UXO 1	2019	Provides clarification on the RAO language that the upland dry forest vegetation restoration is independent, and therefore not pertinent to achieving the RAOs
Remedial Action Completion Report	2019	Documents both the implementation of the remedial activities at UXO 1 and completion of the construction phase of the selected remedy documented in the UXO 1 ROD (NAVFAC, 2015). Signifies the remedy is operating as planned to meet the RAOs (response complete and remedy in place milestones).
UXO 1 Annual Status Report	2020 – 2022	Documents the activities and results of the MEC/LUC LTM inspections at UXO 1.
<p>* Documentation associated with the listed activities is available in the Administrative Record and provides detailed information used to support the remedy selection for UXO 1.</p> <p>Bgs = below ground surface EBS = Environmental Baseline Survey ESD = Explanation of Significant Difference(s) IAS = Initial Assessment Study MD = munitions debris MPPEH = material potentially presenting an explosive hazard NPL = National Priorities List O&M = operations and maintenance PA/SI = Preliminary Assessment/Site Inspection PRAP = Proposed Remedial Action Plan RAB = Restoration Advisory Board RAO = remedial action objective RCRA = Resource Conservation and Recovery Act RFA = RCRA Facility Assessment RFI = RCRA Facility Investigation RI/FS = Remedial Investigation/Feasibility Study ROD = Record of Decision RRD = range related debris SI/ESI = Site Inspection/Expanded Site Inspection VNTR = Vieques Naval Training Range</p>		

TABLE 5-2

UXO 1 Risk Assessment Results*Second Five-Year Review Report**Atlantic Fleet Weapons Training Area - Vieques**Vieques, Puerto Rico*

Media	Human Health Risk
	Current/Future USFWS Workers*
Soil	ELCR = 1×10^{-6} and HI = 0.03 Acceptable
Sediment	ELCR = 7×10^{-8} and HI = 0.0007 Acceptable
Surface Water	ELCR = 2×10^{-8} and HI = 0.002 Acceptable
ELCR – excess lifetime cancer risk HI – hazard index Unacceptable ELCR: $> 1 \times 10^{-4}$ Unacceptable HI: > 1 *Risk/Hazard levels also apply to USCG workers and potential trespassers	
Media	Ecological Risk
	All Receptors
Soil	Acceptable
Sediment	Acceptable
Surface Water	Acceptable



- Legend**
- LIA/ECA Area Boundary
 - Topographic Contour (10 foot interval)
 - UXO 1 Boundary

Notes:
Topographic Contours derived from LIDAR.
Topographic Contour elevations are feet above sea level at time of LIDAR survey.

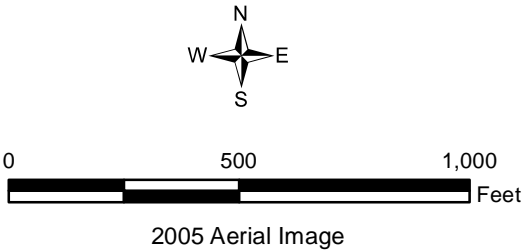
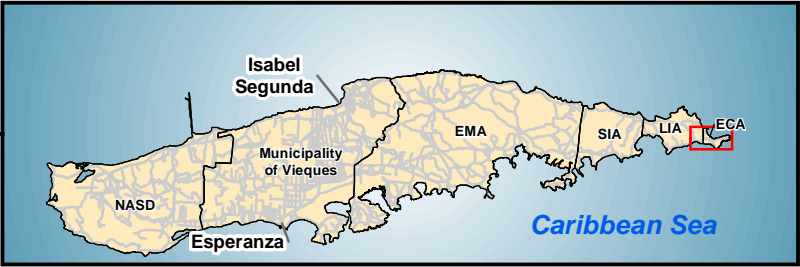
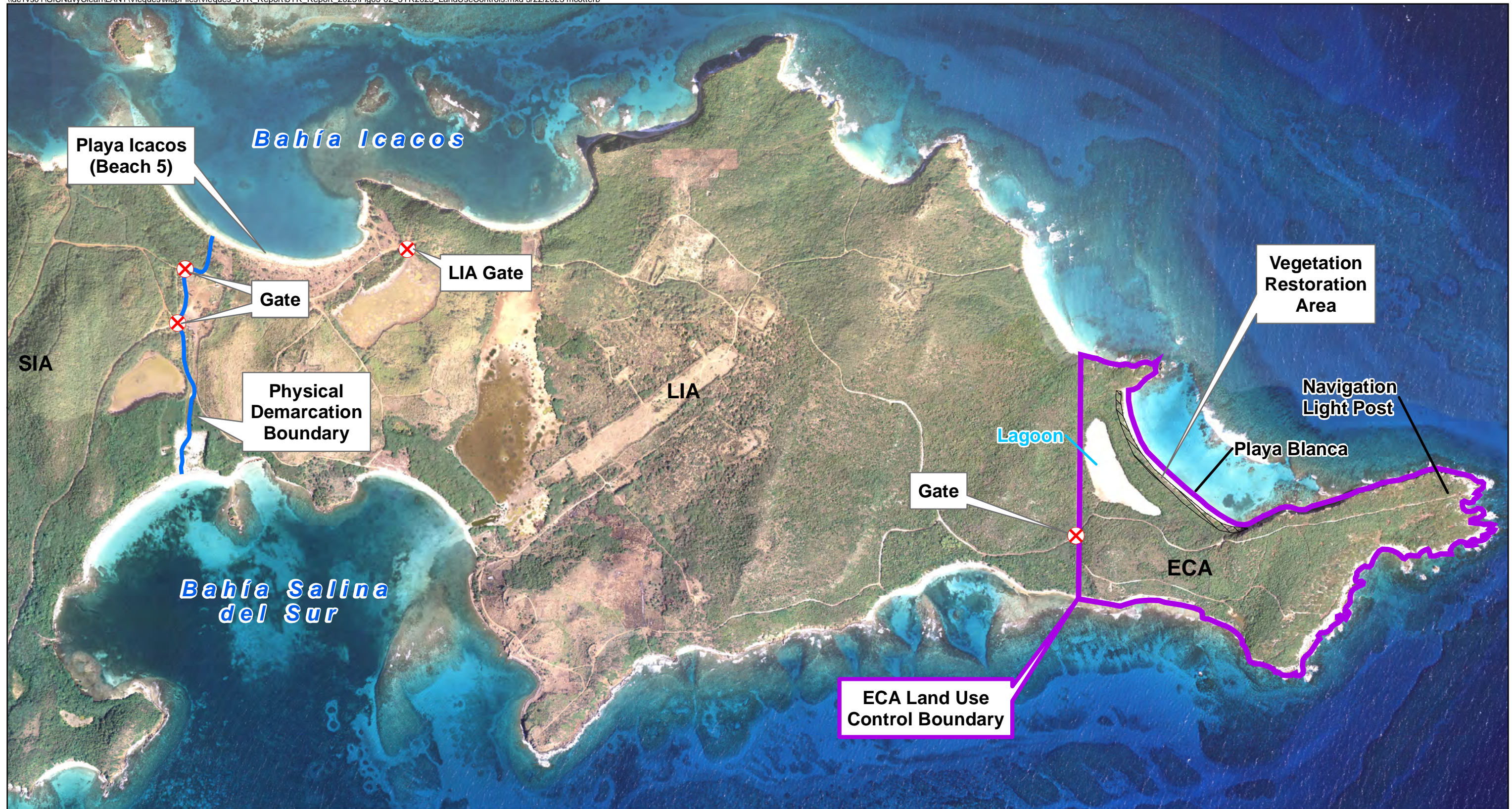


Figure 5-1
UXO 1 Site Location Map
Second Five-Year Review Report
Atlantic Fleet Weapons Training Area
Vieques, Puerto Rico



- Legend**
- Gate
 - Physical Demarcation Boundary
 - ECA Land Use Control Boundary
 - Vegetation Restoration Area

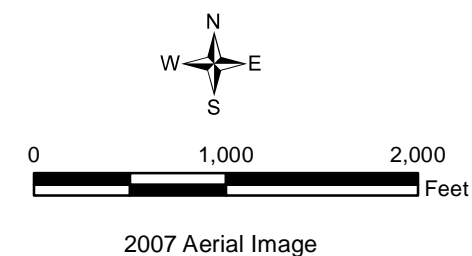
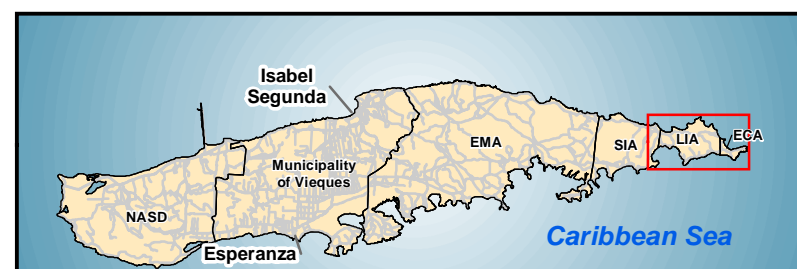


Figure 5-2
UXO 1 Land Use Controls
Second Five-Year Review Report
Atlantic Fleet Weapons Training Area
Vieques, Puerto Rico

UXO 18 – Cayo La Chiva

6.1 Site Chronology

Previous removals and environmental investigations conducted at UXO 18 beginning in 2006 are summarized in Table 6-1.

6.2 Site Background

6.2.1 Description and History

UXO 18 encompasses the entire Cayo La Chiva (an island approximately 12 acres in size), which is located several hundred yards south of Playa La Chiva (Blue Beach) and south of the EMA along the southern edge of the former VNTR in Vieques, Puerto Rico (Figure 6-1). The only documented military training activity on Cayo La Chiva was along the northern portion where a 0.50-caliber machine gun nest fired blank rounds during simulated amphibious landings at Playa La Chiva (on the south shore of the island of Vieques) in 1950. However, during site investigation activities, several MEC were identified both on the island and in the nearshore waters, all of which were subsequently removed.

6.2.2 Physical Characteristics

Cayo La Chiva is a rocky island located several hundred yards south of Playa La Chiva. The topography ranges from ocean level at the perimeter (0 feet amsl) to about 35 feet amsl in the central portion of the island. The majority of the western and southern portions of the island consist of steep, nearly vertical rock slopes rising more than 30 feet above the ocean. The northern portion and very northeastern tip of the island consists of a narrow strand of sandy beach that extends to a very shallow seagrass bed within the bay. Along the eastern side, a very thin strip of sand lies immediately adjacent to the steep rock slope. No surface water features are present within UXO 18.

UXO 18 is heavily vegetated, with the dominant vegetation being a dry scrub forest with occasional isolated stands of taller secondary growth forest. A narrow fringe of mangrove forest exists along the eastern and northern coasts of the island.

The geology of Cayo La Chiva is characterized by weathered limestone, either near or exposed at the ground surface. In some areas, a thin layer (generally less than 1-foot thick) of sandy loam soil overlays the weathered bedrock. Only the northern portion of the island is sandy. Groundwater within UXO 18 is likely within the bedrock, and it is likely to be saline because of the thin veneer of soil, small size of the island, and the proximity to the ocean.

6.2.3 Land and Resource Uses

UXO 18 is owned by the Commonwealth of Puerto Rico and managed by the PRDNER (i.e., UXO 18 is not part of the Vieques National Wildlife Refuge). As part of the UXO 18 ROD (NAVFAC, 2018), anticipated future recreational use of the island is anticipated and will be under the management of PRDNER. There is no current or planned groundwater use within UXO 18. Because of the presence of high cliffs and dense native vegetation, the practical route of access to UXO 18 is limited to the northern portion of the island where a narrow sandy beach is present.

6.2.4 History of Contamination

Transect inspections conducted during the Biological Assessment (2011) and during RI activities (2011-2013) covered approximately 8 percent of the accessible areas on Cayo La Chiva. In total, five MEC (5-inch rockets) and three munitions debris (MD) (expended smoke canisters) were identified. MEC items were destroyed through controlled detonation on Cayo La Chiva and MD items removed for processing and disposal. These findings indicated only a few isolated MEC were present and none are likely to remain in the accessible areas of the island. While these findings are consistent with the historical knowledge of site use, it can be assumed that other isolated MEC

may be present throughout UXO 18. Based on the relatively thin soil horizon observed on UXO 18, all potential MEC is likely at or close to ground surface.

Soil samples were collected and analyzed for explosives, inorganic constituents, and hexachloroethane (an SVOC potentially associated with smoke canisters) during the RI to determine if munitions-related contamination had impacted the environmental media. Neither explosives nor hexachloroethane were detected in UXO 18 soil. Only one inorganic constituent (thallium) was detected in surface soil above a screening criterion (Soil Screening Level [SSL]) and the level detected during the background study. The SSL is a conservative screening criterion designed to evaluate the potential for chemicals to leach from soil to groundwater above safe drinking water levels.

Thallium was detected in only one soil sample at a concentration that was estimated and potentially biased so as to result in a level higher than it actually is. In addition, thallium is not associated with the munition's types found on Vieques, nor is it associated with ordnance paint. Further, the United States Army Corps Technical Guidance for Military Munitions Response Actions (EM 200-1-15, 30 October 2015) states that thallium is not associated with any known munitions. Based on this information, it is likely that thallium is attributable to natural conditions. All other detected inorganic constituents were present at concentrations below background concentrations. It is likely that if contamination associated with past military activities were present, other constituents would have been detected at elevated levels as well. This information further supports the conclusion that thallium, as well as all other inorganic concentrations detected at UXO 18, are attributable to natural conditions. Additionally, an assessment of the Site on December 4, 2017, indicated that there were no physical changes to the site resulting from Hurricanes Irma and Maria that would lead to a change to the selected remedy.

6.2.5 Site Risks

The HHRA and ERA conducted for UXO 18 are described in the UXO 18 Remedial Investigation/Feasibility Report (CH2M., 2015b) and summarized in the following subsections. The results are also presented in Table 6-2.

Human Health

Human health risks were quantitatively evaluated for potential human receptors exposed to COPCs in surface soil under reasonable maximum exposure (RME) scenarios. The RME assumes the highest level of human exposure that could reasonably be expected to occur. Exposure scenarios evaluated for site soil were for current trespassers and future recreational users (adults, youths, and children) and workers, since these groups are likely to have the highest potential exposures based on the anticipated future land use of the island. Potential exposure pathways were ingestion, dermal contact, and inhalation of chemicals in soil. The potential non-cancer hazards, expressed as the HI, and cancer risk estimates, expressed as the excess lifetime cancer risk (ELCR), were calculated using RME assumptions.

No unacceptable human health risks were identified for potential human exposure scenarios at UXO 18. However, there is the potential for explosive hazard posed by MEC that may remain at the site.

Ecological Risk

The ERA was conducted to evaluate potential risks to terrestrial ecological receptors exposed to chemicals detected in soil at UXO 18. The ERA used established ecological effects values to assess risks from direct exposure to organisms as well as via the food chain. UXO 18 is relatively undisturbed and provides suitable terrestrial habitat for a variety of plant, invertebrate, reptile, bird, and mammal communities. No unacceptable risks to plants and animals and other wildlife potentially feeding on those plants and animals were identified.

6.3 Remedial Action Summary

6.3.1 Basis for Taking Action

Based on the results of previous investigations, remedial action was deemed warranted to address potential explosive hazards based on the assumption that MEC may remain at the site in areas planned for potential future recreational use by PRDNER.

6.3.2 Response Actions

Two RAOs were developed to address the potential explosive hazards posed by MEC that may remain within UXO 18. These RAOs presented in the UXO 18 ROD (NAVFAC, 2018) are as follows:

- Prevent or reduce explosive hazard that may be present associated with MEC to be compatible with current and anticipated future land use.
- Prevent or reduce the potential for unauthorized access to portions of UXO 18.

The selected remedy for UXO 18 is Focused MEC Removal, Land Use Controls, and MEC Inspections (NAVFAC, 2018), the elements of which are as follows:

- Focused MEC Removal to remove MEC from areas identified by PRDNER for future recreational use (i.e., picnic areas, trails). MEC removal also includes removal of any MEC that may become exposed by erosion or identified during LTM or reported by the public or agencies.
- Physical Demarcation and ICs to guide access to areas intended for recreational use, discourage access to areas not planned for public use, and provide for explosive safety awareness, all of which will reduce the potential for human exposure to any MEC potentially remaining at the site (i.e., reduce potential explosive hazard).
- LTM to assess and document the progress of the LUCS as they pertain to the RAOs and to identify any MEC that has been exposed at the surface within the recreational areas, determine whether access is occurring in areas not intended for public use (i.e., via observation of any new trails, encampments, etc.) and to evaluate the condition of the educational kiosk.

6.3.3 Status of Implementation

Remedial action implementation was initiated in May 2019. The UXO 18 Remedial Action Completion Report (CH2M, 2019c) represents achievement of the RC milestone and also documents the RIP milestone, as described in the subsections below. Key features and locations of the remedial action are shown in Figure 6-2. LTM is ongoing and the applicable checklists and representative photographs are provided in Appendix F.

Focused MEC Removal

MEC clearance was completed to identify and remove any surface or subsurface MEC down to an estimated depth of 1 foot below ground surface within the planned recreational use areas identified by PRDNER; including the landing/picnic area, overlook/picnic area, and the trail linking the two (Figure 6-2). Five MEC were found during the Focused MEC Removal portion of the remedial action and disposed of accordingly (CH2M, 2019c).

Physical Demarcations and ICs

Physical demarcation (educational kiosk) was installed at the landing/picnic area (Figure 6-2) following the Focused MEC Removal to inform potential visitors about areas of planned public use, discourage access to areas not intended for public use, and provide explosive awareness and safety procedures.

LTM

LTM activities include an annual inspection to determine if MEC has become exposed by erosion within the recreational areas (and remove any that does), determine whether access is occurring in areas not intended for public use (i.e., via observations of new trails, encampments, etc.), and to evaluate the condition of the educational kiosk.

LTM inspections were completed in 2020, 2021, and 2022 (Appendix F). Additionally, inspections were conducted after named tropical storms/hurricanes, comprising tropical storms Isaias (July 2020), Laura (August 2020), and Grace (August 2021) and hurricane Fiona (Category I, September 2022). For all LTM inspections, no MEC was encountered and all LUCs were determined to be functioning as intended with no defects.

During the 2020 annual inspection, three MD items were encountered and several small areas (no more than 2-feet by 2-feet) were unable to be visually inspected due to thick vegetation growth; however, these areas would also be inaccessible to visitors. Similar to UXO 1, an MEC Inspection Standard Operating Procedure (SOP) was suggested and completed (CH2M, 2022d). In December 2021, PRDNER decided to not officially open or maintain the areas planned for recreational use at UXO 18. Based on agreements reached among the stakeholder agencies, the educational kiosk at the landing/picnic area was updated, trail markers previously installed along the trail were removed, and efforts taken to obscure the trail entrance (Figure 6-3). Additionally, the inspection frequency was increased to conduct LUC monitoring approximately every 60 days until the Navy and the regulatory agencies concur sufficient data have been collected to estimate the frequency and type of public access, if any, in order to optimize the monitoring frequency. Inspections were performed through 2022 from January through December, at approximately 60 day intervals, for a total of six events. Evidence of public use was observed during only one monitoring event and it was limited to the public beach area (Figure 6-3), suggesting the island is not often used by the public.

6.4 Progress Since the Last Review

UXO 18 was not included in the First FYR Report (CH2M, 2018b).

6.5 Five-Year Review Process

6.5.1 Site Inspection

A FYR inspection was performed for UXO 18 on August 23, 2022 (Appendix F). Observations did not find anything that affected the overall remedy protectiveness.

6.5.2 Data Review

A total of two annual monitoring events in 2020 through 2021 and six bimonthly (every other month) monitoring events in 2022 were conducted and the results are presented in the following documents:

- UXO 18 Cayo La Chiva 2020 Annual Status Report Land Use Control Monitoring and Maintenance, Atlantic Fleet Weapons Training Area – Vieques, Former Vieques Naval Training Range, Vieques, Puerto Rico (CH2M, 2022f).
- UXO 18 Cayo La Chiva 2021 Annual Status Report Land Use Control Monitoring and Maintenance, Atlantic Fleet Weapons Training Area – Vieques, Former Vieques Naval Training Range, Vieques, Puerto Rico (CH2M, 2022c).
- UXO 18 Cayo La Chiva 2022 Annual Status Report Land Use Control Monitoring and Maintenance, Atlantic Fleet Weapons Training Area – Vieques, Former Vieques Naval Training Range, Vieques, Puerto Rico (CH2M, 2023a)

Evaluation of results of the 2022 bimonthly events, which are deemed representative of current and likely future conditions, found:

- No MEC or other munitions-related items were found, nor were there any observations of erosion likely to expose MEC as the area is well vegetated.
- All LUCs are functioning as intended.
- No indications of trespassing or vandalism were observed during the inspection activities.

6.6 Technical Assessment

6.6.1 Question A: Is the remedy functioning as intended by the decision documents?

Remedial Action Performance

Yes. The remedial action at UXO 18 has been and remains functioning as intended and continues to meet the RAOs established in the UXO 18 ROD (NAVFAC, 2018). In fact, PRDNER's decision not to formally open public access to the island's interior serves to enhance remedy protectiveness.

System Operations/Operations and Maintenance

According to Region 2 Guidance for Incorporating Climate Change Considerations in Five Year Reviews, three climate change tools were utilized to assess UXO 18 (Appendix G). Potential site impacts from climate change have been assessed, and the performance of the remedy is currently not at risk due to potential effects of climate change in the region. While hurricanes and named tropical storms may have the ability to impact the remedy (e.g., storms expose an explosive hazard or damage/destroy physical LUCs), the remedy in place already addresses this contingency as it requires post-storm LUC and MEC inspections and associated repair, as warranted.

Implementation of Institutional Controls and Other Measures

The physical LUC (i.e., educational kiosk) for UXO 18 is shown in Figure 6-3, which was updated to reflect the changes to the planned inland recreational areas as determined by PRDNER. Of note, the planned LUC monitoring and maintenance protocol included in the UXO 18 Remedial Action Land Use Control, and Long-Term Monitoring Work Plan (CH2M, 2019a) accounts for LUC/MEC inspections in open, maintained areas (the original plan) as well as areas not intended for access but being accessed regardless (i.e., trespassing). Specifically, the determination not to open the trails and inland areas for public use has no impact on the planned LUC/MEC inspection protocol because it was designed to address any area that is open and maintained for public use and any area that is being accessed via trespassing.

6.6.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

Yes. Although there are no toxicity data or cleanup levels applicable to the UXO 18 remedy, the RAOs remain applicable despite PRDNER's decision not to open the planned trails and inland recreational areas to the public.

6.6.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No. In fact, not opening areas to the public enhances the remedy protectiveness due to lower likelihood of exposure. Further, bi-monthly LUC/MEC monitoring conducted in 2022 indicated a very low frequency of public access.

6.7 Issues/Recommendations

No issues were identified during the Second FYR that would inhibit the ability of the remedy to be protective and achieve the associated RAOs. Therefore, because no issues were identified that affect remedy protectiveness, no recommendations for follow-up actions are necessary.

6.8 Other Findings

Based on the findings and observations made during the 2022 bi-monthly LUC/MEC inspections, the Navy intends to return to the annual monitoring frequency provided in the UXO 18 Remedial Action Completion Report (CH2M, 2019c).

No other findings were identified.

6.9 Protectiveness Statement

Protectiveness Statement(s)		
<i>Operable Unit:</i> UXO 18	<i>Protectiveness Determination:</i> Protective	<i>Planned Addendum Completion Date:</i> N/A
<i>Protectiveness Statement:</i> <p>The remedy at UXO 18 is currently and is anticipated to remain protective of human health and the environment. Remedy implementation included inspecting areas of potential and/or planned public access to ensure no MEC was likely present. In addition, LUCs were implemented, are monitored/maintained, and have been shown to effectively reduce the potential for unauthorized access to portions of the site and reduce the potential for exposure to explosive hazards.</p>		

TABLE 6-1

UXO 18 Previous Investigations and Document Summaries*Second Five-Year Review Report**Atlantic Fleet Weapons Training Area-Vieques**Vieques, Puerto Rico*

Previous Investigation*	Date	Investigation Activities
Background Investigation	2006	A Background Investigation (CH2M, 2007) was conducted in 2006 for the eastern portion of Vieques to develop a set of background values for inorganic constituents in soil for comparison to soil data to be collected during future investigations. This Background Investigation included the same soil type as encountered in Cayo La Chiva.
Biological Assessment	2011	A Biological Assessment (CH2M, 2015) was conducted in 2011 to determine if any federally listed threatened or endangered plant or animal species were present on Cayo La Chiva. None were observed. No MEC were identified during this investigation.
Remedial Investigation	2011-2013	An RI (CH2M, 2015) was conducted to assess the nature and extent of MEC and environmental media contamination and to assess potential risks to human health and the environment at UXO 18. There were no unacceptable risks to human health or the environment posed by constituent concentrations in site media, so no action is required for environmental media. However, because several MEC and MD were identified and removed, an FS was warranted to address potential explosive hazards associated with the possible presence of additional MEC on the island.
Warning Buoy and Sign Installation	2012	Temporary warning signs on UXO 18 were replaced with seven more-permanent signs installed along the northern, western, and southern portions of the island (where there is the highest probability for trespasser activity) that state "No Trespassing. Restricted Area/Authorized Personnel Only. No Entry Permitted to Beaches and Land Areas." Additionally, six buoys were installed around the island that said, "No Anchor, Explosives" to warn kayakers, boaters, and snorkelers. These buoys were subsequently removed following the NTCRA as noted previously.
Feasibility Study	2015	The FS (CH2M, 2015) analyzed remedial alternatives to address potential explosive hazards ⁵ associated with the potential presence of MEC at UXO 18, in accordance with EPA guidance. A more detailed description of the FS is presented in Section 2.9.
Feasibility Study Addendum	2016	The FS Addendum (CH2M, 2016) provides further clarification of the costs and associated assumptions used to evaluate the remedial alternatives that include MEC removal.
Proposed Remedial Action Plan (PRAP)	2016	The proposed remedial action was documented in the PRAP (NAVFAC, 2016), which was offered for public comment between July 11 and August 24, 2016. The preferred alternative for UXO 18 was Alternative 3, Limited MEC Removal, Land Use Controls, and MEC Inspections.
Record of Decision	2018	The selected remedial action for UXO 18 was Alternative 3, Limited MEC Removal, Land Use Controls, and MEC Inspections. The components of the remedial action include focused MEC removal from areas identified by PRDNER for future recreational use, implementing physical demarcation and ICs to control access, and perform LTM to identify any MEC that may become exposed and proper disposal of MEC, if identified.
Remedial Action Completion Report	2019	Documents both the implementation of the remedial activities at UXO 18 and completion of the construction phase of the selected remedy documented in the UXO 18 ROD (NAVFAC, 2018). Signifies the remedy is operating as planned to meet the RAOs (response complete and remedy in place milestones).
UXO 18 Annual Status Report	2020 - 2022	Documents the activities and results of the MEC/LUC LTM inspections at UXO 18.

TABLE 6-1

UXO 18 Previous Investigations and Document Summaries*Second Five-Year Review Report**Atlantic Fleet Weapons Training Area-Vieques**Vieques, Puerto Rico*

Previous Investigation*	Date	Investigation Activities
<p>* Documentation associated with the listed activities is available in the Administrative Record and provides detailed information used to support the remedy selection for UXO 18.</p> <p>Bgs = below ground surface EBS = Environmental Baseline Survey ESD = Explanation of Significant Difference(s) IAS = Initial Assessment Study MD = munitions debris MPPEH = material potentially presenting an explosive hazard NPL = National Priorities List O&M = operations and maintenance PA/SI = Preliminary Assessment/Site Inspection PRAP = Proposed Remedial Action Plan RAB = Restoration Advisory Board RAO = remedial action objective RCRA = Resource Conservation and Recovery Act RFA = RCRA Facility Assessment RFI = RCRA Facility Investigation RI/FS = Remedial Investigation/Feasibility Study ROD = Record of Decision RRD = range related debris SI/ESI = Site Inspection/Expanded Site Inspection VNTR = Vieques Naval Training Range</p>		

TABLE 6-2

UXO 18 Risk Assessment Results*Second Five-Year Review Report**Atlantic Fleet Weapons Training Area-Vieques**Vieques, Puerto Rico*

Media	Current/Future Demographic	Human Health Risk
Soil	Trespasser/Recreational Adult	ELCR = 1×10^{-6} and HI = 0.05 Acceptable
	Trespasser/Recreational Youth	ELCR = 9×10^{-7} and HI = 0.09 Acceptable
	Trespasser/Recreational Child	ELCR = 3×10^{-6} and HI = 0.4 Acceptable
	Worker	ELCR = 4×10^{-7} and HI = 0.003 Acceptable
ELCR – excess lifetime cancer risk HI – hazard index Unacceptable ELCR: $> 1 \times 10^{-4}$ Unacceptable HI: > 1 *Risk/Hazard levels also apply to USCG workers and potential trespassers		
Media	Ecological Risk	
	All Receptors	
Soil	Acceptable	



Legend

UXO 18

ECA – Eastern Conservation Area
EMA - Eastern Maneuver Area
LIA – Live Impact Area
SIA – Surface Impact Area
NASD - Naval Ammunition Support Detachment
VNTR - Vieques Naval Training Range

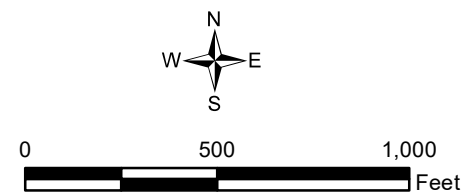







Figure 6-1
UXO 18 Site Location Map
Second Five-Year Review Report
Atlantic Fleet Weapons Training Area
Vieques, Puerto Rico



Legend

-  Educational Kiosk
-  Tourist Tree
-  Trail
-  UXO 18 Boundary
-  Overlook/Picnic Area

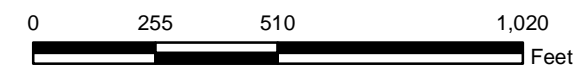
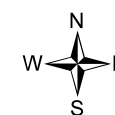


Figure 6-2
UXO 18 Previous Land Use
Second Five-Year Review Report
Atlantic Fleet Weapons Training Area
Vieques, Puerto Rico



- Legend**
- UXO 18 Boundary
 - Educational Kiosk

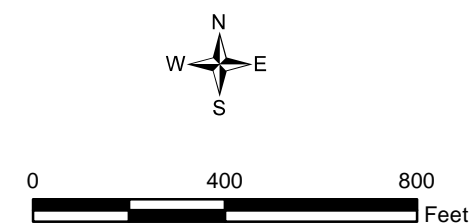


Figure 6-3
UXO 18 Current Land Use
Second Five-Year Review Report
Atlantic Fleet Weapons Training Area
Vieques, Puerto Rico

SWMU 4 – Former Open Burn/Open Detonation Area

7.1 Site Chronology

Previous removals, environmental investigations, and the remedial action conducted at SWMU 4 beginning in 1984 are summarized in Table 7-1.

7.2 Site Background

7.2.1 Description and History

SWMU 4 is approximately 450 acres in size and located on the western end of Vieques within the former NASD (Figure 7-1). SWMU 4 was used for the 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. Fuels, propellants, and explosive waste material were reportedly burned and/or detonated in the pits.

7.2.2 Physical Characteristics

The ground elevation at SWMU 4 ranges from 50 meters (164 feet) amsl at the slope of Mount Pirata to sea level at the Laguna Boca Quebrada and the Caribbean Sea (Figure 7-2). The primary surface water body within SWMU 4 is the 73-acre Laguna Boca Quebrada. SWMU4 is heavily vegetated with a high density of thorny shrubs throughout; mangroves occur around the edge of Laguna Boca Quebrada. Where bedrock is not encountered at the surface, the soil depth at SWMU 4 is approximately 2 feet bgs or more closer to the water bodies. Groundwater flows generally westward within the saprolite and bedrock toward the coastline.

7.2.3 Land and Resource Uses

SWMU 4 is located on property managed by the DOI (through USFWS) that been designated as the Vieques National Wildlife Refuge. The planned public use includes an observation tower, parking areas, hiking and biking areas, and permitted hunting and land crabbing.

There is no current, planned, or likely use of groundwater within SWMU 4. Groundwater at the site would not be potable without desalination due to the brackish nature of the groundwater at the site. Further, potable water for the island of Vieques is provided via subsea piping from mainland Puerto Rico.

7.2.4 History of Contamination

As detailed in Table 7-1 and in Section 7.2.5, an RI was completed in 2017 to assess the nature and extent of MEC and environmental media contamination to assess potential risks to human health and the environment at SWMU 4.

7.2.5 Site Risks

The HHRA and ERA conducted for SWMU 4 are described in the *SWMU 4 Feasibility Study Addendum* (CH2M, 2017b) and summarized in the following subsections. The results are presented in Table 7-2.

Human Health Risk

The HHRA was conducted to evaluate potential human health risks associated with exposure to chemicals detected in soil, groundwater, surface water, sediment, and biota (fish and blue crab). Human health risks were quantitatively evaluated for current and potential future human receptors exposed to COPCs in site media under RME scenarios. Exposure scenarios evaluated for site media comprised current and likely potential future

recreational users and trespassers (adult, youth, and child exposure to soil, surface water, and sediment) and maintenance and construction workers (adult exposure to soil), as well as hypothetical residents (adult and child exposure to soil, groundwater, and indoor air) and industrial workers (adult exposure to soil, groundwater, and indoor air). Additionally, potential ingestion of fish and crab by adult, youth, and child consumers was evaluated. The potential non-cancer hazards, expressed as the HI, and cancer risk estimates, expressed as the ELCR, were calculated using RME assumptions.

COCs were not identified for soil, surface water, sediment, or biota (fish and blue crab) because either risk estimates for site-related chemicals were below threshold values (the upper end of EPA's acceptable ELCR range of 10^{-4} and non-cancer HI of 1) or constituents detected at levels resulting in potentially unacceptable risks are attributable to natural background levels. The only COC identified in the HHRA was perchlorate in groundwater based on the hypothetical use of groundwater for drinking water. However, future groundwater use at SWMU 4 is unlikely because groundwater is not currently used, nor is there a planned or likely potable use of groundwater at the site. As noted previously, the land containing the site is mandated to be part of the Vieques National Wildlife Refuge where groundwater use is not anticipated, and groundwater at the site is also likely too brackish (salty) to be used for drinking water without desalinization based upon the site's groundwater data and its close proximity to the ocean. However, to ensure protection of human health, perchlorate in groundwater is addressed as part of the remedial action for SWMU 4.

There is the potential for explosive hazard posed by MEC that may remain at the site.

Ecological Risk

No unacceptable risks were identified for ecological receptors at SWMU 4, which included an assessment of plant and animal receptor exposure to surface soil, surface water, sediment, and food web exposures.

7.3 Remedial Action Summary

7.3.1 Basis for Taking Action

Based on the results of previous investigations and removal actions, a remedial action was deemed warranted to address potential explosive hazards that may remain at the site in areas planned for potential future recreational use by USFWS. Additionally, the HHRA identified potentially unacceptable human risk to hypothetical exposure to perchlorate in groundwater if used as drinking water.

7.3.2 Response Actions

The SWMU 4 RAOs were developed to be protective of current, potential future, and hypothetical receptors, in accordance with the current and reasonably anticipated future recreational land use for SWMU 4. The RAOs presented in the SWMU 4 ROD (NAVFAC, 2019) are:

- Reduce or prevent the explosive hazard associated with MEC to be compatible with current and anticipated land use.
- Reduce or prevent the potential for unauthorized access to certain portions of SWMU 4.
- Reduce or prevent the potential for 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.

The selected remedy for SWMU 4 to address the potential explosive hazard is Land Use Controls. The selected remedy for SWMU 4 to address the hypothetical exposure to perchlorate in groundwater if used as drinking water is Natural Attenuation and Land Use Controls. The elements of these selected remedial actions are as follows:

- Land Use Controls involves implementing LUCs and an MEC LTM program to facilitate public recreational use and ensure the remedy remains effective in the long-term.

- Natural Attenuation and Land Use Controls involves implementing LUCs and a groundwater LTM program to monitor the effectiveness of source removal of groundwater perchlorate concentrations and ensure groundwater is not used while levels remain above an acceptable level. The perchlorate RG will be the MCL if/when promulgated. Currently, the perchlorate RG is the tapwater Regional Screening Level (RSL).

7.3.3 Status of Implementation

Remedial action implementation at SWMU 4 was completed in March 2023. The SWMU 4 Remedial Action Completion Report (CH2M, 2023c) represents achievement of the RC milestone and also documents the RIP milestone, as described in the subsections below. Key features and locations of the remedial action are shown in Figure 7-3. LTM activities are anticipated to start shortly after issuing the final SWMU 4 RACR.

Land Use Controls

Educational kiosks and monuments are shown in Figure 7-3. Educational kiosks are bilingual (Spanish and English) and are intended to show visitors the areas of public use maintained and supported by USFWS, discourage access to areas not intended for public use, provide explosive awareness and safety procedures, and identify prohibited activities. Additionally, 10 monuments are located at SWMU 4 and, as indicated on the educational kiosks, are reminders to site users to follow the various requirements (e.g., no digging/fires/staking) detailed on the educational kiosks.

Natural Attenuation and Land Use Controls

USFWS planned land use does not include groundwater use and LUC monitoring will ensure potable use wells are not installed. Groundwater monitoring was initiated in July and December 2022; the results are discussed in Section 7.5.2.

7.4 Progress Since the Last Review

SWMU 4 was not included in the First FYR Report (CH2M, 2018b).

7.5 Five-Year Review Process

7.5.1 Site Inspection

A FYR inspection was not warranted because the remedy was completed in March 2023 during preparation of the FYR. The IRACR is currently being developed.

7.5.2 Data Review

Groundwater monitoring as part of the SWMU 4 remedial action began with two rounds of data collected in July and December 2022. The event included sampling of monitoring wells the Navy and regulatory agency concurred provide the appropriate coverage within and downgradient of the OB/OD pits, which coincides with where perchlorate was historically detected in groundwater above 14 µg/L (used to establish the RG) as well as downgradient of these locations, as shown in Figure 7-4. The results are presented in the following document:

- Solid Waste Management Unit 4 Annual Status Report, 2022 Groundwater Monitoring, Atlantic Fleet Weapons Training Area-Vieques, Former Naval Ammunition Support Detachment, Vieques, Puerto Rico (CH2M, 2023d)

Evaluation of the results of the two initial LTM events found:

- During the July 2022 sampling event, both wells in each of monitoring well pairs MW-08/MW-09 and MW-07/MW-20 were sampled to determine if there was vertical variability in perchlorate concentrations at these locations and, ultimately, to select the well from each pair that would continue to be sampled as part of LTM. As shown in Figure 7-4, the perchlorate concentrations in both sets of well pairs were low-to-non-detect. Based on that, the wells in which perchlorate was detected (i.e., MW-19 and MW-07) were retained in the LTM program.

- Evaluation of the initial LTM results considers natural attenuation, but also includes historical perchlorate concentrations, as shown in Figure 7-4, as well as other potential influences, to aid in understanding long-term trends. The concentrations of perchlorate observed in July 2022 are comparable to those observed during historical sampling, with exceedances of the perchlorate RG in the same wells (MW-02, MW-09, and MW-18) where concentrations above 14 µg/L were historically observed. The perchlorate concentrations in these three wells shows a significant decline between the July 2022 and December 2022 sampling events. Based on evaluation of the data, the potential reasons for the significant decline in perchlorate concentrations between January 2022 and December 2022 are:
 - Natural decline or attenuation of perchlorate concentrations
 - Seasonal variation
 - A unique series of sequential precipitation-producing weather events just prior to December 2022 sampling event

Evaluation of potential reasons for the substantial decline in perchlorate concentrations between July and December 2022 is significantly aided by the availability of historical perchlorate data over a period of many years. As shown in Figure 7-4, the perchlorate concentrations in wells MW-02, MW-09, and MW-18 have been relatively consistent for over a decade and the concentrations detected during this time do not appear to be significantly influenced by Vieques' two seasons (i.e., "dry" and "wet") because multiple samples have been collected in both seasons and the data are relatively consistent. Therefore, neither natural attenuation nor seasonal influence alone are likely the reason for the significant decline. Another potential reason for the significant decline may be the unique weather circumstances that occurred in the 2 months prior to the December 2022 sampling event. Hurricane Fiona in late September and several significant rain-producing storms in October and November 2022 brought approximately 35 inches of rain in the 2 months prior to the December groundwater sampling event. Confirmation of the likely reason for the perchlorate concentration decline will be confirmed through evaluation of additional rounds of LTM groundwater data.

7.6 Technical Assessment

7.6.1 Question A: Is the remedy functioning as intended by the decision documents?

Remedial Action Performance

Yes. The remedial action at SWMU 4 is functioning as intended to meet the RAOs established in the SWMU 4 ROD (NAVFAC, 2019).

System Operations/Operations and Maintenance

According to Region 2 Guidance for Incorporating Climate Change Considerations in Five Year Reviews, three climate change tools were utilized to assess SWMU 4 (Appendix G). Potential site impacts from climate change have been assessed, and the performance of the remedy is currently not at risk due to potential effects of climate change in the region. While hurricanes and named tropical storms may have the ability to impact the remedy (e.g., storms expose an explosive hazard or damage/destroy physical LUCs), the remedy in place already addresses this contingency as it requires post storm LUC and MEC inspections and associated repair, as warranted.

Implementation of Institutional Controls and Other Measures

The location of the physical LUCs (i.e., educational kiosks and monuments) for SWMU 4 are shown in Figure 7-3.

7.6.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

Yes. The current and reasonably anticipated future land use remains the same as that considered in the SWMU 4 ROD, which is that the site is to be managed as part of the Vieques National Wildlife Refuge with recreational use, for which the remedial action was designed. Although there is no current or planned groundwater use at

SWMU 4, performance monitoring for groundwater is a component of the remedial actions and analytical results will be provided in future annual reports (as applicable). There have been no changes in exposure assumptions from EPA's Recommended Default Exposure Factors in 2014 and Exposure Factors Handbook from 2011 through 2019 and no establishment of a federal MCL since the ROD; therefore the assessment of perchlorate and its RG remain valid.

7.6.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No. This collective information from NASD and VNTR Sites indicates LUCs, including restrictions placed on public access via Vieques National Wildlife Refuge management policy, educational mechanisms such as kiosks associated with other sites, and access restriction enforcement, are effective in deterring unapproved access.

7.7 Issues/Recommendations

No issues were identified during the Second FYR that would inhibit the ability of the remedy to be protective and achieve the associated RAOs. Therefore, because no issues were identified that affect remedy protectiveness, no recommendations for follow-up actions are necessary.

7.8 Other Findings

No other findings were identified.

7.9 Protectiveness Statement

Protectiveness Statement(s)		
<i>Operable Unit:</i> SWMU 4	<i>Protectiveness Determination:</i> Protective	<i>Planned Addendum Completion Date:</i> N/A
<i>Protectiveness Statement:</i> <p>The remedy at SWMU 4 is currently and is anticipated to remain protective of human health and the environment. Remedy implementation included inspecting areas of potential and/or planned public access to ensure no MEC was likely present. In addition, LUCs were implemented, are monitored/maintained, and have been shown to effectively reduce the potential for unauthorized access to portions of the site, reduce the potential for exposure to explosive hazards, and reduce or prevent potential exposure to groundwater containing perchlorate concentrations above the RG.</p>		

TABLE 7-1

SWMU 4 Previous Investigations and Document Summaries*Second Five-Year Review Report**Atlantic Fleet Weapons Training Area-Vieques**Vieques, Puerto Rico*

Previous Investigation*	Date	Investigation Activities
Initial Assessment Study	1984	An Initial Assessment Study (IAS; Greenleaf, 1984) was conducted in 1984 to identify and assess sites posing potential threats to human health or the environment. SWMU 4 was designated as Site 19, the West Explosive Ordnance Disposal (EOD) Range.
Phase II RCRA Facility Assessment	1988	A Phase II Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA; Kearney, 1988) was conducted in 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. The Phase II RFA Report recommended soil, groundwater, and surface water sampling at SWMU 4.
Expanded Preliminary Assessment/Site Investigation	2000	An Expanded Preliminary Assessment/Site Investigation (PA/SI; CH2M, 2000) was conducted in 2000 to determine if a release of hazardous constituents had occurred because of site-related activities, and to assess whether SWMU 4 required further investigation. Munitions found during transect inspections were removed. Based on the results of the Expanded PA/SI, an 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 Investigation (CH2M, 2002) was conducted in 2000 for the former NASD to develop a set of background concentrations for inorganic constituents in soil to help distinguish inorganic concentrations that occur in soil from those that may be present because of a site-related release.
Environmental Baseline Survey	2000	An Environmental Baseline Survey (PMC, 2000) was completed in 2000 to disclose information regarding the environmental condition of the Navy property. The information was used as a basis for determining the environmental suitability of the property for transfer.
Remedial Investigation/Feasibility Study	2002-2009	A Remedial Investigation/Feasibility Study (RI/FS; CH2M, 2012) was conducted to assess the nature and extent of MEC and environmental media contamination, to assess potential risks to human health and environment, and evaluate remedial alternatives for SWMU 4. It was concluded that although MEC is potentially present across SWMU 4, the highest densities were located within and immediately around the former OB/OD area, with decreasing density with distance. As part of the RI, munitions removal occurred across 87 acres. The RI also identified potentially unacceptable human health risk associated with hypothetical potable use of groundwater contaminated with perchlorate and hypothetical fish and aquatic crab (biota) consumption from Laguna Boca Quebrada. There were no unacceptable risks to human health or the environment posed by constituent concentrations in soil, sediment, or surface water. The FS evaluated potential remedial alternatives to address potential MEC remaining at SWMU 4 and potentially unacceptable human health risk associated with hypothetical groundwater and fish and crab (biota) consumption.
Non-Time Critical Removal Action	2009-2010	A Non-Time-Critical Removal Action (NTCRA) was conducted to remove munitions across all roads and the beach at SWMU 4 to reduce the potential explosive hazard associated with areas intended for public use. The NTCRA area comprised 24 acres: 17 acres of roads (to a maximum depth of 2 feet below ground surface [bgs]) and 7 acres of beach (to a maximum depth of 4 feet bgs).
Supplemental Remedial Investigation	2014	A Supplemental RI (CH2M, 2017) was conducted in 2014 during which additional biota (fish and blue crab) samples were collected from Laguna Boca Quebrada and used to update the human health risk assessment (HHRA). Based on the concentrations of constituents in biota samples collected during the Supplemental RI, it was determined there is no unacceptable fish/crab consumption risk attributable to

TABLE 7-1

SWMU 4 Previous Investigations and Document Summaries*Second Five-Year Review Report**Atlantic Fleet Weapons Training Area-Vieques**Vieques, Puerto Rico*

Previous Investigation*	Date	Investigation Activities
		past OB/OD activities; therefore, no remedial action for biota was determined to be necessary. An additional round of groundwater samples was collected for perchlorate analysis to provide up-to-date data. Perchlorate levels in groundwater were found to be comparable to the 2009 levels.
Non-Time Critical Removal Action	2015	An NTCRA was conducted over an additional 54 acres in 2015 to further reduce the potential explosive hazard associated with the areas intended for public use. The NTCRA focused on the following four areas: <ul style="list-style-type: none"> • OB/OD pits and Planned Observation Tower Area – munitions removal to the total depth of any subsurface anomaly detected at the OB/OD pits and to a maximum depth of 2 feet bgs at the planned observation tower area (approximately 6 acres). • Planned Parking and Picnic Areas – munitions removal to a maximum depth of 2 feet bgs (approximately 5 acres). • Lagoon Fringe Area – munitions removal to a maximum depth of 1 foot bgs within areas likely accessed for land crabbing around the lagoon fringe (approximately 19 acres). • Investigation “Spokes” Area – munitions removal to a maximum depth of 1 foot bgs within the planned hunting area (approximately 24 acres).
Feasibility Study Addendum	2016	The FS Addendum (CH2M, 2017) provides further clarification of the costs and associated assumptions used to evaluate the MEC remedial alternatives.
Proposed Remedial Action Plan (PRAP)	2018	The proposed remedial action was documented in the PRAP (NAVFAC, 2018), which was offered for public comment between July 16 and August 14, 2018. The preferred alternative for SWMU 4 was Alternative M-2 (to address potential explosive hazards) and Alternative G-2 (to address residual groundwater perchlorate contamination).
Record of Decision	2019	The selected remedial action for SWMU 4 was Alternative M-2 and Alternative G-2. The components of the remedial action include LUCs to address potential explosive hazards and residual groundwater perchlorate contamination, along with natural attenuation. Additionally, remedial actions include LTM to identify any MEC that may become exposed and proper disposal of MEC, if identified.

* Documentation associated with the listed activities is available in the Administrative Record and provides detailed information used to support the remedy selection for SWMU 4.

Bgs = below ground surface

EBS = Environmental Baseline Survey

ESD = Explanation of Significant Difference(s)

IAS = Initial Assessment Study

LTM = long-term monitoring

MD = munitions debris

MPPEH = material potentially presenting an explosive hazard

NPL = National Priorities List

O&M = operations and maintenance

PA/SI = Preliminary Assessment/Site Inspection

PRAP = Proposed Remedial Action Plan

RAB = Restoration Advisory Board

RAO = remedial action objective

RCRA = Resource Conservation and Recovery Act

RFA = RCRA Facility Assessment

RFI = RCRA Facility Investigation

TABLE 7-1

SWMU 4 Previous Investigations and Document Summaries*Second Five-Year Review Report**Atlantic Fleet Weapons Training Area-Vieques**Vieques, Puerto Rico*

Previous Investigation*	Date	Investigation Activities
RI/FS = Remedial Investigation/Feasibility Study ROD = Record of Decision RRD = range related debris SI/ESI = Site Inspection/Expanded Site Inspection VNTR = Vieques Naval Training Range		

TABLE 7-2

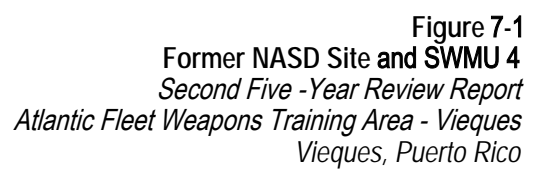
SWMU 4 Risk Assessment Results*Second Five-Year Review Report**Atlantic Fleet Weapons Training Area-Vieques**Vieques, Puerto Rico*

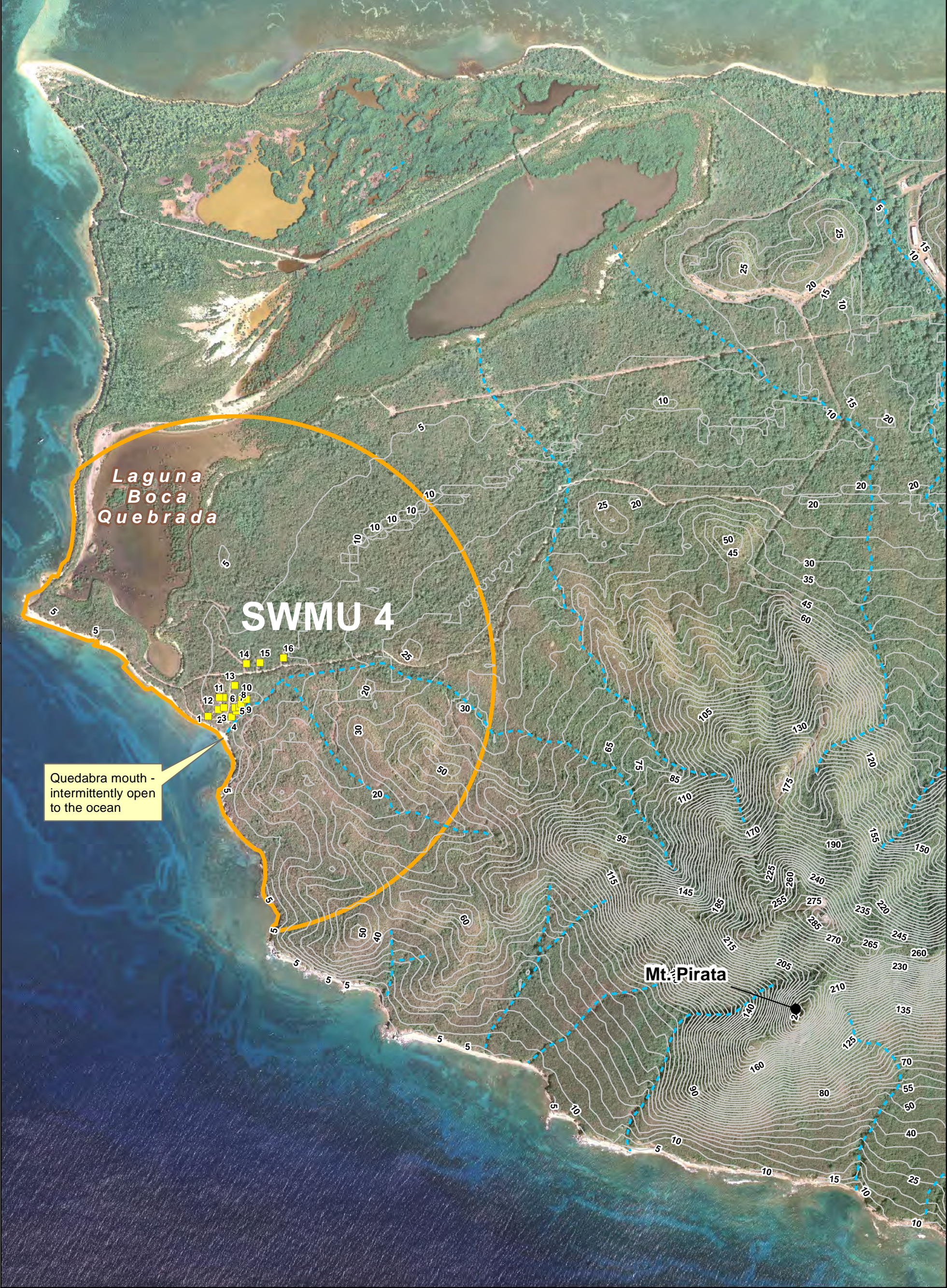
Media	Current/Future Demographic	Human Health Risk
Soil, Surface Water, Sediment, Groundwater, and Biota (fish and blue crab)	Current/Future Recreational Users/Trespassers	Adult – ELCR = 9×10^{-6} and HI < 1.0 Youth – ELCR = 6×10^{-6} and HI < 1.0 Child – ELCR = 7×10^{-6} and HI < 1.0 Acceptable
	Hypothetical Future Residents	Adult/Child – ELCR = 7×10^{-5} (cumulative); 4×10^{-6} (soil); 7×10^{-5} (groundwater) and HI < 1.0 (soil); HI > 1.0 (groundwater) Acceptable for soil; unacceptable for groundwater*
	Potential Future Maintenance Workers	ELCR < 1×10^{-6} and HI < 1.0 Acceptable
	Potential Future Construction Workers	ELCR < 1×10^{-6} and HI < 1.0 Acceptable
	Hypothetical Future Industrial Workers	ELCR = 4×10^{-5} and HI < 1.0 (soil); HI > 1.0 (groundwater) Acceptable for soil; unacceptable for groundwater*
	Potential Current/Future Fish Consumers	Adult – ELCR < 1×10^{-6} and HI > 1.0 Youth – ELCR < 1×10^{-6} and HI > 1.0 Child – ELCR < 1×10^{-6} and HI > 1.0 Although calculations indicate unacceptable non-cancer hazards, inorganics concentrations responsible for calculated unacceptable HI values are attributable to natural conditions; therefore, no unacceptable risk associated with past site-related activities
	Potential Current/Future Land Crab Consumers	Adult – ELCR = 3×10^{-5} and HI > 1.0 Youth – ELCR = 3×10^{-5} and HI > 1.0 Child – ELCR = 2×10^{-5} and HI > 1.0 Although calculations indicate unacceptable non-cancer hazards, inorganics concentrations responsible for calculated unacceptable HI values are attributable to natural conditions; therefore, no unacceptable risk associated with past munitions-related activities
<p>For there to be unacceptable cancer risk, the ELCR would need to be higher than 1×10^{-4}</p> <p>For there to be unacceptable non-cancer hazard, the HI would need to be higher than 1</p> <p>ELCR = excess lifetime cancer risk</p> <p>HI = hazard index</p>		

TABLE 7-2

SWMU 4 Risk Assessment Results*Second Five-Year Review Report**Atlantic Fleet Weapons Training Area-Vieques**Vieques, Puerto Rico*

Media	Current/Future Demographic	Human Health Risk
*Due to perchlorate concentrations in groundwater (maximum concentration detected = 160 µg/L versus tap water RSL of 14 µg/L) *Risk/Hazard levels also apply to USCG workers and potential trespassers		
Media	Ecological Risk	
	All Receptors	
Soil, Surface Water, Sediment, Food Web Exposures	Acceptable	





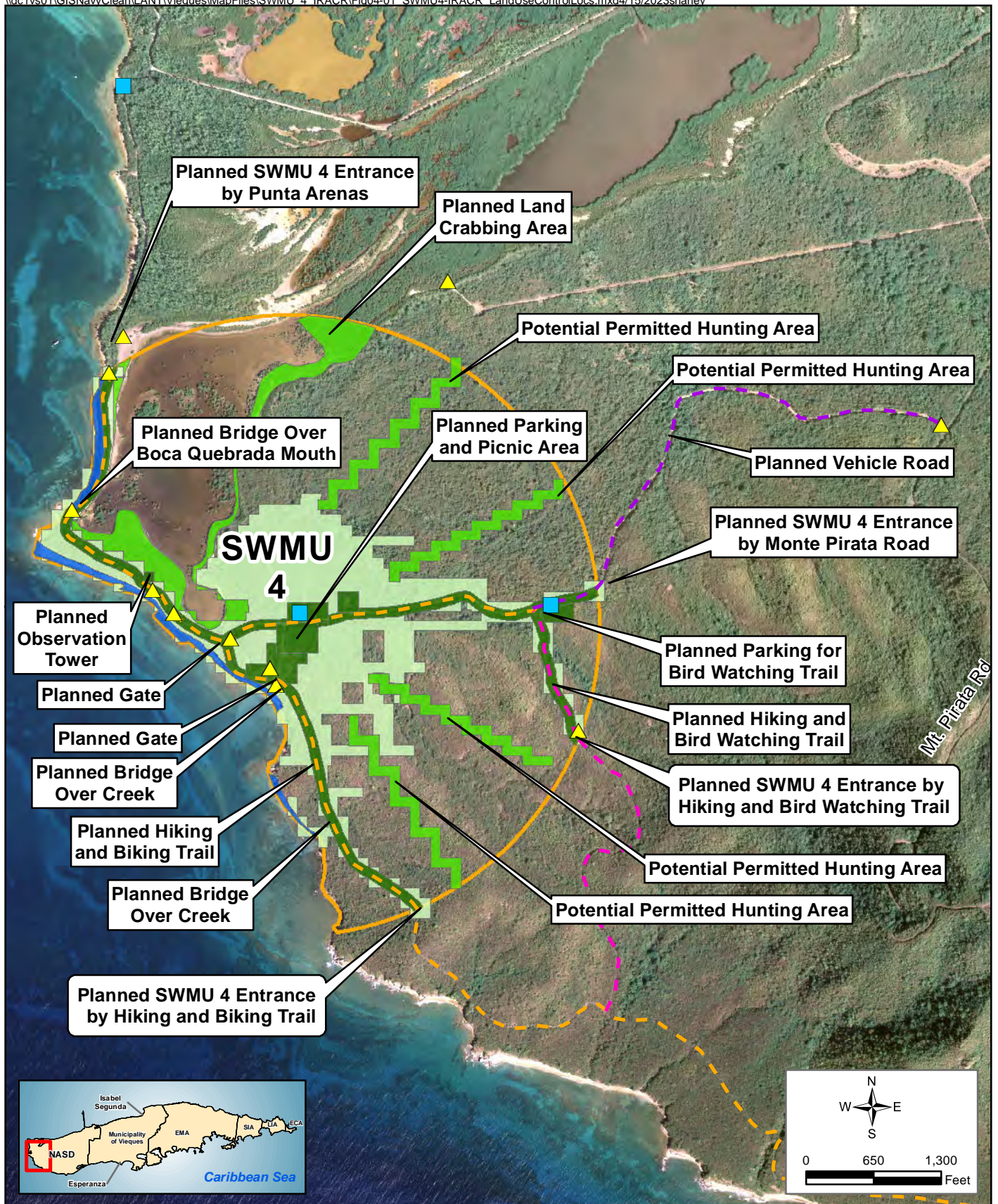
- Legend**
- OB/OD Pits
 - Ephemeral Stream
 - Topographic Contours (5 Meter)
 - SWMU 4 Site Boundary



Figure 7-2
SWMU 4 Site Features
Second Five-Year Review Report
Atlantic Fleet Weapons Training Area - Vieques
Vieques, Puerto Rico

0 1,000 2,000 Feet

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W E
S



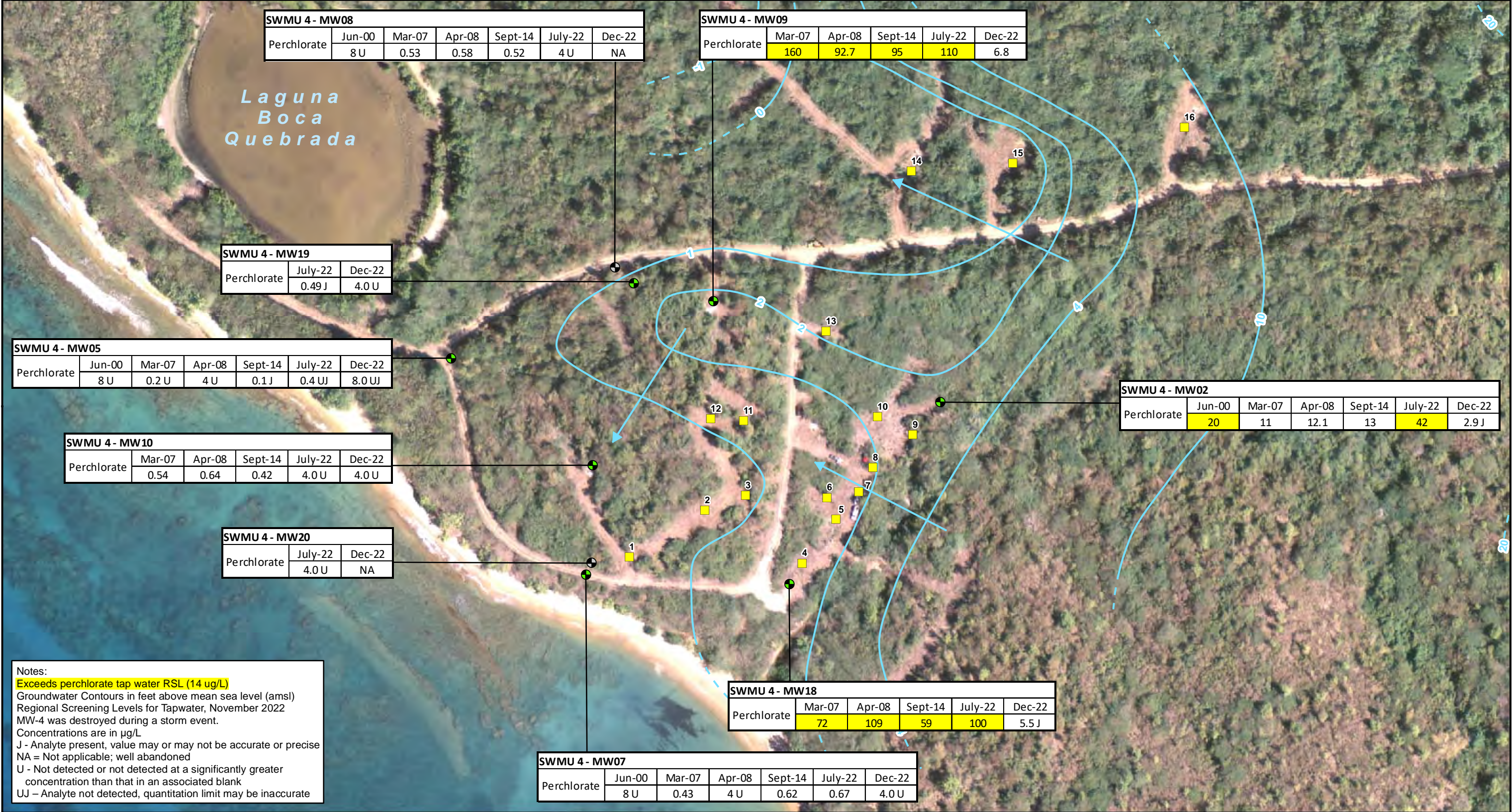
Legend

Munitions Clearance By Depth

- Surface Clearance Only
- Subsurface Cleared to 1 Foot: Potential Permitted Hunting Area, Lagoon Fringe (Planned Land Crabbing Area)
- Subsurface Cleared to 4 feet: Sandy Beach Areas

- Subsurface Cleared to 2 Feet: Planned Observation Tower, Planned Parking Areas, Planned Hiking and Biking Trail, Road Buffer, OB/OD Pits
- SWMU 4 LUC and MEC Monitoring Boundary
- Monument
- Kiosk

Figure 7-3
SWMU4 Land Use Control
Locations
Second Five-Year Review
Report
Atlantic Fleet Weapons Training Area - Vieques
Vieques, Puerto Rico



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Appendix A
Public Notice of Five-Year Review for
SWMU 1, AOC E, UXO 1, UXO 18, and
SWMU 4



NAVFAC ATLANTIC
Community Relations Team
P.O. BOX 1532
Vieques, PR 00765

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JOIN THE VIEQUES RESTORATION ADVISORY BOARD

If you are interested in environmental issues and want to become more involved in your community, consider joining the Vieques Restoration Advisory Board (RAB).

For more information about the RAB, please contact:

Kevin Cloe
kevin.r.cloe.civ@us.navy.mil

ÚNASE A LA JUNTA DE CONSEJO PARA LA RESTAURACIÓN DE VIEQUES

Si usted está interesado en temas ambientales y desea involucrarse más en su comunidad, considere unirse al Consejo para la Restauración de Vieques (RAB).

Para obtener más información sobre el RAB, póngase en contacto con:

María Danois
maria.m.danois.civ@us.navy.mil

For more information contact:
Para más información, comuníquese con:

NAVFAC Atlantic Public Affairs and Communications Office

Oficina de Asuntos Públicos y Comunicaciones de NAVFAC Atlantic

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✉ NAVFAC_LANT_PAO@us.navy.mil



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Por su seguridad, por favor obedecer todos los letreros de advertencia y mantenerse fuera de todas las áreas no autorizadas.

Vieques

Environmental Restoration News
Noticias Sobre la Restauración Ambiental

APRIL-MAY 2023

Vieques Restoration Advisory Board Site Visit

The Navy is pleased to announce and invite the Vieques Restoration Advisory Board (RAB) and Community members to a down-range tour in May!

The tour will include sites located along the eastern portion of the island including Playa Jalova, Punta Carrenero, Playa Matías, Puerto Diablo, and overlook at Playa Campana (see map). These are areas where the Navy is actively cleaning up munitions to make the areas available for use planned by USFWS, including public access in certain places. The guided tour will provide RAB and community members the opportunity to learn about the cleanup progress and ask questions.

Because space is limited, reservations are required and RAB and community members who request to join the guided tour will be included on a first come, first serve basis. The tour is scheduled for Wednesday, May 10, 2023, beginning at 10:00 AM at the entrance of Camp García, and will last approximately 4 hours. For your safety, it is important that you wear appropriate clothing: long pants, shirts with sleeves, boots or closed shoes (no sandals), and hat. We also recommend that

continued page 2

ABRIL-MAYO 2023

Visita al sitio para miembros de la Junta de Consejo de Restauración (RAB) y la Comunidad de Vieques

¡La Marina se complace en anunciar e invitar a la Junta de Consejo de Restauración de Vieques (RAB, por sus siglas en inglés) y a los miembros de la Comunidad a una visita de campo de trabajo de la limpieza en mayo!

El recorrido incluirá sitios ubicados a lo largo de la parte este de la isla, incluyendo Playa Jalova, Punta Carrenero, Playa Matías, Puerto Diablo y mirador en Playa Campana (ver mapa). Estas son áreas donde la Marina está limpiando activamente las municiones para que las áreas estén disponibles para el uso planificado por el Servicio de Pesca y Vida Silvestre de EE. UU. (USFWS, por sus siglas en inglés) incluyendo el acceso público en ciertos lugares. La visita guiada brindará a los miembros del RAB y a los miembros de la comunidad la oportunidad de aprender sobre el progreso de la limpieza y hacer preguntas.

Debido a que el espacio es limitado, se requieren reservaciones y los miembros de RAB y de la comunidad que soliciten unirse a la visita guiada se incluirán por orden de llegada. El recorrido está programado para el miércoles 10 de mayo de 2023, comenzando a las 10:00 AM en la entrada del Campamento García, y durará aproximadamente 4 horas. Por su seguridad, es importante que use ropa adecuada: pantalones

continúa en la página 3

STAY INFORMED • MANTÉNGASE INFORMADO



PUBLIC INPUT OPPORTUNITIES

- 1 Attend the Virtual RAB Site Visit (p. 1)
- 2 Field Activities (p. 2)
- 3 Join the Vieques RAB (p. 4)

OPORTUNIDADES DE COMENTARIO PÚBLICO

- 1 Asista al recorrido de visita al sitio (pág. 2)
- 2 Actividades de Campo (pág. 3)
- 3 Únase a la Junta de Consejo para la Restauración de Vieques (pág. 4)

you bring sunscreen and/or bug repellent. The Navy will have water available for all; however, we recommend that you bring your own lunch or snack.

Register Today!

RALLY PLACE:

Camp Garcia, Vieques, PR

DATE:

Wednesday, May 10, 2023

TIME:

10:00 AM- 2:00 PM

If you wish to join the tour, you **must pre-register** by calling or texting **Rosa Esquivel at (757) 739-3049**, by email at Vieques.Restoration.Program@jacobs.com or by scanning the QR code by end of Thursday, May 4, 2023.

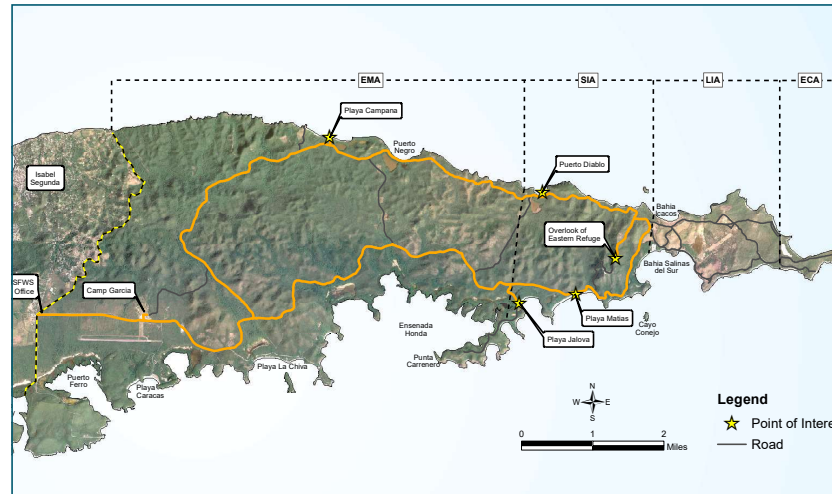
If you have any questions, please contact Rosa Esquivel.

WE LOOK FORWARD TO SEEING YOU THERE!

Disclaimer: Tour schedule is subject to change based on inclement weather or public safety concerns. If it changes, those pre-registered will be contacted with updates.



SCAN HERE!



The Navy Would Like Your Input on the Second Five-Year Review Process for Vieques

The Navy is conducting the second Five-Year Review of sites for which remedial actions have been implemented under a Record of Decision (ROD). The objective of these Five-Year Reviews, which are required under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), is to determine whether the remedial action/remedy is functioning as intended and remains protective of human health and the environment in accordance with the requirements set forth in each of their respective RODs.

Remedial actions/remedies that have been implemented at Vieques and will be part of the second Five-Year Review are:

- Solid Waste Management Unit (SWMU) 1 – Former Camp Garcia Landfill
- SWMU 4 – Former Open Burn/Open Detonation (OB/OD) site
- Area of Concern (AOC) E – Former Underground Storage Tank (UST) Area
- UXO 1 – Former Eastern Conservation Area
- UXO 18 – Cayo La Chiva

More information regarding public participation in the Five-Year Review process will be provided in a public notice that will be issued in August.

Field Activities

- Non-Time Critical Removal Action (NTCRA) surface munitions removal in the Surface Impact Area (SIA) (UXOs 9 and 10)
- NTCRA surface and subsurface clearance of roads in the Eastern Maneuver Area (EMA) and SIA (UXOs, 5, 6, and 11)
- Time Critical Removal Action (TCRA) work in the Submunitions Area (UXO 4)
- Underwater Remedial Investigation (RI) and munitions removal work offshore of beaches anticipated for future public use

de la página 1

largos, camisas con mangas, botas o zapatos cerrados (no sandalias) y sombrero. También le recomendamos que traiga protector solar y / o repelente de insectos. La Marina tendrá agua disponible para todos; Sin embargo, le recomendamos que traiga su propio almuerzo o snack.

¡Regístrese hoy!

LUGAR DE REUNIÓN:

Campamento Garcia, Vieques, PR

FECHA:

Miércoles, 10 de mayo de 2023

HORA:

10:00 AM- 2:00 PM

Si desea unirse al tour, **debe preinscribirse** llamando o enviando un mensaje de texto a **Rosa Esquivel al (757) 739-3049**, por correo electrónico ViequesRestorationProgram@jacobs.com o escaneando el código QR antes del final del **jueves 4 de mayo de 2023**.

Si tiene alguna pregunta, comuníquese con **Rosa Esquivel**.

¡ESPERAMOS VERLE ALLÍ!

Descargo de responsabilidad: El horario del tour está sujeto a cambios del clima o las preocupaciones de seguridad pública. Si el horario cambia, aquellos que han hecho reservaciones serán contactados con actualizaciones.



¡ESCANEAR AQUÍ!

La Marina desearía su opinión sobre el Segundo Repaso Quinquenal del Proceso de Vieques

La Marina está llevando a cabo la segunda revisión quinquenal de los sitios para los cuales se han implementado medidas correctivas bajo un Registro de Decisión (ROD, por sus siglas en inglés). El objetivo de estas revisiones quinquenales, que son requeridas bajo la Ley de Respuesta Ambiental Integral, Compensación y Responsabilidad (CERCLA, por sus siglas en inglés), es determinar si la acción correctiva/remedio está funcionando según lo previsto y sigue protegiendo la salud humana y el medio ambiente de acuerdo con los requisitos establecidos en cada uno de sus respectivos RODs.

Las medidas correctivas que se han implementado en Vieques y que formarán parte de la segunda revisión quinquenal son:

- Unidad de Manejo de Residuos Sólidos (SWMU) 1 – Antiguo Vertedero de Camp Garcia
- SWMU 4 – Antiguo sitio de combustión abierta / detonación abierta (OB / OD)
- Área de preocupación (AOC) E - Área del antiguo tanque de almacenamiento subterráneo (UST)
- UXO 1 – Antigua Área de Conservación Oriental
- UXO 18 – Cayo La Chiva

Se proporcionará más información sobre la participación pública en el Proceso de Revisión de Cinco Años en un aviso público que se emitirá en agosto.

Actividades de Campo

- Acción de Remoción de Tiempo no Crítico (NTCRA, por sus siglas en inglés) de remoción de municiones de superficie en el Área de Impacto de Superficie (SIA) (UXOs 9 y 10)
- NTCRA, despeje de superficie y subsuelo de carreteras en el Área de Maniobra del Este (EMA) y SIA (UXO, 5, 6 y 11)
- Trabajo de la Acción de Remoción de Tiempo Crítico (TCRA) en el Área de Submuniciones (UXO 4)
- Se prevé que la Investigación de Remediación Submarina (RI, por sus siglas en inglés) y los trabajos de remoción de municiones frente a las playas que se prevén para uso público futuro

Appendix B

Documents Reviewed by Site

Documents Reviewed by Site

In addition to the documents listed chronologically for each site, review of documents maintained on the Vieques (Navy, Environmental Protection Agency Region 2, and Puerto Rico Department of Natural and Environmental Resources) website was also performed including groundwater monitoring data, groundwater contour maps, and landfill inspection reports.

SWMU 1

A. T. Kearney, Inc. & K. W. Brown & Associates, Inc. 1988. *Phase II RCRA Facility Assessment of the Atlantic Fleet Weapons Training Facility (LANT) Including the Eastern Maneuver Area, Camp Garcia and Inner Range, Vieques Island, Puerto Rico*. October.

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CH2M. 2008. *Preliminary Assessment/Site Inspection Report 12 Consent Order Sites and 8 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico*. June.

CH2M. 2010. *Site Inspection/Expanded Site Inspection Report, 7 Consent Order Sites and 16 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico*. August.

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CH2M. 2012. *Remedial Action Implementation, Operations and Maintenance, Land Use Control, and Long-Term Monitoring Work Plan - Solid Waste Management Unit 1 (SWMU 1), Former Naval Ammunition Support Detachment, Vieques, Puerto Rico*. July.

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SWMU 4

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Appendix C

SWMU 1 Inspection Checklists and Photographs

Five-Year Review Site Inspection Checklist

Site name: Solid Waste Management Unit 1 (SWMU 1)	Date of Inspection:
Location and Region: Former VNTR, Vieques, Puerto Rico	EPA ID: CERCLIS National Superfund database identification number: PRN000204694 SWMU 1 is also known as Operable Unit 11 – East SWMU 1 – Camp Garcia LF in the SEMS database.
Agencies involved in site visit:	Weather/temperature:
Remedy Includes: Native (vegetative) cover, groundwater monitoring, and land use control (LUC) implementation and monitoring to address potential exposure from direct contact with subsurface landfill debris and associated contamination, minimize the potential for erosion of landfill debris, and ensure that land use within the landfill boundaries is controlled.	
Are Institutional Controls and LUCs properly implemented and fully enforced? <div style="text-align: right;"> <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No </div> If no, note on map and explain in Remarks below.	
Institutional Controls implementation and enforcement <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div> Conditions imply ICs not properly implemented Conditions imply ICs not being fully enforced </div> <div style="text-align: right;"> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A </div> </div> <div style="margin-top: 10px;"> Type of monitoring (e.g., self-reporting, drive by): _____ Frequency: <u>5 year review</u> Responsible party/agency: <u>Navy</u> Contact: <u>Kevin Cloe</u> Name: <u>Kevin Cloe/Navy</u> Title: <u>Remedial Project Manager</u> Date: _____ Phone no. <u>757-322-4736</u> </div> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div> Reporting is up-to-date Reports are verified by the lead agency </div> <div style="text-align: right;"> <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A </div> </div> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div> Specific requirements in deed or decision documents have been met Violations have been reported Are Institutional Controls Adequate? </div> <div style="text-align: right;"> <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A </div> </div> <div style="margin-top: 10px;"> Other problems or suggestions: <input type="checkbox"/> Report attached </div>	
Fencing status <input checked="" type="checkbox"/> Location shown on site map <input type="checkbox"/> Gates secured <input type="checkbox"/> N/A Remarks: _____	
Signs and other security measures status <input checked="" type="checkbox"/> Location shown on site map <input type="checkbox"/> N/A Remarks: _____	
Is an active Remediation System part of the selected remedy? <div style="text-align: right;"> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No </div> If no, next section not applicable.	
If yes, for active remediation systems, are the following components in good condition and working properly? If no, explain in Remarks below.	
i. Pumps and Electrical	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
ii. Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
iii. Treatment Technology	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
iv. Discharge Structure and Appurtenances	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
v. Recovery Wells	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

LUC Site Inspection Checklist
Former Vieques Naval Training Range, Vieques, Puerto Rico

SWMU 1 (Annual Inspection)

DATE: 1/17/2019 WEATHER CONDITIONS: Sunny and clear, 84°F INSPECTOR'S NAME: Ronny Fields

Item	Potential Problems	Observations	Acceptable ?		Recommended Remedial Action	Date of Completion
			Yes	No		
Vegetative Cover	Dead or distressed vegetation; insufficient coverage; areas of exposed soil	Vegetation cover is very thick all over the entire site.	Yes		None	1/17/2019
Signs, Fencing, and Gates	Deterioration of signs, fence, or gates; Personnel unable to read sign due to obstruction; Observed signs of trespassing (noting the location)	Signs and fencing in good order. All signs are present in designated locations and are clearly visible. The fence is intact and secures site. All posts are in good shape except for one that was bent during the semi-annual fence line vegetation clearing task. The post still maintains its integrity, but will be replaced with a new one. Field observations regarding the signs were captured in the Semi-annual Sign Inventory data application.	Yes		Replace bent fence post	1/17/2019
Erosion	Exposed debris. Visible runoff patterns such as channels or gullies.	No evidence of erosion onsite. No visible signs of runoff patterns. The low lying area on the north side of the road (where the ephemeral stream historically bisects the road) has thick vegetation growth deeming the area as non-passable without having heavy, thick vegetation removed. Vegetation growth over the entire site is very thick and continues to thicken throughout the season. Tree tops sheared off during the hurricane are growing back blooming with foliage.	Yes		None	1/17/2019
Other Observations		All areas accessed exhibited competent, dry ground in both the north and south areas of the site.	Yes		None	1/17/2019

ADDITIONAL COMMENTS:

Vieques Sign Inventory

Sequence Number	746
-----------------	-----

Sign Region/Name

Sign Region	SWMU 1
LocationCode	swmu1-1a
Assessment Fiscal Quarter	2019 Q2 (JAN-MAR 2019)
Date of Assessment	01/17/2019

Sign Condition Assessment

Is Sign Present?	Yes
Is Pole/Post/Gate/Platform Present?	Yes
Is Sign Damaged?	No
If Damaged, Does Sign need to be repaired/replaced?	No
Is the Post Damaged?	No
Is Hardware In Place?	Yes
Is Hardware Causing Damage to Sign?	No
Additional Notes About this Sign	Sign intact and legible

Sign Photo(s)

Sign Pictures



Vieques Sign Inventory

Sequence Number	741
-----------------	-----

Sign Region/Name

Sign Region	SWMU 1
LocationCode	swmu1-1b
Assessment Fiscal Quarter	2019 Q2 (JAN-MAR 2019)
Date of Assessment	01/17/2019

Sign Condition Assessment

Is Sign Present?	Yes
Is Pole/Post/Gate/Platform Present?	Yes
Is Sign Damaged?	No
If Damaged, Does Sign need to be repaired/replaced?	No
Is the Post Damaged?	No
Is Hardware In Place?	Yes
Is Hardware Causing Damage to Sign?	No
Additional Notes About this Sign	Sign legible and intact

Sign Photo(s)

Sign Pictures



Vieques Sign Inventory

Sequence Number	744
-----------------	-----

Sign Region/Name

Sign Region	SWMU 1
LocationCode	swmu1-2a
Assessment Fiscal Quarter	2019 Q2 (JAN-MAR 2019)
Date of Assessment	01/17/2019

Sign Condition Assessment

Is Sign Present?	Yes
Is Pole/Post/Gate/Platform Present?	Yes
Is Sign Damaged?	No
If Damaged, Does Sign need to be repaired/replaced?	No
Is the Post Damaged?	No
Is Hardware In Place?	Yes
Is Hardware Causing Damage to Sign?	No
Additional Notes About this Sign	Sign legible and intact

Sign Photo(s)

Sign Pictures



Vieques Sign Inventory

Sequence Number	745
-----------------	-----

Sign Region/Name

Sign Region	SWMU 1
LocationCode	swmu1-2b
Assessment Fiscal Quarter	2019 Q2 (JAN-MAR 2019)
Date of Assessment	01/17/2019

Sign Condition Assessment

Is Sign Present?	Yes
Is Pole/Post/Gate/Platform Present?	Yes
Is Sign Damaged?	No
If Damaged, Does Sign need to be repaired/replaced?	No
Is the Post Damaged?	No
Is Hardware In Place?	Yes
Is Hardware Causing Damage to Sign?	No
Additional Notes About this Sign	Sign legible and intact

Sign Photo(s)

Sign Pictures



Vieques Sign Inventory

Sequence Number	742
-----------------	-----

Sign Region/Name

Sign Region	SWMU 1
LocationCode	swmu1-3a
Assessment Fiscal Quarter	2019 Q2 (JAN-MAR 2019)
Date of Assessment	01/17/2019

Sign Condition Assessment

Is Sign Present?	Yes
Is Pole/Post/Gate/Platform Present?	Yes
Is Sign Damaged?	No
If Damaged, Does Sign need to be repaired/replaced?	No
Is the Post Damaged?	No
Is Hardware In Place?	Yes
Is Hardware Causing Damage to Sign?	No
Additional Notes About this Sign	Sign legible and intact

Sign Photo(s)

Sign Pictures



Vieques Sign Inventory

Sequence Number	743
-----------------	-----

Sign Region/Name

Sign Region	SWMU 1
LocationCode	swmu1-3b
Assessment Fiscal Quarter	2019 Q2 (JAN-MAR 2019)
Date of Assessment	01/17/2019

Sign Condition Assessment

Is Sign Present?	Yes
Is Pole/Post/Gate/Platform Present?	Yes
Is Sign Damaged?	No
If Damaged, Does Sign need to be repaired/replaced?	No
Is the Post Damaged?	No
Is Hardware In Place?	Yes
Is Hardware Causing Damage to Sign?	No
Additional Notes About this Sign	Sign legible and intact

Sign Photo(s)

Sign Pictures



Vieques Sign Inventory

Sequence Number	739
-----------------	-----

Sign Region/Name

Sign Region	SWMU 1
LocationCode	swmu1-4a
Assessment Fiscal Quarter	2019 Q2 (JAN-MAR 2019)
Date of Assessment	01/17/2019

Sign Condition Assessment

Is Sign Present?	Yes
Is Pole/Post/Gate/Platform Present?	Yes
Is Sign Damaged?	No
If Damaged, Does Sign need to be repaired/replaced?	No
Is the Post Damaged?	No
Is Hardware In Place?	Yes
Is Hardware Causing Damage to Sign?	No
Additional Notes About this Sign	Sign legible and intact

Sign Photo(s)

Sign Pictures



Vieques Sign Inventory

Sequence Number	740
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Sign Region/Name

Sign Region	SWMU 1
LocationCode	swmu1-4b
Assessment Fiscal Quarter	2019 Q2 (JAN-MAR 2019)
Date of Assessment	01/17/2019

Sign Condition Assessment

Is Sign Present?	Yes
Is Pole/Post/Gate/Platform Present?	Yes
Is Sign Damaged?	No
If Damaged, Does Sign need to be repaired/replaced?	No
Is the Post Damaged?	No
Is Hardware In Place?	Yes
Is Hardware Causing Damage to Sign?	No
Additional Notes About this Sign	Sign legible and intact

Sign Photo(s)

Sign Pictures



Vieques Sign Inventory

Sequence Number	737
-----------------	-----

Sign Region/Name

Sign Region	SWMU 1
LocationCode	swmu1-5a
Assessment Fiscal Quarter	2019 Q2 (JAN-MAR 2019)
Date of Assessment	01/17/2019

Sign Condition Assessment

Is Sign Present?	Yes
Is Pole/Post/Gate/Platform Present?	Yes
Is Sign Damaged?	No
If Damaged, Does Sign need to be repaired/replaced?	No
Is the Post Damaged?	No
Is Hardware In Place?	Yes
Is Hardware Causing Damage to Sign?	No
Additional Notes About this Sign	Sign legible and intact

Sign Photo(s)

Sign Pictures



Vieques Sign Inventory

Sequence Number	738
-----------------	-----

Sign Region/Name

Sign Region	SWMU 1
LocationCode	swmu1-5b
Assessment Fiscal Quarter	2019 Q2 (JAN-MAR 2019)
Date of Assessment	01/17/2019

Sign Condition Assessment

Is Sign Present?	Yes
Is Pole/Post/Gate/Platform Present?	Yes
Is Sign Damaged?	No
If Damaged, Does Sign need to be repaired/replaced?	No
Is the Post Damaged?	No
Is Hardware In Place?	Yes
Is Hardware Causing Damage to Sign?	No
Additional Notes About this Sign	Sign legible and intact

Sign Photo(s)

Sign Pictures



Vieques Sign Inventory

Sequence Number	735
-----------------	-----

Sign Region/Name

Sign Region	SWMU 1
LocationCode	swmu1-6a
Assessment Fiscal Quarter	2019 Q2 (JAN-MAR 2019)
Date of Assessment	01/17/2019

Sign Condition Assessment

Is Sign Present?	Yes
Is Pole/Post/Gate/Platform Present?	Yes
Is Sign Damaged?	No
If Damaged, Does Sign need to be repaired/replaced?	No
Is the Post Damaged?	No
Is Hardware In Place?	Yes
Is Hardware Causing Damage to Sign?	No
Additional Notes About this Sign	Sign legible and intact

Sign Photo(s)

Sign Pictures



Vieques Sign Inventory

Sequence Number	736
-----------------	-----

Sign Region/Name

Sign Region	SWMU 1
LocationCode	swmu1-6b
Assessment Fiscal Quarter	2019 Q2 (JAN-MAR 2019)
Date of Assessment	01/17/2019

Sign Condition Assessment

Is Sign Present?	Yes
Is Pole/Post/Gate/Platform Present?	Yes
Is Sign Damaged?	No
If Damaged, Does Sign need to be repaired/replaced?	No
Is the Post Damaged?	No
Is Hardware In Place?	Yes
Is Hardware Causing Damage to Sign?	No
Additional Notes About this Sign	Sign legible and intact

Sign Photo(s)

Sign Pictures



Vieques Sign Inventory

Sequence Number	734
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Sign Region/Name

Sign Region	SWMU 1
LocationCode	swmu1-7a
Assessment Fiscal Quarter	2019 Q2 (JAN-MAR 2019)
Date of Assessment	01/17/2019

Sign Condition Assessment

Is Sign Present?	Yes
Is Pole/Post/Gate/Platform Present?	Yes
Is Sign Damaged?	No
If Damaged, Does Sign need to be repaired/replaced?	No
Is the Post Damaged?	No
Is Hardware In Place?	Yes
Is Hardware Causing Damage to Sign?	No
Additional Notes About this Sign	Sign legible and intact

Sign Photo(s)

Sign Pictures



Vieques Sign Inventory

Sequence Number	733
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Sign Region/Name

Sign Region	SWMU 1
LocationCode	swmu1-7b
Assessment Fiscal Quarter	2019 Q2 (JAN-MAR 2019)
Date of Assessment	01/17/2019

Sign Condition Assessment

Is Sign Present?	Yes
Is Pole/Post/Gate/Platform Present?	Yes
Is Sign Damaged?	No
If Damaged, Does Sign need to be repaired/replaced?	No
Is the Post Damaged?	No
Is Hardware In Place?	Yes
Is Hardware Causing Damage to Sign?	No
Additional Notes About this Sign	Sign legible and intact

Sign Photo(s)

Sign Pictures



Vieques Sign Inventory

Sequence Number	731
-----------------	-----

Sign Region/Name

Sign Region	SWMU 1
LocationCode	swmu1-8a
Assessment Fiscal Quarter	2019 Q2 (JAN-MAR 2019)
Date of Assessment	01/17/2019

Sign Condition Assessment

Is Sign Present?	Yes
Is Pole/Post/Gate/Platform Present?	Yes
Is Sign Damaged?	No
If Damaged, Does Sign need to be repaired/replaced?	No
Is the Post Damaged?	No
Is Hardware In Place?	Yes
Is Hardware Causing Damage to Sign?	No
Additional Notes About this Sign	Sign legible and intact

Sign Photo(s)

Sign Pictures	 
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Vieques Sign Inventory

Sequence Number	732
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Sign Region/Name

Sign Region	SWMU 1
LocationCode	swmu1-8b
Assessment Fiscal Quarter	2019 Q2 (JAN-MAR 2019)
Date of Assessment	01/17/2019

Sign Condition Assessment

Is Sign Present?	Yes
Is Pole/Post/Gate/Platform Present?	Yes
Is Sign Damaged?	No
If Damaged, Does Sign need to be repaired/replaced?	No
Is the Post Damaged?	No
Is Hardware In Place?	Yes
Is Hardware Causing Damage to Sign?	No
Additional Notes About this Sign	Sign legible and intact

Sign Photo(s)

Sign Pictures





Fence facing south (1/17/2019)



Fence and signs facing west (1/17/2019)



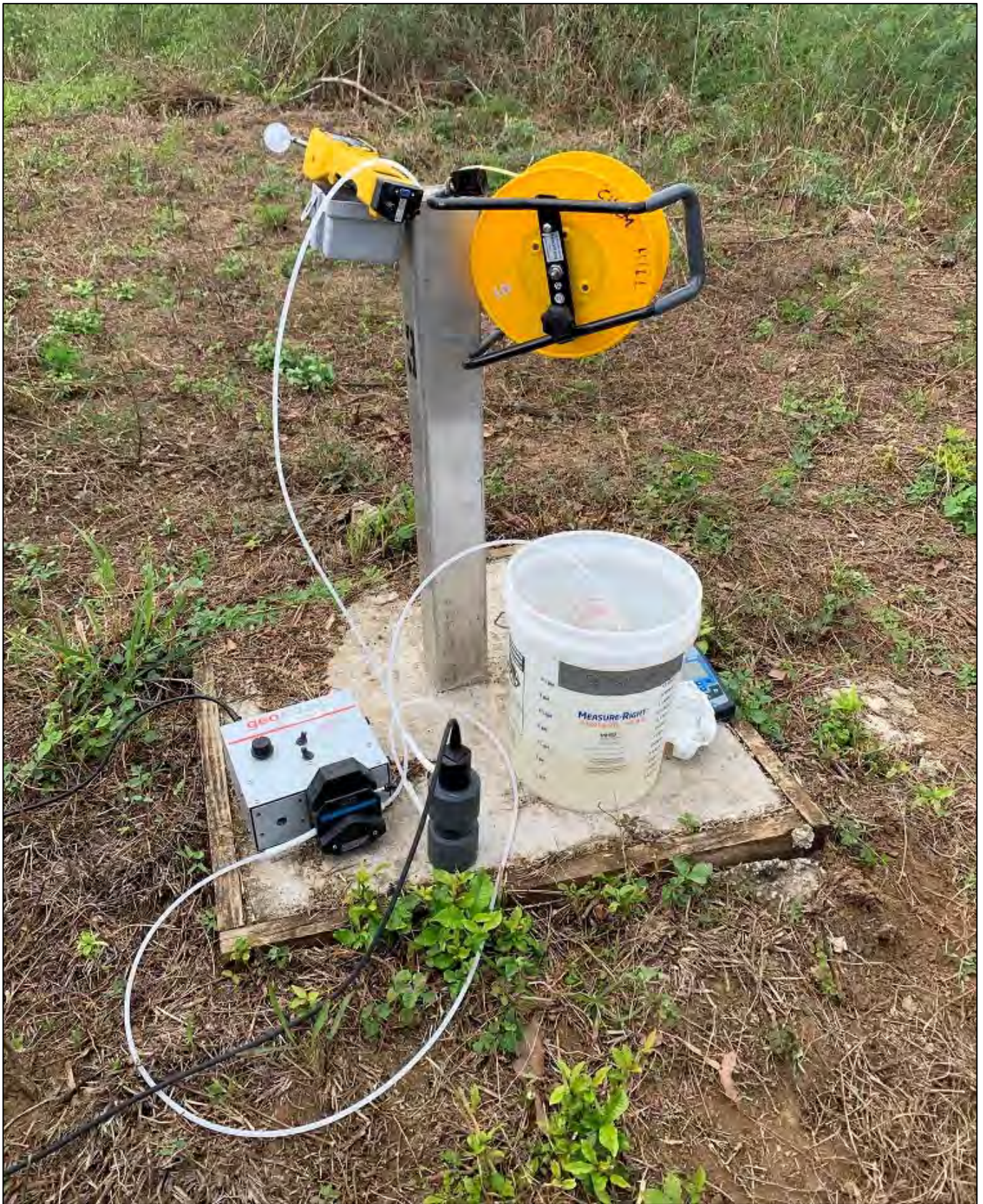
Historical road overgrown facing north (1/17/2019)



MW-02 facing west (1/17/2019)



Groundwater sampling CGW1MW02 (1/8/2019)



Groundwater sampling CGW1MW03 (1/7/2019)



MW-03 facing north (1/17/2019)



MW-08 facing west (1/17/2019)



MW-10 facing west (1/17/2019)



MW-11 facing south (1/17/2019)



MW-13 facing west (1/17/2019)

SWMU 1 Annual Inspection Form

DATE: 1/7/2020

WEATHER CONDITIONS: Sunny

INSPECTOR'S NAME: Troy Horn/Allyson Shwartz

Item	Key Observations to Make during Each Inspection	Observations	Acceptable ?		Recommended Remedial Action	Date of Completion
			Yes	No		
Vegetative Cover	Condition of vegetative cover as it relates to cover integrity (e.g., dead or distressed vegetation, large areas of exposed soil, etc.)	Vegetation ample and in good condition.	X		None	1/7/2020
Signs, Fencing, and Gates	Condition of signs, fence, gate (e.g., signs of deterioration, personnel unable to read signs due to obstruction, evidence of trespassing or vandalism [noting the location], damaged or missing gate locks, etc.)	All in good condition, legible.	X		None	1/7/2020
Erosion	Exposed debris, visible runoff patterns such as channels or gullies	No debris, roads dry and in good condition.	X		None	1/7/2020
Other Observations		Ant infestation at MW-03, MW-10, and MW-13. All well locks could use some WD-40, otherwise in good shape.	X		Instant grits to help eradicate ant population in wells	1/7/2020

ADDITIONAL COMMENTS:

Photographic Documentation



Photograph 1. SWMU 1 MW-02 with locked cap. (12/30/2019)



Photograph 2. SWMU 1 MW-03 with locked cap. (12/30/2019)



Photograph 3. SWMU 1 MW-08 with locked cap. (12/30/2019)



Photograph 4. SWMU 1 MW-10 with locked cap. (12/30/2019)



Photograph 5. SWMU 1 MW-11 with locked cap. (12/30/2019)



Photograph 6. SWMU 1 MW-13 with locked cap. (12/30/2019)



Photograph 7. Sampling equipment set up at SWMU 1 MW-10. (01/08/2020)



Photograph 8. Sampling equipment set up at SWMU 1 MW-13. (01/09/2020)



Photograph 9. Purge water 3 air pump system. (01/09/2020)



Photograph 10. SWMU 1 fence showing damaged barbed wire. (12/30/2019)



Photograph 11. SWMU 1 repaired fence. (12/30/2019)



Photograph 12. SWMU 1 damaged fence. (12/30/2019)



Photograph 13. SWMU 1 barbed wire damage was repaired prior to inspection. (12/30/2019)



Photograph 14. SWMU 1 fence facing west with broken wire. Damage was repaired prior to inspection. (12/30/2019)



Photograph 15. SWMU 1 fence facing north. (12/30/2019)



Photograph 16. SWMU 1 fence facing west. (12/30/2019)

SWMU1-1a (English)



Photograph 1. SWMU 1 Sign 1a (12/6/2019)

swmu1-1a	
objectid	269
loc_code	swmu1-1a
northing	2004955.14
easting	246620.19
region_1	SWMU 1
locationcode	swmu1-1a
sign_barricade_type_1	2 (pair) no trespassing, hunting, dumping
sign_group_1	No Trespassing Sign
recommendations	Sign in Place
surveycompleted	Yes
signpresent	Yes
polepresent	Yes
signdamaged	No
replacesign	No
postdamaged	No
hardwarepresent	Yes
textlegible	Yes
globalid	{495D0F29-B3BF-4E57-8AB7-FDCB42D2B89E}

SWMU1-1b (Spanish)



Photograph 2. SWMU 1 Sign 1b (12/6/2019)

swmu1-1b	
objectid	135
loc_code	swmu1-1b
northing	2004955.14
easting	246620.19
region_1	SWMU 1
locationcode	swmu1-1b
sign_barricade_type_1	2 (pair) no trespassing, hunting, dumping
sign_group_1	No Trespassing Sign
recommendations	Sign in Place
surveycompleted	Yes
signpresent	Yes
polepresent	Yes
signdamaged	No
replacesign	No
postdamaged	No
hardwarepresent	Yes
textlegible	Yes
globalid	{D897E758-E1A3-4207-8697-FAB3F8FB0532}

SWMU1-2a (English)



Photograph 3. SWMU 1 Sign 2a (12/6/2019)

swmu1-2a	
objectid	270
loc_code	swmu1-2a
northing	2004958.16
easting	246604.71
region_1	SWMU 1
locationcode	swmu1-2a
sign_barricade_type_1	2 (pair) no trespassing, hunting, dumping
sign_group_1	No Trespassing Sign
recommendations	Sign in Place
surveycompleted	Yes
signpresent	Yes
polepresent	Yes
signdamaged	No
replacesign	No
postdamaged	No
hardwarepresent	Yes
textlegible	Yes
globalid	{9152C2F3-E80E-412C-8BC8-088B8A959759}

SWMU1-2b (Spanish)



Photograph 4. SWMU 1 Sign 2b (12/6/2019)

swmu1-2b	
objectid	136
loc_code	swmu1-2b
northing	2004958.16
easting	246604.71
region_1	SWMU 1
locationcode	swmu1-2b
sign_barricade_type_1	2 (pair) no trespassing, hunting, dumping
sign_group_1	No Trespassing Sign
recommendations	Sign in Place
surveycompleted	Yes
signpresent	Yes
polepresent	Yes
signdamaged	No
replacesign	No
postdamaged	No
hardwarepresent	Yes
textlegible	Yes
globalid	{B359FCFC-2DAE-4F73-B6F7-69375C9D325C}

SWMU1-3a (English)



Photograph 5. SWMU 1 Sign 3a (12/6/2019)

swmu1-3a	
objectid	271
loc_code	swmu1-3a
northing	2005080.13
easting	246566.98
region_1	SWMU 1
locationcode	swmu1-3a
sign_barricade_type_1	2 (pair) no trespassing, hunting, dumping
sign_group_1	No Trespassing Sign
recommendations	Sign in Place
surveycompleted	Yes
signpresent	Yes
polepresent	Yes
signdamaged	No
replacesign	No
postdamaged	No
hardwarepresent	Yes
textlegible	Yes
globalid	{C35A3314-5158-4D93-97F6-8708D11CBE55}

SWMU1-3b (Spanish)



Photograph 6. SWMU 1 Sign 3b (12/6/2019)

swmu1-3b	
objectid	137
loc_code	swmu1-3b
northing	2005080.13
easting	246566.98
region_1	SWMU 1
locationcode	swmu1-3b
sign_barricade_type_1	2 (pair) no trespassing, hunting, dumping
sign_group_1	No Trespassing Sign
recommendations	Sign in Place
surveycompleted	Yes
signpresent	Yes
polepresent	Yes
signdamaged	No
replacesign	No
postdamaged	No
hardwarepresent	Yes
textlegible	Yes
globalid	{F730B81C-81A4-4252-98A6-D27B33320604}

SWMU1-4a (English)



Photograph 7. SWMU 1 Sign 4a (12/6/2019)

swmu1-4a	
objectid	272
loc_code	swmu1-4a
northing	2005121.38
easting	246615.02
region_1	SWMU 1
locationcode	swmu1-4a
sign_barricade_type_1	2 (pair) no trespassing, hunting, dumping
sign_group_1	No Trespassing Sign
recommendations	Sign in Place
surveycompleted	Yes
signpresent	Yes
polepresent	Yes
signdamaged	No
replacesign	No
postdamaged	No
hardwarepresent	Yes
textlegible	Yes
globalid	{1082B03C-8A29-48FB-93FC-B79DA45976DB}

SWMU1-4b (Spanish)



Photograph 8. SWMU 1 Sign 4b (12/6/2019)

swmu1-4b	
objectid	138
loc_code	swmu1-4b
northing	2005121.38
easting	246615.02
region_1	SWMU 1
locationcode	swmu1-4b
sign_barricade_type_1	2 (pair) no trespassing, hunting, dumping
sign_group_1	No Trespassing Sign
recommendations	Sign in Place
surveycompleted	Yes
signpresent	Yes
polepresent	Yes
signdamaged	No
replacesign	No
postdamaged	No
hardwarepresent	Yes
textlegible	Yes
globalid	{ 13C28115-88E8-4459-B408-CFBA12C89B64 }

SWMU1-5a (English)



Photograph 9. SWMU 1 Sign 5a (12/6/2019)

swmu1-5a	
objectid	273
loc_code	swmu1-5a
northing	2005150.44
easting	246652.17
region_1	SWMU 1
locationcode	swmu1-5a
sign_barricade_type_1	2 (pair) no trespassing, hunting, dumping
sign_group_1	No Trespassing Sign
recommendations	Sign in Place
surveycompleted	Yes
signpresent	Yes
polepresent	Yes
signdamaged	No
replacesign	No
postdamaged	No
hardwarepresent	Yes
textlegible	Yes
globalid	{BFDD9A29-C2C8-4846-A9AF-CF445559B240}

SWMU1-5b (Spanish)



Photograph 10. SWMU 1 Sign 5b (12/6/2019)

swmu1-5b	
objectid	139
loc_code	swmu1-5b
northing	2005150.44
easting	246652.17
region_1	SWMU 1
locationcode	swmu1-5b
sign_barricade_type_1	2 (pair) no trespassing, hunting, dumping
sign_group_1	No Trespassing Sign
recommendations	Sign in Place
surveycompleted	Yes
signpresent	Yes
polepresent	Yes
signdamaged	No
replacesign	No
postdamaged	No
hardwarepresent	Yes
textlegible	Yes
globalid	{AD0B443F-3875-4A85-A09B-9CD15DE9B34D}

SWMU1-6a (English)



Photograph 11. SWMU 1 Sign 6a (12/6/2019)

swmu1-6a	
objectid	274
loc_code	swmu1-6a
northing	2005178.34
easting	246778.63
region_1	SWMU 1
locationcode	swmu1-6a
sign_barricade_type_1	2 (pair) no trespassing, hunting, dumping
sign_group_1	No Trespassing Sign
recommendations	Sign in Place
surveycompleted	Yes
signpresent	Yes
polepresent	Yes
signdamaged	No
replacesign	No
postdamaged	No
hardwarepresent	Yes
textlegible	Yes
globalid	{E86E8D59-F7BA-4A0C-99E2-136EA348576C}

SWMU1-6b (Spanish)



Photograph 12. SWMU 1 Sign 6b (12/6/2019)

swmu1-6b	
objectid	140
loc_code	swmu1-6b
northing	2005178.34
easting	246778.63
region_1	SWMU 1
locationcode	swmu1-6b
sign_barricade_type_1	2 (pair) no trespassing, hunting, dumping
sign_group_1	No Trespassing Sign
recommendations	Sign in Place
surveycompleted	Yes
signpresent	Yes
polepresent	Yes
signdamaged	No
replacesign	No
postdamaged	No
hardwarepresent	Yes
textlegible	Yes
globalid	{8B0AE585-15D4-42EA-9C74-FC0F8A9F8DE6}

SWMU1-7a (English)



Photograph 13. SWMU 1 Sign 7a (12/6/2019)

swmu1-7a	
objectid	275
loc_code	swmu1-7a
northing	2005187.66
easting	246876.41
region_1	SWMU 1
locationcode	swmu1-7a
sign_barricade_type_1	2 (pair) no trespassing, hunting, dumping
sign_group_1	No Trespassing Sign
recommendations	Sign in Place
surveycompleted	Yes
signpresent	Yes
polepresent	Yes
signdamaged	No
replacesign	No
postdamaged	No
hardwarepresent	Yes
textlegible	Yes
globalid	{EC64677C-72D6-4E69-B4D3-2A25A702CCC9}

SWMU1-7b (Spanish)



Photograph 14. SWMU 1 Sign 7b (12/6/2019)

swmu1-7b	
objectid	141
loc_code	swmu1-7b
northing	2005187.66
easting	246876.41
region_1	SWMU 1
locationcode	swmu1-7b
sign_barricade_type_1	2 (pair) no trespassing, hunting, dumping
sign_group_1	No Trespassing Sign
recommendations	Sign in Place
surveycompleted	Yes
signpresent	Yes
polepresent	Yes
signdamaged	No
replacesign	No
postdamaged	No
hardwarepresent	Yes
textlegible	Yes
globalid	{630AD20D-1218-4B4D-B4C6-614EBB0DA949}

SWMU1-8a (English)



Photograph 15. SWMU 1 Sign 8a (12/6/2019)

swmu1-8a	
objectid	276
loc_code	swmu1-8a
northing	2005199.52
easting	246871.91
region_1	SWMU 1
locationcode	swmu1-8a
sign_barricade_type_1	2 (pair) no trespassing, hunting, dumping
sign_group_1	No Trespassing Sign
recommendations	Sign in Place
surveycompleted	Yes
signpresent	Yes
polepresent	Yes
signdamaged	No
replacesign	No
postdamaged	No
hardwarepresent	Yes
textlegible	Yes
globalid	{08583087-D08F-4E8C-B578-1C33F59E6463}

SWMU1-8b (Spanish)



Photograph 16. SWMU 1 Sign 8b (12/6/2019)

swmu1-8b	
objectid	142
loc_code	swmu1-8b
northing	2005199.52
easting	246871.91
region_1	SWMU 1
locationcode	swmu1-8b
sign_barricade_type_1	2 (pair) no trespassing, hunting, dumping
sign_group_1	No Trespassing Sign
recommendations	Sign in Place
surveycompleted	Yes
signpresent	Yes
polepresent	Yes
signdamaged	No
replacesign	No
postdamaged	No
hardwarepresent	Yes
textlegible	Yes
globalid	{223FE8DF-CEFB-4A52-981D-093CE326F779}

SWMU 1 (Annual Inspection)

1/28/2021

WEATHER CONDITIONS: upper 70s, mostly sunny

INSPECTOR'S NAME: Andrew Winebrenner/Toby L. Stewart

Item	Potential Problems	Observations	Acceptable ?		Recommended Remedial Action	Date of Completion
			Yes	No		
Vegetative Cover	Dead or distressed vegetation; insufficient coverage; areas of exposed soil	Dense vegetation observed, excluding cleared paths to MW locations. Dense vegetation within 30 feet of fence line along north side of Range Rd and within 15 feet along south side of Range Rd.	X		None	not applicable
Signs, Fencing, and Gates	Deterioration of signs, fence, or gates; personnel unable to read sign due to obstruction; observed signs of trespassing (noting the location)	All signs secure, in good condition, and legible. Fallen tree lying across fence, but fence does not appear to have been breached. Two fence posts missing, several fence posts bent/damaged.	X		Remove fallen tree and reassess integrity of fence in that area. Missing fence posts replaced and damaged fence posts repaired.	Fallen tree removed during week of 2/22/21. Area of fence where fallen tree was removed was repaired on 5/24/21 along with other fence repairs.
Erosion	Exposed debris; visible runoff patterns such as channels or gullies	NE facing side of MW-08 concrete pad has a 4-inch gap space from existing grade. Potential reptile den in space.	X		Add gravel or fill to block animal use of underside of MW-08 well pad.	5/27/2021
Other Observations		One black, rubber tire (no metal rim noted) approximately 65-inch outer diameter, observed lying flat on east side of cleared path leading to MW-08. Additionally, one empty metal container located in vegetation observed lying on the east side of cleared path leading to MW-08.	X		Remove debris along access path.	3/4/21 (metal container) and 3/5/2021 (rubber tire)

ADDITIONAL COMMENTS:

Site Photographs



Photograph 1. MW-02 protective casing and concrete pad. Photograph taken on January 28, 2021.



Photograph 2. MW-02 well and cap condition. Photograph taken on January 28, 2021.



Photograph 3. MW-03 protective casing and well pad. Photograph taken on January 28, 2021.



Photograph 4. MW-03 well and cap condition. Photograph taken on January 28, 2021.



Photograph 5. MW-08 protective casing and well pad. Photograph taken on January 28, 2021.



Photograph 6. MW-08 well and cap condition. Photograph taken on January 28, 2021.



Photograph 7. MW-08 approximately 4-inch gap underneath concrete pad on northeast corner. Photograph taken on January 28, 2021.



Photograph 8. MW-08 concrete pad showing potential animal burrow area below pad. Photograph taken on January 28, 2021.



Photograph 9. Gravel placed around the MW-08 concrete pad on May 27, 2021.



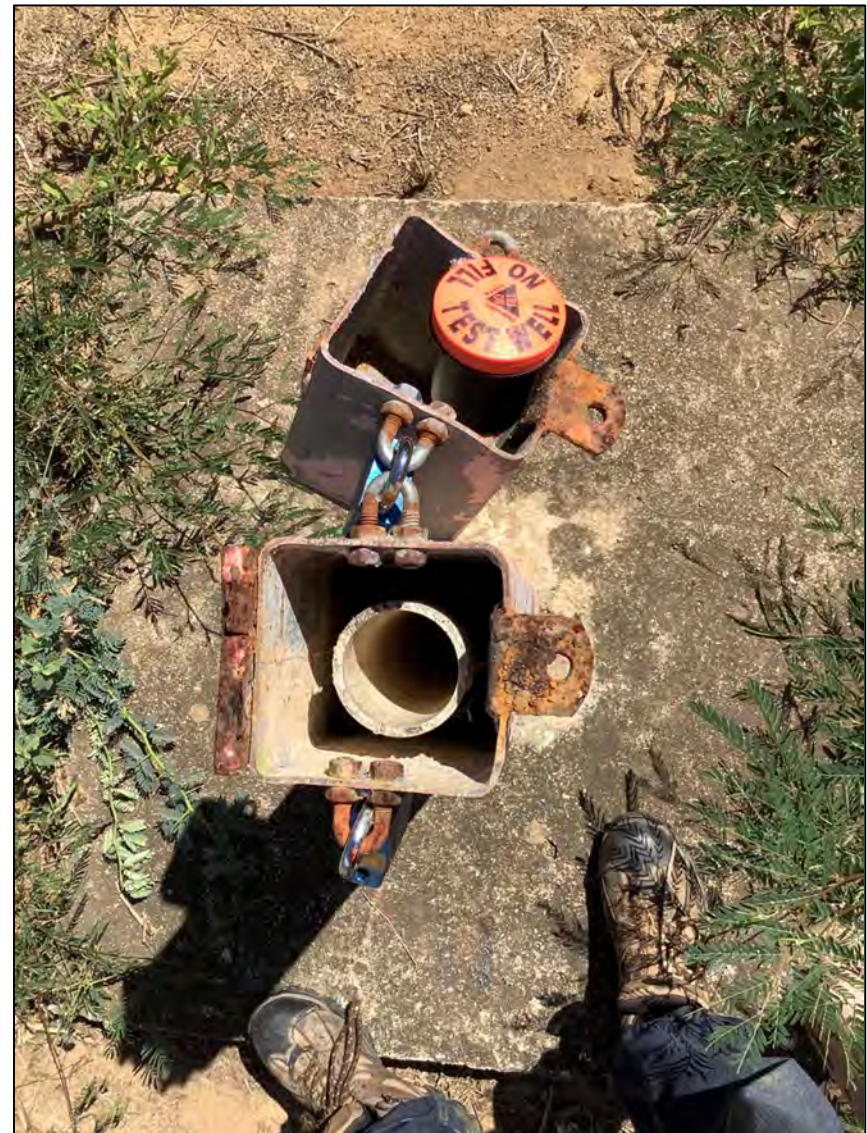
Photograph 10. MW-10 protective casing and well pad. Photograph taken on January 28, 2021.



Photograph 11. MW-10 well and cap condition. Photograph taken on January 28, 2021.



Photograph 12. MW-11 protective casing and well pad. Photograph taken on January 28, 2021.



Photograph 13. MW-11 well and cap condition. Photograph taken on January 28, 2021.



Photograph 14. MW-13 protective casing and well pad. Photograph taken on January 28, 2021.



Photograph 15. MW-13 well and cap condition. Photograph taken on January 28, 2021.



Photograph 16. Debris 1 – metal container, facing north along path to MW-08. Photograph taken on January 28, 2021.



Photograph 17. Debris 2 – rubber tire, facing north along path to MW-08. Photograph taken on January 28, 2021.



Photograph 18. Debris 2 – rubber tire, facing north along path to MW-08. Photograph taken on January 28, 2021.



Photograph 19: Rubber tire removed from site, cut up and transported to the Vieques Municipality Landfill recycling area on June 2, 2021.



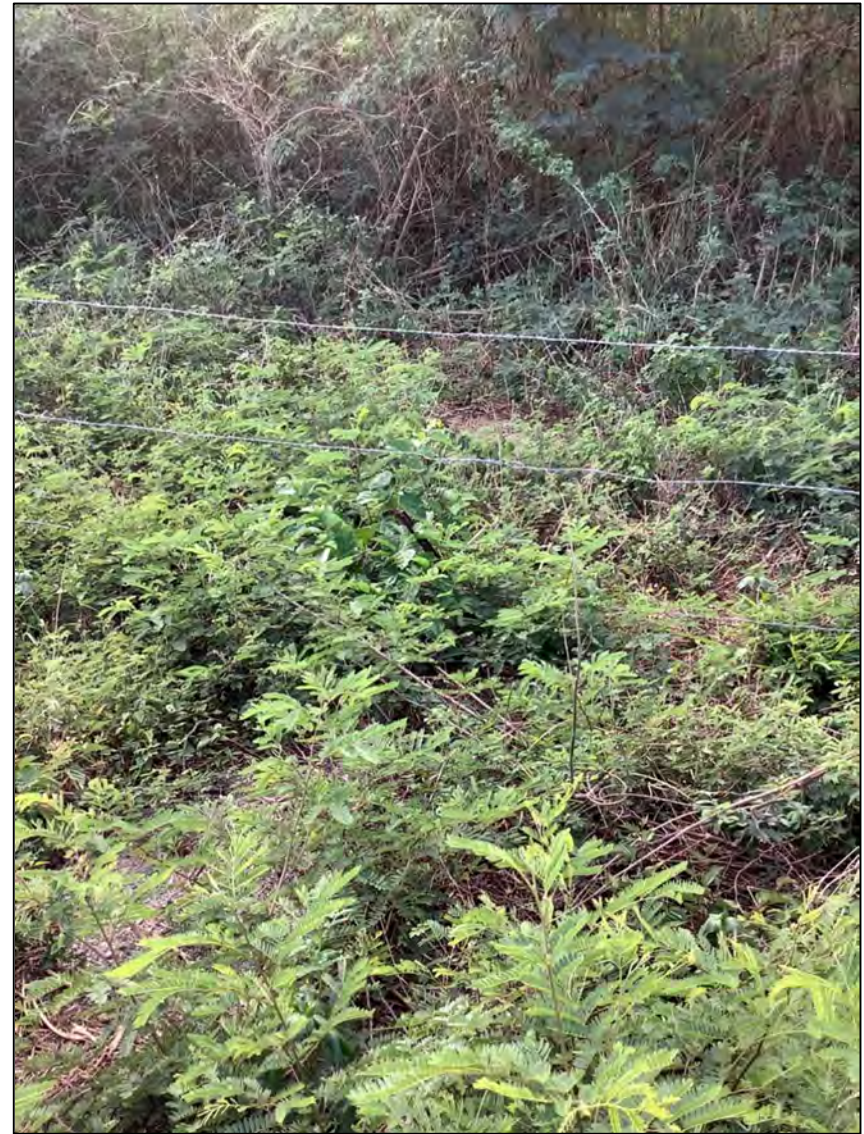
Photograph 20. SWMU 1 damaged fence post #1. Photograph taken on January 28, 2021.



Photograph 21. SWMU 1 damaged fence post #2. Photograph taken on January 28, 2021.



Photograph 22. SWMU 1 damaged fence post #3. Photograph taken on January 28, 2021.



Photograph 23. SWMU 1 missing fence post #1. Photograph taken on January 28, 2021.



Photograph 24. SWMU 1 missing fence post #2. Photograph taken on January 28, 2021.



Photograph 25. Vegetation cleared around fences and fence posts repaired on May 24, 2021.



Photograph 26. Vegetation cleared around fences and fence posts repaired on May 24, 2021.



Photograph 27. Vegetation cleared around fences and fence posts repaired on May 24, 2021.



Photograph 28. Vegetation cleared around fences and fence posts repaired on May 24, 2021.



Photograph 29. Small tree down along north side of access road with dense overgrowth, facing east. Photograph taken on January 28, 2021.



Photograph 30. Same small tree down along north side of access road with dense overgrowth, facing north.



Photograph 31. Same small tree down along north side of access road with dense overgrowth, facing northwest.



Photograph 32: Area where small tree was removed from fence during the week of February 22, 2021 and the fence repaired on May 24, 2021. Photograph taken on May 27, 2021 facing east northeast.

SWMU 1 (Annual Inspection)

1/20/2022

WEATHER CONDITIONS: 83

INSPECTOR'S NAME: Troy Horn

Item	Potential Problems	Observations	Acceptable ?		Recommended Corrective Measure	Date of Completion ¹
			Yes	No		
Vegetative Cover	Dead or distressed vegetation; insufficient coverage; areas of exposed soil	Dense vegetation observed throughout.	X		None	Not applicable
Signs, Fencing, and Gates	Deterioration of signs, fence, or gates; personnel unable to read sign due to obstruction; observed signs of trespassing (noting the location)	All signs secure, in good condition, and legible. Fence is bent but is intact.	X		None	Not applicable
Erosion	Exposed debris; visible runoff patterns such as channels or gullies	Broken cinder blocks along the trail at MW-02 and exposed wire along trail to MW-08.		X	Remove debris along path.	
Other Observations	Monitoring Well Deterioration	Top of protective cover at MW-02 has a corrosion hole.		X	Replace square well cover at MW-02 with rivit kit.	

Notes:

¹ When corrective measures are implemented, they are documented in the subsequent annual report

ADDITIONAL COMMENTS:

APPENDIX E
Site Photographs



Photograph 1. MW-02 protective casing and concrete pad. Photograph taken on January 20, 2022.



Photograph 2. MW-02 well top of casing rust condition. Photograph taken on January 20, 2022.



Photograph 3. MW-02 Protective casing and well pad. Photograph taken on January 20, 2022.



Photograph 4. MW-03 Protective casing and well pad. Photograph taken on January 20, 2022.



Photograph 5. Exposed broken concrete fragments 30 feet north and 50 feet south of MW-03. Photograph taken on January 20, 2022.



Photograph 6. MW-08 protective casing and well pad. Photograph taken on January 20, 2022.



Photograph 7. Exposed com wire on the path to MW-08, approximately 50 feet from the edge of the road. Photograph taken on January 20, 2022.



Photograph 8. MW-10 protective casing and well pad. Photograph taken on January 20, 2022.



Photograph 9. Surface metal debris 30 feet northeast of MW-10. Photograph taken on January 20, 2022.



Photograph 10. Concrete debris 90 feet northeast of MW-10. Photograph taken on January 20, 2022.



Photograph 11. MW-11 protective casing and well pad. Photograph taken on January 20, 2022.



Photograph 12. Exposed plastic debris 50 feet north of MW-11. Photograph taken on January 20, 2022.



Photograph 13. MW-13 protective casing and well pad. Photograph taken on January 20, 2022.

Appendix D

AOC E Inspection Checklists and Photographs

Five-Year Review Site Inspection Checklist

Site name: Area of Concern E (AOC E)	Date of Inspection:
Location and Region: Former NASD, Vieques, Puerto Rico	EPA ID: CERCLIS National Superfund database identification number: PRN000204694. AOC E is also known as Operable Unit 2 – West AOC E – UST Area in the SEMS database.
Agencies involved in site visit:	Weather/temperature:
Remedy Includes: Groundwater monitoring, land use control (LUC) implementation and monitoring, and implementation of Contingency Plans, if necessary, to address the potential for persistent persulfate (Contingency Plan 2a) and COC rebound above remedial goals (Contingency Plan 2b) to prevent exposure to groundwater contaminants of concern at concentrations above remedial goals.	
Are Institutional Controls and LUCs properly implemented and fully enforced? <div style="text-align: right;"> <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No </div> If no, note on map and explain in Remarks below.	
Institutional Controls implementation and enforcement <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div> Conditions imply ICs not properly implemented Conditions imply ICs not being fully enforced </div> <div> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A </div> </div> <div style="margin-top: 10px;"> Type of monitoring (e.g., self-reporting, drive by): _____ Frequency: _____ Responsible party/agency: <u>Navy</u> Contact <u>Kevin Cloe</u> Name: <u>Kevin Cloe/Navy</u> Title: <u>Remedial Project Manager</u> Date: _____ Phone no. <u>757-322-4736</u> </div> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div> Reporting is up-to-date Reports are verified by the lead agency </div> <div> <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A </div> </div> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div> Specific requirements in deed or decision documents have been met Violations have been reported Are Institutional Controls Adequate? </div> <div> <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A </div> </div> <div style="margin-top: 10px;"> Other problems or suggestions: <input type="checkbox"/> Report attached </div>	
Fencing status <input checked="" type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Gates secured <input type="checkbox"/> N/A Remarks: _____	
Signs and other security measures status <input checked="" type="checkbox"/> Location shown on site map <input type="checkbox"/> N/A Remarks: _____	
Is an active Remediation System part of the selected remedy? <div style="text-align: right;"> <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No </div> If no, next section not applicable.	
If yes, for active remediation systems, are the following components in good condition and working properly? If no, explain in Remarks below.	
i. Pumps and Electrical	<div style="text-align: right;"> <u>NA</u> <input type="checkbox"/> Yes <input type="checkbox"/> No </div>
ii. Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances	<div style="text-align: right;"> <u>NA</u> <input type="checkbox"/> Yes <input type="checkbox"/> No </div>
iii. Treatment Technology	<div style="text-align: right;"> <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No </div>
iv. Discharge Structure and Appurtenances	<div style="text-align: right;"> <u>NA</u> <input type="checkbox"/> Yes <input type="checkbox"/> No </div>
v. Recovery Wells	<div style="text-align: right;"> <u>NA</u> <input type="checkbox"/> Yes <input type="checkbox"/> No </div>

AOC E Land Use Control Inspection Form

DATE: March 2, 2020

WEATHER CONDITIONS: Clear/Sunny

INSPECTOR'S NAME: Jerry R. Fields Jr.

Item	Key Observations to Make during Each Inspection	Observations	Acceptable ?		Recommended Remedial Action	Date of Completion
			Yes	No		
Signs, Fencing, and Gate	Condition of signs, fence, gate (e.g., signs of deterioration, personnel unable to read signs due to obstruction, evidence of trespassing or vandalism [noting the location], damaged or missing gate locks, etc.)	The signs, fencing, and gates are in good order. The signage is visible, legible, and the hardware intact at all 8 locations. The site boundary fence is secure, exhibiting no issues of being breached. However, the vegetation growth (vines) on the fence is greater than normal. It could possibly be due to the large amount of rain received over the past couple of months. The gates are secure and functioning, locks were lubricated.	X		Although not impacting LUC integrity, recommend cutting vegetation on fence to prevent further growth.	To be conducted as part of routine maintenance upon return to normal operations associated with Covid-19
Vegetation	Condition of vegetation as it relates to LUC integrity (e.g., growth on fence causing damage or obscuring signage, vegetation/dirt obscuring or encroaching on wells, etc.)	Vegetation growth has been maintained across the site as normal, except for the area along the north fence boundary. That area is not easily accessible due to the presence of debris from the collapsed building associated with Hurricane Maria (2017). Until debris is removed, manual cutting is likely necessary to maintain that particular area. Even though the vegetative growth in that area is higher than normal, it is not affecting the visibility of the signage nor affecting the fence. Grass cutting is also warranted due to faster than normal growth, but grass is not interfering with LUCs or the ability to locate wells.	X		Although not impacting LUC integrity, recommend cutting vegetation on fence to prevent further growth.	To be conducted as part of routine maintenance upon return to normal operations associated with Covid-19
Wells	Condition of wells as it relates to integrity (e.g., flush mount seal leaking/missing, flush mount bolts stripped/missing/holes broken, expansion plug or lock missing/damaged, well obstructed, concrete pad significantly cracked)	All wells exhibited all bolts, caps, and locks, except for wells MW-01 and MW-05 which were used in the CP-2 ISCO injection event. However, they are capped with injection plumbing fittings that are water tight. The well pads are intact, with some exhibiting some minor cracking. None of the observations is currently impacting well integrity.	X		Although not impacting well integrity, recommend replacing the water-tight fittings on wells MW-01 and MW-05 with standard caps and locks and performing crack repair on pads where cracking is observed.	To be conducted as part of routine maintenance upon return to normal operations associated with Covid-19
Other Observations (including potential groundwater use)		Note: Recently a new rum distillery opened inside the MOV public works area, adjacent to the site. They now have their own entrance on the north side which directs public traffic by the north side of site. They have placed a vinyl sign with their name, logo, and an arrow directing traffic to the distillery on the north fence.	X			

ADDITIONAL COMMENTS:

Photographic Documentation



Figure 1. East fence facing south.



Figure 2. South fence facing northwest.



Figure 3. North fence facing east.



Figure 4. Northwest corner facing southeast.



Figure 5. West fence facing north.



Figure 6. South fence facing northeast.



Figure 7. Southeast corner facing northwest.



Figure 8. Northeast corner facing southwest.



Figure 9. Northeast corner facing southwest; rum distillery direction sign in foreground.



Figure 10. Inside fence line, southwest corner facing north.



Figure 11. Inside fence line, southwest corner facing east.



Figure 12. Inside fence line, southeast corner facing west.



Figure 13. Inside fence line, southeast corner facing north.



Figure 14. Inside fence line, northwest corner facing southeast.



Figure 15. MW-02, MW-07, and MW-08.

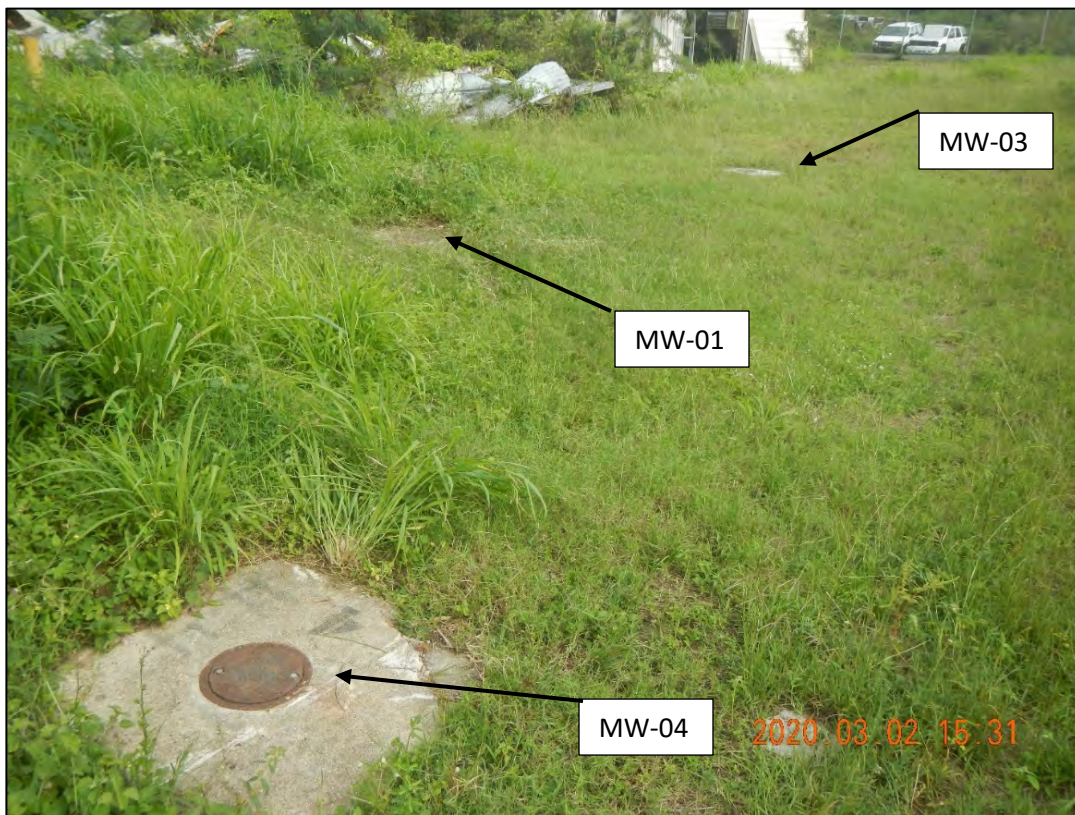


Figure 16. MW-01, MW-03, and MW-04.



Figure 17. MW-01 pad and well cover condition; minor pad cracking observed.



Figure 18. MW-01 capped following in situ chemical oxidation (ISCO) injections.



Figure 19. MW-02 pad and well cover condition.



Figure 20. MW-02 well and cap condition.



Figure 21. MW-03 pad and well cover condition.



Figure 22. MW-03 well and cap condition.



Figure 23. MW-04 pad and well cover condition; minor pad cracking observed.



Figure 24. MW-04 well and cap condition.



Figure 25. MW-05 well pad and cover condition; minor pad cracking observed.



Figure 26. MW-05 capped following ISCO injections.



Figure 27. MW-07 pad and well cover condition.



Figure 28. MW-07 well and cap condition.



Figure 29. MW-08 well cover and pad condition; minor pad cracking observed.



Figure 30. MW-08 well and cap condition.

AOC E Land Use Control Inspection Form

DATE: February 1, 2021

WEATHER CONDITIONS: Mostly sunny, highs near 85F, winds ESE 10-15 mph

INSPECTOR'S NAME: Toby Stewart/Andrew Winebrenner

Item	Potential Problems	Observations	Acceptable ?		Recommended Remedial Action	Date of Completion
			Yes	No		
Signs, Fencing, and Gate	Deterioration of signs, fence, or gate; Personnel unable to read sign due to obstruction; Observed signs of trespassing (noting the location); lock damaged or missing, etc.	All signs intact and readable; no signs of trespassing observed; all gates locked.	X			2/1/2021
Vegetation	Growth on fence, damaging fence, obscuring signage. Vegetation hiding wells.	Very minor vine growth since last routine vegetation clearance; all signs visible.	X		Clear vegetation on both sides of fence line for entire perimeter length of site. Cut sapling trees at ground surface, that is, below the chain link fence curtain height.	2/1/2021
Well integrity	Flush mount seal leaking/missing. Flush mount bolts stripped/missing/holes broken. Expanding plug/lock missing/damaged. Well obstructed. Flush mount obscured by dirt.	All monitoring wells identified on the remedial action work plan are in good working order.	X			2/1/2021, 2/3/2021
Other Observations (including potential groundwater use)			X			2/1/2021

ADDITIONAL COMMENTS:

APPENDIX F
Site Photographs



Photograph 1. MW-01 concrete pad and well cover condition on 2/1/2021.



Photograph 2. MW-01 well and cap condition on 2/1/2021.



Photograph 3. MW-04 concrete pad and well cover condition on 2/1/2021.



Photograph 4. MW-04 well and cap condition on 2/1/2021.



Photograph 5. MW-05 concrete pad and well cover condition on 2/1/2021.



Photograph 6. MW-05 well and cap condition on 2/1/2021.



Photograph 7. Small tree growing along west fence line facing west on 2/1/2021.



Photograph 8. Same small tree along west fence line facing east on 2/1/2021.



Photograph 9. Tree growing on southern fence, facing north on 2/1/2021.



Photograph 10. Tree growing along eastern fence, facing southwest on 2/1/2021.



Photograph 11. Vegetation cleared on 5/25/2021. Facing south along western fence line.



Photograph 12. Vegetation cleared on 5/25/2021. Facing south along eastern fence line.



Photograph 13. Vegetation cleared on 5/25/2021. Facing west along southern fence line.



Photograph 14. Gate, lock, fence, and sign in good condition on 2/1/2021. Looking south at main gate in northwest corner of site.



Photograph 15. Fence and sign in good condition on 2/1/2021. Looking south along western most fence.



Photograph 16. Fence and sign in good condition on 2/1/2021. Looking north along western most fence.



Photograph 17. Fence and sign in good condition on 2/1/2021. Looking northwest at southern fence line.



Photograph 18. Fence and sign in good condition on 2/1/2021. Looking west along south fence line.



Photograph 19. Fence and sign in good condition on 2/1/2021. Looking northwest at eastern most fence.



Photograph 20. Fence and sign in good condition on 2/1/2021. Looking north along eastern most fence.



Photograph 21. Fence and sign in good condition on 2/1/2021. Looking southeast along northern most fence.

AOC E Land Use Control Inspection Form

DATE: January 14, 2022

WEATHER CONDITIONS: Sunny, high 78F

INSPECTOR'S NAME: Troy Horn

Item	Potential Problems	Observations	Acceptable ?		Recommended Remedial Action	Date of Completion
			Yes	No		
Signs, Fencing, and Gate	Deterioration of signs, fence, or gate; personnel unable to read sign due to obstruction; observed signs of trespassing (noting the location); lock damaged or missing, etc.	All signs intact and readable; no signs of trespassing observed; all gates locked.	X			
Vegetation	Growth on fence, damaging fence, obscuring signage. Vegetation hiding wells.	Some vines and saplings growing up through the fence, but are not affecting fence integrity; all signs visible.	X		Although not necessary for LUC integrity, consider cutting saplings and vines from fence during next quarterly vegetation maintenance event.	
Well Integrity	Flush mount seal leaking/missing. Flush mount bolts stripped/missing/holes broken. Expanding plug/lock missing/damaged. Well obstructed. Flush mount obscured by dirt.	A bolt is missing at MW-05; southern side of concrete pad is cracked at MW-06 and one of the threads on the casing is broken; pad is cracked at MW-08.	X		Replace missing bolt at MW-05. Monitor cracked concrete pads to determine if repair becomes warranted.	
Other Observations (including potential groundwater use)						

ADDITIONAL COMMENTS:

Site Photographs



Photograph 1. MW-05 surface condition on 1/14/2022.



Photograph 2. MW-06 surface condition on 1/14/2022.



Photograph 3. MW-08 surface condition on 1/14/2022.



Photograph 4. Tree growing in southern fence line 1/14/2022.



Photograph 5. Tree growing in southern fence line near gate entrance 1/14/2022.



Photograph 6. Fence and sign in good condition on 1/14/2022. Looking west along south fence line.



Photograph 7. Western fence and sign in good condition on 1/14/2022.



Photograph 8. VWAEMW01 Sampling Persulfate Field Test Kit 1/13/2022.



Photograph 9. VWAEMW04 Sampling Persulfate Field Test Kit 1/13/2022.



Photograph 10. VWAEMW05 Sampling Persulfate Field Test Kit 1/13/2022.

Appendix E

UXO 1 Inspection Checklists and Photographs

Five-Year Review Site Inspection Checklist

Site name: UXO 1	Date of Inspection:
Location and Region: Former VNTR, Vieques, Puerto Rico	EPA ID: CERCLIS National Superfund database identification number: PRN000204694 UXO 1 is also known as Operable Unit (OU) 18 in the SEMS database.
Agencies involved in site visit:	Weather/temperature:
Remedy Includes: Focused additional munitions and explosives of concern (MEC) removal and land use control (LUC) implementation and monitoring (including MEC inspections) to address explosive hazards by reducing the potential for uncontrolled human contact with MEC potentially present in site soil and the lagoon and ensuring land use controls are in place consistent with the property being part of the Vieques National Wildlife Refuge.	
Are Institutional Controls and LUCs properly implemented and fully enforced? <div style="text-align: right;"> <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No </div> If no, note on map and explain in Remarks below.	
Institutional Controls implementation and enforcement <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div> Conditions imply ICs not properly implemented Conditions imply ICs not being fully enforced </div> <div style="text-align: right;"> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A </div> </div> <div style="margin-top: 10px;"> Type of monitoring (e.g., self-reporting, drive by): _____ Frequency: _____ Responsible party/agency: <u>Navy</u> Contact <u>Kevin Cloe</u> Name: <u>Kevin Cloe/Navy</u> Title: <u>Remedial Project Manager</u> Date: _____ Phone no. <u>757-322-4736</u> </div> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div> Reporting is up-to-date Reports are verified by the lead agency </div> <div style="text-align: right;"> <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A </div> </div> <div style="margin-top: 10px;"> Specific requirements in deed or decision documents have been met <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Violations have been reported <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Are Institutional Controls Adequate? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A </div> <div style="margin-top: 10px;"> Other problems or suggestions: <input checked="" type="checkbox"/> Report attached (ADD) LIA GATE INCIDENT (3 INCIDENTS) </div>	
Fencing status <input checked="" type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Gates secured <input type="checkbox"/> N/A Remarks: _____	
Signs and other security measures status <input checked="" type="checkbox"/> Location shown on site map <input type="checkbox"/> N/A Remarks: _____	
Is an active Remediation System part of the selected remedy? <div style="text-align: right;"> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No </div> If no, next section not applicable.	
If yes, for active remediation systems, are the following components in good condition and working properly? If no, explain in Remarks below.	
i. Pumps and Electrical	<input type="checkbox"/> Yes <input type="checkbox"/> No
ii. Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances	<input type="checkbox"/> Yes <input type="checkbox"/> No
iii. Treatment Technology	<input type="checkbox"/> Yes <input type="checkbox"/> No
iv. Discharge Structure and Appurtenances	<input type="checkbox"/> Yes <input type="checkbox"/> No
v. Recovery Wells	<input type="checkbox"/> Yes <input type="checkbox"/> No

Five-Year Review Site Inspection Checklist

USFWS
VNWR

Site name: UXO 1	Date of Inspection:	
Location and Region: Former VNTR, Vieques, Puerto Rico	EPA ID: CERCLIS National Superfund database identification number: PRN000204694 UXO 1 is also known as Operable Unit (OU) 18 in the SEMS database.	
Agencies involved in site visit:	Weather/temperature:	
Remedy Includes: Focused additional munitions and explosives of concern (MEC) removal and land use control (LUC) implementation and monitoring (including MEC inspections) to address explosive hazards by reducing the potential for uncontrolled human contact with MEC potentially present in site soil and the lagoon and ensuring land use controls are in place consistent with the property being part of the Vieques National Wildlife Refuge.		
Are Institutional Controls and LUCs properly implemented and fully enforced? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If no, note on map and explain in Remarks below.		
Institutional Controls implementation and enforcement		
Conditions imply ICs not properly implemented	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No <input type="checkbox"/> N/A
Conditions imply ICs not being fully enforced	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No <input type="checkbox"/> N/A
Type of monitoring (e.g., self-reporting, drive by): <u>Drive by USFWS</u> Frequency: <u>4 to 8 times per year</u> Responsible party/agency: <u>Navy</u> Contact: <u>Kevin Cloe</u> Name: <u>Kevin Cloe/Navy</u> Title: <u>Remedial Project Manager</u> Date: _____ Phone no. <u>757-322-4736</u>		
Reporting is up-to-date	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
Reports are verified by the lead agency	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
Specific requirements in deed or decision documents have been met	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
Violations have been reported	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No <input type="checkbox"/> N/A
Are Institutional Controls Adequate?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
Other problems or suggestions: <input type="checkbox"/> Report attached		
Fencing status	<input checked="" type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Gates secured <input type="checkbox"/> N/A
Remarks: _____		
Signs and other security measures status	<input checked="" type="checkbox"/> Location shown on site map	<input type="checkbox"/> N/A
Remarks: _____		
Is an active Remediation System part of the selected remedy? <input type="checkbox"/> Yes <input type="checkbox"/> No If no, next section not applicable.		
If yes, for active remediation systems, are the following components in good condition and working properly? If no, explain in Remarks below.		
i. Pumps and Electrical	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
ii. Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
iii. Treatment Technology	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
iv. Discharge Structure and Appurtenances	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
v. Recovery Wells	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No

* See USFWS note in remarks

Site name: UXO 1	Date of Inspection:	
Is Long- Term Monitoring data adequate, current and readily available?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
If no, explain in Remarks below.		
Do monitoring wells at the site appear to be functioning, locked, and in good condition?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
If no, explain in Remarks below.		
Do any observations indicate that RAOs are not being met?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
If yes, explain in Remarks below.		
If RAOs are not being met, are contingency measures being implemented?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Explain in Remarks below.		
Has land use on- or offsite changed?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
If yes, explain in Remarks below.		
Is the area free of identifiable concerns, such as signs of trespassing/vandalism, dumping of chemicals or debris, etc. with regards to the site?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
If no, explain in Remarks below.		
Are there any previously undocumented features at the site (new roads, changes in grade, site conditions, etc.)?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
If yes, note on map and identify any effect on the remedy in Remarks below.		
Remarks:		
<p>Over the course of the last 3 years there have been at least 4 incidents of trespassing and 2 of those involved damage and vandalism to the LUC in one area. The fence and gate between beaches Icacos and Fossil (next to El Gato lagoon) was broken by trespassers on 2 occasions. Both incidents were discovered and reported by NAVFAC contractors. The fence and gate were repaired by NAVFAC contractors. There were 2 other incidents that occurred off hours and were not reported to NAVFAC by USFWS until the day of the UXO 1 site visit. The incidents did not involve damage or vandalism to the LUC. On 5/4/2021 drug traffickers entered UXO 1 and UXO 4 to avoid LE capture. The individuals were apprehended and removed. On 10/17/2021 illegal immigrants trespassed into UXO 1 and UXO 4. Folks were apprehended and removed.</p>		

**UXO 1 Annual Inspection
LUC Site Inspection Checklist
Former Vieques Naval Training Range, Vieques, Puerto Rico**

DATE: February 11, 2020

WEATHER CONDITIONS: Sunny with high winds >20mph

INSPECTOR'S NAME: Brent Ray (UXO Technician) and Ronny Fields

Item	Potential Problems	Observations	Acceptable?		Recommended Remedial Action	Date of Completion
			Yes	No		
Concrete Monuments, Demarcation, and Gates	Deterioration of signage, monuments, or gates; Personnel unable to read demarcation due to obstruction; Observed signs of trespassing (noting the location)	The concrete monuments (demarcation barrier), connections, and gates are all present, intact, secured with locks that are in good order, and are functioning as intended. The demarcation barrier was inspected by land and by UAV. No signs of vandalism were observed along the demarcation barrier. The ECA gate is secure, with functioning lock. However, the lock was showing signs of weathering (rusting) so it was replaced. The gate is functioning properly.	X		None	The lock was replaced on February 11, 2020
Erosion	Visible runoff patterns such as channels or gullies that may expose subsurface munitions	The areas planned for USFWS and Coast Guard use and other accessible areas were inspected for erosion. No evidence of erosion was observed.	X		None	Not applicable
Munitions	Exposed munitions on the ground surface	The ECA roads, Playa Blanca (including beach access trails), and the accessible portion of the southern ECA coastline were inspected by UXO personnel utilizing a Schonstedt metal detector. No munitions were found. One munitions debris item and one non-munitions-related debris item were found by the UXO personnel. On the southern ECA coastline part of an expended parachute flare (MD) was encountered. Also, part of a sonar buoy (NMRD) was found on the southern end of Playa Blanca near the beach access trail.	X		None	Not applicable
Other Observations	Other observations of note	None			None	Not applicable

ADDITIONAL COMMENTS: None

Photographic Log

UXO 1, Eastern Conservation Area Munitions and Explosives of Concern Inspection Activities and Findings



Aerial photo of Playa Blanca looking north with UXO Technician walking on beach.



Aerial photo of Playa Blanca showing location of sonar buoy piece found on southern portion of beach near the beach trail entrance. Orange spray paint was used to mark the item prior to removal.



Sonar buoy piece encountered on Playa Blanca. A Schonstedt is shown above the sonar buoy for scale.



Expended parachute flare part encountered on southern ECA coastline. A Schonstedt is shown to the right of the item for scale.



UXO Technician conducting instrument-aided visual munitions inspections along the road from the ECA gate to the navigational light post.



Navigational light post shown at the end of the access road.

UXO 1, Eastern Conservation Area Land Use Control Inspection and Findings



Physical demarcation boundary along the Live Impact Area/Surface Impact Area (LIA/SIA) boundary line. Photo shows the northern portion of the boundary near Playa Bahia Icacos/Beach 5 and no signs of vandalism.



Physical demarcation boundary along the LIA/SIA boundary line. Photo shows the northern portion of the boundary and no signs of vandalism. Photo was taken south of the Central Processing Center (CPC) looking north toward Playa Bahia Icacos/Beach 5. The southern access gate can be seen on the left side of the photo.



Physical demarcation boundary along the LIA/SIA boundary line. Photo was taken looking north toward Playa Bahia Icacos/ Beach 5 and shows Laguna Icacos to the left of the demarcation boundary and no signs of vandalism.



Physical demarcation boundary along the LIA/SIA boundary line. Photo was taken looking south toward Playa Bahia Salinas del Sur/Beach 2 and shows no signs of vandalism.



ECA access gate shown in the photo. Inspections of the gate concluded the gate and lock were operating as intended with no defects.



Annual inspection activities found no indications of trespassing. Photo taken on the ECA access road looking west with OP 1 in the distance.

Appendix A
LUC Site Inspection Checklist
UXO 1 Post Tropical Storm Inspections

DATE: September 2, 2020

WEATHER CONDITIONS: ~88°F, Partial cloud cover

INSPECTOR'S NAME: Ronny Fields, James Paksi, Billy Capstick

Item	Potential Problems	Observations	Acceptable?		Recommended Remedial Action	Date of Completion
			Yes	No		
Concrete Monuments, Demarcation, and Gates	Deterioration of signage, monuments, or gates; Personnel unable to read demarcation due to obstruction; Observed signs of trespassing (noting the location)	The concrete monuments (demarcation barrier), connections, and gates are all present, intact, secured with locks that are in good order, and are functioning as intended. The ECA gate is secure and functioning as intended. No signs of trespassing or vandalism observed.	Yes		None	9/2/2020
Erosion	Visible runoff patterns such as channels or gullies that may expose subsurface munitions	The areas planned for USFWS and Coast Guard use and other accessible areas were inspected for erosion. No signs of site erosion observed. No signs of trespassing observed.	Yes		None	9/2/2020
Munitions	Exposed munitions on the ground surface	The ECA roads, Playa Blanca (including beach access trails), and the accessible portion of the southern ECA coastline were inspected. No munitions were observed. No signs of trespassing observed. No signs of site erosion observed.	Yes		None	9/2/2020
Other Observations	Other observations of note	Note this observation was conducted as part of the Post Tropical Storm Isaias and Post Tropical Storm Laura, which occurred in 2020 (see Additional Comments below).	Yes		None	9/2/2020

ADDITIONAL COMMENTS: During the drafting of the *UXO 1, Eastern Conservation Area 2020 Annual Status Report Land Use Control Monitoring and Maintenance* (CH2M, 2020), Tropical Storm Isaias (~July 30, 2020) and Tropical Storm Laura (~August 22, 2020) potentially may have impacted Vieques, PR. A post tropical storm inspection was conducted after Tropical Storm Laura (which also served as the post Tropical Storm Isaias inspection). The results of the post tropical storm inspections for both Tropical Storm Laura and Tropical Storm Isaias are presented above.

Appendix A
LUC Site Inspection Checklist
UXO 1 Annual Inspection

DATE: August 26, 30, 31, 2021 WEATHER CONDITIONS: ~86°F, Sunny with partial cloud cover INSPECTOR'S NAME: Ronny Fields, James Paksi, Billy Capstick, Daniel Vargus

Item	Potential Problems	Observations	Acceptable?		Recommended Remedial Action	Date of Completion
			Yes	No		
Concrete Monuments, Demarcation, and Gates	Deterioration of signage, monuments, or gates; Personnel unable to read demarcation due to obstruction; Observed signs of trespassing (noting the location)	The concrete monuments (demarcation barrier), connections, and gates are all present, intact, secured with locks that are in good order, and are functioning as intended. The ECA gate is secure and functioning as intended. No signs of trespassing or vandalism observed.	Yes		None	8/31/2021
Erosion	Visible runoff patterns such as channels or gullies that may expose subsurface munitions	The areas planned for USFWS and Coast Guard use and other accessible areas were inspected for erosion. No signs of site erosion observed. No signs of trespassing observed.	Yes		None	8/26/2021, 8/30/2021, and 8/31/2021
Munitions	Exposed munitions on the ground surface	The ECA roads, Playa Blanca (including beach access trails), and the accessible portion of the southern ECA coastline were inspected. No munitions were observed. No signs of trespassing observed. No signs of site erosion observed.	Yes		None	8/26/2021, 8/30/2021, and 8/31/2021
Other Observations	Other observations of note	Note this observation was conducted as part of the Second Annual Inspection, which includes the Post Tropical Storm Grace Inspection.	Yes		None	8/26/2021, 8/30/2021, and 8/31/2021

ADDITIONAL COMMENTS:

Photographic Log



UXO Technician conducting all-metals analog detector function test at Camp Garcia analog certification area.



USFWS access trail to Playa Blanca on the southern end of the beach.



USFWS access trail to Playa Blanca on the northern end of the beach.



UXO Technicians conducting instrument-aided (all-metals detector) visual inspection along Playa Blanca.



UXO Technician conducting instrument-aided (all-metals detector) visual inspection along the main access road.



UXO Technicians conducting instrument-aided (all-metals detector) visual inspection along the southern rocky coastline.



Physical demarcation boundary barriers and LIA Gate.



Physical demarcation boundary barriers looking south.



ECA access gate and lock. Inspection of the gate and lock concluded they were operating with no defects that would threaten their integrity.



Former southern road determined to be inaccessible from vegetation growth (photo facing eastward).

Appendix F

UXO 18 Inspection Checklists and Photographs

Five-Year Review Site Inspection Checklist

Site name: UXO 18	Date of Inspection:
Location and Region: Former VNTR, Vieques, Puerto Rico	EPA ID: CERCLIS National Superfund database identification number: PRN000204694 UXO 18 is also known as Operable Unit (OU) 28 in the SEMS database.
Agencies involved in site visit:	Weather/temperature:
Remedy Includes: Focused munitions and explosives of concern (MEC) removal, land use control implementation and monitoring (including MEC Inspections) to address potential future explosive hazards to be compatible with the current and anticipated future land use as a recreational area, while preserving Cayo La Chiva's ecological habitat.	
Are Institutional Controls and LUCs properly implemented and fully enforced? <div style="text-align: right;"> <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No </div> If no, note on map and explain in Remarks below.	
Institutional Controls Implementation and enforcement <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div> Conditions imply ICs not properly implemented Conditions imply ICs not being fully enforced </div> <div style="text-align: right;"> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A </div> </div> <div style="margin-top: 10px;"> Type of monitoring (e.g., self-reporting, drive by): _____ Frequency: _____ Responsible party/agency: <u>Navy</u> Contact: <u>Kevin Cloe</u> Name: <u>Kevin Cloe/Navy</u> Title: <u>Remedial Project Manager</u> Date: _____ Phone no. <u>757-322-4736</u> </div> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div> Reporting is up-to-date Reports are verified by the lead agency </div> <div style="text-align: right;"> <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A </div> </div> <div style="margin-top: 10px;"> Specific requirements in deed or decision documents have been met <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Violations have been reported <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Are Institutional Controls Adequate? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A </div> <div style="margin-top: 10px;"> Other problems or suggestions: <input type="checkbox"/> Report attached </div>	
Fencing status <input type="checkbox"/> Location shown on site map <input type="checkbox"/> Gates secured <input checked="" type="checkbox"/> N/A Remarks: _____	
Signs and other security measures status <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> N/A Remarks: _____	
Is an active Remediation System part of the selected remedy? <div style="text-align: right;"> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No </div> If no, next section not applicable.	
If yes, for active remediation systems, are the following components in good condition and working properly? If no, explain in Remarks below.	
i. Pumps and Electrical	<input type="checkbox"/> Yes <input type="checkbox"/> No
ii. Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances	<input type="checkbox"/> Yes <input type="checkbox"/> No
iii. Treatment Technology	<input type="checkbox"/> Yes <input type="checkbox"/> No
iv. Discharge Structure and Appurtenances	<input type="checkbox"/> Yes <input type="checkbox"/> No
v. Recovery Wells	<input type="checkbox"/> Yes <input type="checkbox"/> No

Appendix A
LUC Site Inspection Checklist
UXO 18 (Annual Inspection)

DATE: September 9, 2020

WEATHER CONDITIONS: ~86°F, Sunny with partial cloud cover

INSPECTOR'S NAME: Brent Ray

Item	Potential Problems	Observations	Acceptable ?		Recommended Corrective Action	Date of Completion
			Yes	No		
Kiosk	Damage or deterioration of kiosk or its informational banners; obstruction of kiosk by vegetation	Kiosk observed to be functioning as intended with no indications of damage and/or sun fading. No vegetation was obstructing the view and/or access to the kiosk. Display was free of any debris and able to be viewed without obstruction.	Yes		None	09/09/2020
Landing Area	Potentially exposed munitions due to erosion or public use	No munitions were observed in the landing area. No signs of site erosion observed.	Yes		None	09/09/2020
Public Access Trail	Potentially exposed munitions due to erosion, public use	No munitions were observed along the public access trail. No signs of site erosion or public use observed. All trail markers were observed and functioning as intended. No damage and/or sun fading was observed on any of the trail markers.	Yes		None	09/09/2020
Overlook	Potentially exposed munitions due to erosion or public use	No munitions were observed within the overlook area. No signs of site erosion or public use observed. Three small fragments of metal (MD) encountered near removal detonation area. Metal fragments were approximately two-inches by three-inches with no explosive hazard present. Metal debris was removed.	Yes		None	09/09/2020
Evidence of Public Access to Areas not intended for Public Use	Newly created trails/paths, encampments, etc.; potentially exposed munitions due to erosion or public use in these areas	No newly created trails/paths, encampments, or signs of public use were observed.	Yes		None	09/09/2020

APPENDIX A: LUC SITE INSPECTION CHECKLIST

Item	Potential Problems	Observations	Acceptable ?		Recommended Corrective Action	Date of Completion
			Yes	No		
Other Observations	N/A	Note this observation was conducted post Tropical Storms Isaias and Laura. No storm related observations noted.	Yes		None	09/09/2020
Vegetation Overgrowth	Trail may be inaccessible	Vegetation overgrowth along the trail	Yes		None	

Photographic Log



UXO 18 Cayo La Chiva northern landing/picnic area with kayak shown (photo looking southeast).



UXO 18 Cayo La Chiva northern landing/picnic area with kayak shown (photo looking southwest).



UXO 18 Cayo La Chiva educational kiosk located just south of the northern landing/picnic area.



UXO 18 Cayo La Chiva educational kiosk shown on the right with first trail marker on the left denoting start of trail.



UXO 18 Cayo La Chiva trail with trail marker shown. UXO technician conducting the instrument-aided visual MEC inspection along the trail..



UXO 18 Cayo La Chiva trail with overgrowth of vegetation.



UXO 18 Cayo La Chiva southern overlook/picnic area (photo facing west).



UXO 18 Cayo La Chiva southern overlook/picnic area (photo facing south).



UXO 18 Cayo La Chiva small metal piece located near southern overlook/picnic area.



UXO 18 Cayo La Chiva tourist tree.

Appendix A
LUC Site Inspection Checklist

UXO 18 Annual Inspection and Post Tropical Storm Grace Inspection

DATE: August 24, 2021

WEATHER CONDITIONS: ~86°F, Sunny with partial cloud cover

INSPECTOR'S NAME(s): Ronny Fields, James Paksi, Daniel Vargus

Item	Potential Problems	Observations	Acceptable?		Recommended Corrective Action	Date of Completion
			Yes	No		
Kiosk	Damage or deterioration of kiosk or its informational banners; obstruction of kiosk by vegetation	Kiosk observed to be functioning as intended with no indications of damage and/or sun fading. No vegetation was obstructing the view and/or access to the kiosk. Display was free of any debris and able to be viewed without obstruction.	Yes		None	08/24/2021
Landing Area	Potentially exposed munitions due to erosion or public use	No munitions were observed in the landing area. No signs of site erosion observed. No signs of trespassing observed.	Yes		None	08/24/2021
Public Access Trail	Potentially exposed munitions due to erosion, public use	No munitions were observed along the public access trail. No signs of site erosion, public use, and or trespassing observed. All trail markers were observed and functioning as intended. No damage and/or sun fading was observed on any of the trail markers.	Yes		None	08/24/2021
Overlook	Potentially exposed munitions due to erosion or public use	No munitions were observed within the overlook area. No signs of site erosion, public use, or trespassing observed.	Yes		None	08/24/2021
Evidence of Public Access to Areas not intended for Public Use	Newly created trails/paths, encampments, etc.; potentially exposed munitions due to erosion or public use in these areas	No newly created trails/paths, encampments, or signs of public use were observed. No signs of trespassing observed.	Yes		None	08/24/2021

Item	Potential Problems	Observations	Acceptable?		Recommended Corrective Action	Date of Completion
			Yes	No		
Other Observations	--	During the 2021 inspections, it was observed that the northern landing/picnic area, trail through the island, and southern overlook/picnic area have not been maintained (i.e., vegetation clearance).	Yes		No corrective action needed in regard to land use control effectiveness	08/24/2021

Additional Comments: All activities were conducted in accordance with applicable guidance documents and no quality control issues/failures were observed by the quality control oversight.

Photographic Log



UXO Technician conducting all-metals analog detector function test at Camp Garcia analog certification area.



Garmin GPS function test at Camp Garcia benchmark.



UXO 18 northern landing/picnic area. Photo taken at the edge of the water looking south towards the landing/picnic area. Boat utilized by field team to access the island is partially visible on the left side of the photo.



UXO 18 northern landing/picnic area. Photo taken looking west from the landing/picnic area.



Senior UXO Technician (SUXOS) conducting instrument-aided (all-metals detector) visual inspection along the trail through the center of the island.



SUXOS conducting instrument-aided (all-metals detector) visual inspection along the trail through the center of the island. A trail marker is visible on the left side of photo.



UXO Technician II conducting instrument-aided (all-metals detector) visual inspection along the trail through the center of the island.



Photo showing general trail conditions while traversing the trail north from the southern picnic area. Trail marker visible on right side of trail. Vegetation growth was observed to be consistent along the trail, indicating no new trails had been established.



Photo shows southern overlook/picnic area general site conditions. UXO Technician shown standing in high vegetation growth of thick and typically thorny scrub.



Southern overlook/picnic area looking south from trail.



Southern overlook/picnic area looking north.



Southern overlook/picnic area looking northwest. SUXOS shown conducting instrument-aided (all-metals detector) visual survey within accessible areas.



UXO 18 educational kiosk located at the northern landing/picnic area.

Appendix A
LUC Site Inspection Checklist
UXO 18 Inspection – 1st 60-Day Reoccurring Inspection

DATE: January 25, 2022

WEATHER CONDITIONS: ~84°F, Sunny with partial cloud cover

INSPECTOR'S NAME(s): Ronny Fields (Geologist/FTL), James Paksi (SUXOS), Daniel Vargas (UXOSO/UXOQCS)

Item	Potential Problems	Observations	Acceptable?		Recommended Corrective Action	Date of Completion
			Yes	No		
Kiosk	Damage or deterioration of kiosk or its informational banners; obstruction of kiosk by vegetation	A new sign was installed in the Kiosk that shows the revised public area (i.e., Designated Public Beach Area). Display is free of any debris and/or vegetation and able to be viewed without obstruction.	Yes		Not Applicable	01/25/2022
Landing Area (This will be referred to as the "Public Beach Area" moving forward)	Potentially exposed munitions due to erosion or public use	No munitions-related items were observed in the Public Beach Area. No signs of site erosion observed. No signs of trespassing observed. No signs/indications of any recent public use observed.	Yes		Not Applicable	01/25/2022
Public Access Trail	Potentially exposed munitions due to erosion, public use	The proposed recreational trail was never developed as planned, so vegetation has been growing over the trail since the remedial action was implemented in August 2019. PRDNER has indicated that it has no plans to develop the trail in the foreseeable future; therefore, all trail markers were removed. Additionally, vegetation was placed across the trail entrance at the Public Beach Area to obscure the trail entrance. Therefore, MEC inspections were conducted along the trail for this inspection event only (no munitions-related items observed) and will not be conducted along the trail during future inspections unless trespassing is observed to be occurring. No signs of site erosion, public use, and/or trespassing observed.	Yes		Not Applicable	01/25/2022

Item	Potential Problems	Observations	Acceptable?		Recommended Corrective Action	Date of Completion
			Yes	No		
Overlook	Potentially exposed munitions due to erosion or public use	The proposed Overlook/Picnic Area was never developed as planned, so vegetation has been growing over this area since the remedial action was implemented in August 2019. PRDNER has indicated that it has no plans to develop the Overlook/Picnic Area in the foreseeable future. Therefore, MEC inspections were conducted within the Overlook/Picnic Area for this inspection event only (no munitions-related items observed) and will not be conducted during future inspection events unless trespassing is observed to be occurring. No signs of site erosion, public use, or trespassing observed.	Yes		Not Applicable	01/25/2022
Evidence of Public Access to Areas not intended for Public Use	Newly created trails/paths, encampments, etc.; potentially exposed munitions due to erosion or public use in these areas	No newly created trails/paths, encampments, trespassing, or indications of public use observed.	Yes		Not Applicable	01/25/2022
Other Observations	--	The vegetation along the trail and within/adjacent to the Overlook/Picnic Area remains overgrown with no indication of any cutting or clearance activities.	Yes		Not Applicable	01/25/2022

Additional Comments: All activities were conducted in accordance with applicable guidance documents and no quality control issues/failures were observed by the quality control oversight.

Appendix A
LUC Site Inspection Checklist
UXO 18 Inspection – 2nd 60-Day Reoccurring Inspection

DATE: March 22, 2022

WEATHER CONDITIONS: ~82°F, Sunny with partial cloud cover

INSPECTOR'S NAME(s): Ronny Fields (Geologist/FTL), Brent Ray (SUXOS), Daniel Vargas (UXOSO/UXOQCS)

Item	Potential Problems	Observations	Acceptable?		Recommended Corrective Action	Date of Completion
			Yes	No		
Kiosk	Damage or deterioration of kiosk or its informational banners; obstruction of kiosk by vegetation	Display is free of any debris and/or vegetation and able to be viewed without obstruction.	Yes		Not Applicable	03/22/2022
Landing Area (This will be referred to as the "Public Beach Area" moving forward)	Potentially exposed munitions due to erosion or public use	No munitions-related items were observed in the Public Beach Area. No signs of site erosion observed. No signs of trespassing observed. No signs/ indications of any recent public use observed.	Yes		Not Applicable	03/22/2022
Public Access Trail	Potentially exposed munitions due to erosion, public use	The public access trail is now closed to the public, overgrowing, and its entrance blocked with vegetation with no signs of attempted access; therefore, inspection along the former trail would not be possible without vegetation cutting to facilitate access. As stated in the MEC Inspection Procedure, the Navy will not cut or clear vegetation in order to provide access to areas that the landowner/administrator does not maintain as accessible. As a conservative measure, additional vegetation was placed across the trail entrance at the Public Beach Area to further obscure the former trail entrance. No signs of trespassing observed.	Yes		Not Applicable	03/22/2022

Item	Potential Problems	Observations	Acceptable?		Recommended Corrective Action	Date of Completion
			Yes	No		
Overlook	Potentially exposed munitions due to erosion or public use	The Overlook/Picnic Area is now closed to the public with no accessible route observed; therefore, inspection of this area would not be possible without vegetation cutting to facilitate access. However, as noted above, no signs of accessing the former trail leading to the Overlook or any trespassing into other areas observed. See also the note above about cutting vegetation.	Yes		Not Applicable	03/22/2022
Evidence of Public Access to Areas not intended for Public Use	Newly created trails/paths, encampments, etc.; potentially exposed munitions due to erosion or public use in these areas	No newly created trails/paths, encampments, trespassing, or indications of public use observed.	Yes		Not Applicable	03/22/2022
Other Observations	--	--	--	--	--	03/22/2022

Additional Comments: All activities were conducted in accordance with applicable guidance documents and no quality control issues/failures were observed by the quality control oversight personnel.

Appendix A
LUC Site Inspection Checklist
UXO 18 Inspection – 3rd 60-Day Reoccurring Inspection

DATE: May 25, 2022

WEATHER CONDITIONS: ~82°F, Sunny with partial cloud cover

INSPECTOR'S NAME(s): Ronny Fields (Geologist/FTL), Brent Ray (SUXOS), Daniel Vargas (UXOSO/UXOQCS)

Item	Potential Problems	Observations	Acceptable?		Recommended Corrective Action	Date of Completion
			Yes	No		
Kiosk	Damage or deterioration of kiosk or its informational banners; obstruction of kiosk by vegetation	Display is free of any debris and/or vegetation and able to be viewed without obstruction.	Yes		Not Applicable	05/25/2022
Landing Area (This will be referred to as the "Public Beach Area" moving forward)	Potentially exposed munitions due to erosion or public use	No munitions-related items were observed in the Public Beach Area. No signs of site erosion observed. No signs of trespassing observed. No signs/ indications of any recent public use observed.	Yes		Not Applicable	05/25/2022
Public Access Trail	Potentially exposed munitions due to erosion, public use	The public access trail is now closed to the public, overgrowing, and its entrance blocked with vegetation with no signs of attempted access; therefore, inspection along the former trail would not be possible without vegetation cutting to facilitate access. As stated in the MEC Inspection Procedure, the Navy will not cut or clear vegetation in order to provide access to areas that the landowner/administrator does not maintain as accessible. No signs of trespassing observed.	Yes		Not Applicable	05/25/2022

Item	Potential Problems	Observations	Acceptable?		Recommended Corrective Action	Date of Completion
			Yes	No		
Overlook	Potentially exposed munitions due to erosion or public use	The Overlook/Picnic Area is now closed to the public with no accessible route observed; therefore, inspection of this area would not be possible without vegetation cutting to facilitate access. However, as noted above, no signs of accessing the former trail leading to the Overlook or any trespassing into other areas observed. See also the note above about cutting vegetation.	Yes		Not Applicable	05/25/2022
Evidence of Public Access to Areas not intended for Public Use	Newly created trails/paths, encampments, etc.; potentially exposed munitions due to erosion or public use in these areas	No newly created trails/paths, encampments, trespassing, or indications of public use observed.	Yes		Not Applicable	05/25/2022
Other Observations	--	--	--	--	--	05/25/2022

Additional Comments: All activities were conducted in accordance with applicable guidance documents and no quality control issues/failures were observed by the quality control oversight personnel.

Appendix A
LUC Site Inspection Checklist
UXO 18 Inspection – 4th 60-Day Reoccurring Inspection

DATE: August 5, 2022

WEATHER CONDITIONS: ~90°F, Sunny with partial cloud cover

INSPECTOR'S NAME(s): Ronny Fields (Geologist/FTL), James Paksi (SUXOS), Daniel Vargas (UXOSO/UXOQCS)

Item	Potential Problems	Observations	Acceptable?		Recommended Corrective Action	Date of Completion
			Yes	No		
Kiosk	Damage or deterioration of kiosk or its informational banners; obstruction of kiosk by vegetation	Display is free of any debris and/or vegetation and able to be viewed without obstruction.	Yes		Not Applicable	08/05/2022
Landing Area (This will be referred to as the "Public Beach Area" moving forward)	Potentially exposed munitions due to erosion or public use	No munitions-related items were observed in the Public Beach Area. No signs of site erosion observed. No signs of trespassing observed. No signs/ indications of any recent public use observed.	Yes		Not Applicable	08/05/2022
Public Access Trail	Potentially exposed munitions due to erosion, public use	The public access trail is now closed to the public, overgrowing, and its entrance blocked with vegetation with no signs of attempted access; therefore, inspection along the former trail would not be possible without vegetation cutting to facilitate access. As stated in the MEC Inspection Procedure, the Navy will not cut or clear vegetation in order to provide access to areas that the landowner/administrator does not maintain as accessible. No signs of trespassing observed.	Yes		Not Applicable	08/05/2022

Item	Potential Problems	Observations	Acceptable?		Recommended Corrective Action	Date of Completion
			Yes	No		
Overlook	Potentially exposed munitions due to erosion or public use	The Overlook/Picnic Area is now closed to the public with no accessible route observed; therefore, inspection of this area would not be possible without vegetation cutting to facilitate access. However, as noted above, no signs of accessing the former trail leading to the Overlook or any trespassing into other areas observed. See also the note above about cutting vegetation.	Yes		Not Applicable	08/05/2022
Evidence of Public Access to Areas not intended for Public Use	Newly created trails/paths, encampments, etc.; potentially exposed munitions due to erosion or public use in these areas	No newly created trails/paths, encampments, trespassing, or indications of public use observed.	Yes		Not Applicable	08/05/2022
Other Observations	--	--	--	--	--	--

Additional Comments: All activities were conducted in accordance with applicable guidance documents and no quality control issues/failures were observed by the quality control oversight personnel.

Appendix A
LUC Site Inspection Checklist

UXO 18 Inspection – 5th 60-Day Reoccurring Inspection and Post-storm Fiona Inspection

DATE: October 07, 2022 WEATHER CONDITIONS: ~87°F, Sunny with partial cloud cover INSPECTOR'S NAME(s): Ronny Fields (Geologist/FTL), James Paksi (SUXOS), Brent Ray (UXOSO/UXOQCS)

Item	Potential Problems	Observations	Acceptable?		Recommended Corrective Action	Date of Completion
			Yes	No		
Kiosk	Damage or deterioration of kiosk or its informational banners; obstruction of kiosk by vegetation	Display is free of any debris and/or vegetation and able to be viewed without obstruction.	Yes		Not Applicable	10/07/2022
Landing Area (This will be referred to as the "Public Beach Area" moving forward)	Potentially exposed munitions due to erosion or public use	No munitions-related items were observed in the Public Beach Area. No signs of site erosion observed. No signs of trespassing observed. No signs/ indications of any recent public use observed.	Yes		Not Applicable	10/07/2022
Public Access Trail	Potentially exposed munitions due to erosion, public use	The public access trail is now closed to the public, overgrowing, and its entrance blocked with vegetation with no signs of attempted access; therefore; inspection along the former trail would not be possible without vegetation cutting to facilitate access. As stated in the MEC Inspection Procedure, the Navy will not cut or clear vegetation in order to provide access to areas that the landowner/administrator does not maintain as accessible. No signs of trespassing observed.	Yes		Not Applicable	10/07/2022

Item	Potential Problems	Observations	Acceptable?		Recommended Corrective Action	Date of Completion
			Yes	No		
Overlook	Potentially exposed munitions due to erosion or public use	The Overlook/Picnic Area is now closed to the public with no accessible route observed; therefore, inspection of this area would not be possible without vegetation cutting to facilitate access. However, as noted above, no signs of accessing the former trail leading to the Overlook or any trespassing into other areas observed. See also the note above about cutting vegetation.	Yes		Not Applicable	10/07/2022
Evidence of Public Access to Areas not intended for Public Use	Newly created trails/paths, encampments, etc.; potentially exposed munitions due to erosion or public use in these areas	No newly created trails/paths, encampments, trespassing, or indications of public use were observed.	Yes		Not Applicable	010/07/2022
Other Observations	--	--	--	--	--	--

Additional Comments: All activities were conducted in accordance with applicable guidance documents and no quality control issues/failures were observed by the quality control oversight personnel.

Appendix A
LUC Site Inspection Checklist
UXO 18 Inspection – 6th 60-Day Reoccurring Inspection

DATE: December 09, 2022 WEATHER CONDITIONS: ~84°F, Sunny with partial cloud cover

INSPECTOR'S NAME(s): Ronny Fields (Geologist/FTL), Brent Ray (SUXOS), Daniel Vargas (UXOSO/UXOQCS)

Item	Potential Problems	Observations	Acceptable?		Recommended Corrective Action	Date of Completion
			Yes	No		
Kiosk	Damage or deterioration of kiosk or its informational banners; obstruction of kiosk by vegetation	Display is free of any debris and/or vegetation and able to be viewed without obstruction.	Yes		Not Applicable	12/09/2022
Landing Area (This will be referred to as the "Public Beach Area" moving forward)	Potentially exposed munitions due to erosion or public use	No munitions-related items were observed in the Public Beach Area. No signs of site erosion observed. No signs of trespassing observed. A trash bag was observed tied to a branch with what appeared to be trash associated with fishing activities (i.e., netting, water bottles) at the Public Beach Area.	Yes		Not Applicable	12/09/2022
Public Access Trail	Potentially exposed munitions due to erosion, public use	The public access trail is now closed to the public, overgrowing, and its entrance blocked with vegetation with no signs of attempted access; therefore, inspection along the former trail would not be possible without vegetation cutting to facilitate access. As stated in the MEC Inspection Procedure, the Navy will not cut or clear vegetation in order to provide access to areas that the landowner/administrator does not maintain as accessible. No signs of trespassing observed.	Yes		Not Applicable	12/09/2022

Item	Potential Problems	Observations	Acceptable?		Recommended Corrective Action	Date of Completion
			Yes	No		
Overlook	Potentially exposed munitions due to erosion or public use	The Overlook/Picnic Area is now closed to the public with no accessible route observed; therefore, inspection of this area would not be possible without vegetation cutting to facilitate access. However, as noted above, no signs of accessing the former trail leading to the Overlook or any trespassing into other areas observed. See also the note above about cutting vegetation.	Yes		Not Applicable	12/09/2022
Evidence of Public Access to Areas not intended for Public Use	Newly created trails/paths, encampments, etc.; potentially exposed munitions due to erosion or public use in these areas	No newly created trails/paths, encampments, trespassing, or indications of public use in areas not intended for public use were observed.	Yes		Not Applicable	12/09/2022
Other Observations	--	--	--	--	--	--

Additional Comments: All activities were conducted in accordance with applicable guidance documents and no quality control issues/failures were observed by the quality control oversight personnel.

1st 60-Day Inspection Photographic Log



UXO Technicians conducting all-metals analog detector function test at Camp Garcia Analog Certification Area.



New sign installation with trail entrance shown in background.



New sign installation with trail entrance shown in the background. Vegetation debris was placed across the trail entrance to naturally obscure it.

2nd 60-Day Inspection Photographic Log



UXO Technicians conducting all-metals analog instrument-aided visual inspection at the Public Beach Area at UXO 18 Cayo la Chiva. Kayaks used to access the island by the inspection team shown on the shoreline.



UXO 18 kiosk shown with vegetation debris obscuring trail access point. Inspection teams equipment/supplies shown at the base of the kiosk.

3rd 60 Day Inspection Photographic Log



UXO Technicians conducting all-metals analog instrument-aided visual inspection at the Public Beach Area at UXO 18 Cayo la Chiva.



UXO 18 kiosk shown with vegetation debris obscuring trail access point. Inspection teams equipment/supplies shown on top of the kiosk.

4th 60-Day Inspection Photographic Log



UXO Technicians perform analog function test at the Analog Certification Area at Camp Garcia.



UXO Technician conducting instrument-aided visual inspection within the Public Beach Area at UXO 18.



UXO 18 kiosk shown with vegetation debris obscuring trail access point.



UXO 18 Public Beach Area.

5th 60-Day and Post Storm Fiona Inspection Photographic Log



UXO Technicians conducting all-metals analog instrument function test at Analog Certification Area at Camp Garcia.



View from water of the Public Beach Area at Cayo La Chiva. UXO Technician shown conducting inspection to the left of the boat used to access the island.



UXO 18 kiosk shown with vegetation debris obscuring trail access point.

6th 60-Day Inspection Photographic Log



UXO Technicians conducting all-metals analog instrument function test at Analog Certification Area at Camp Garcia.



UXO Technician shown conducting inspection within the Public Beach Area.



Trash bag tied to vegetation with netting and general trash (i.e., plastic water bottles, plastic bags).

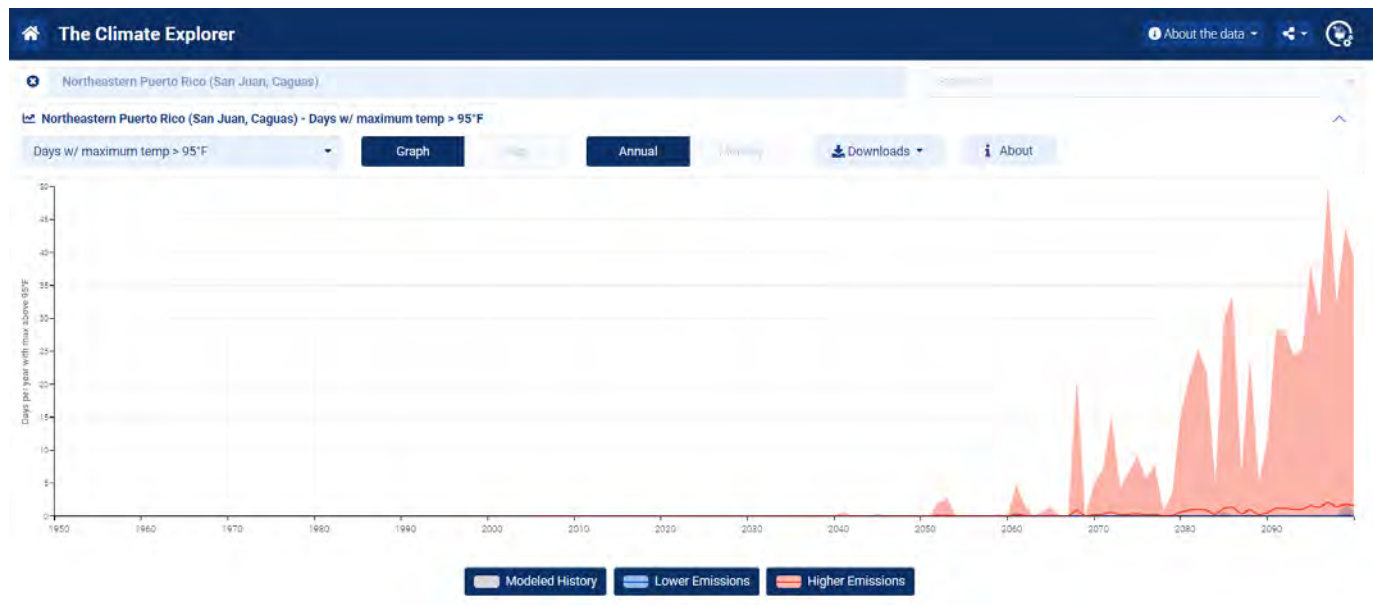
Appendix G

Climate Change

Climate Change

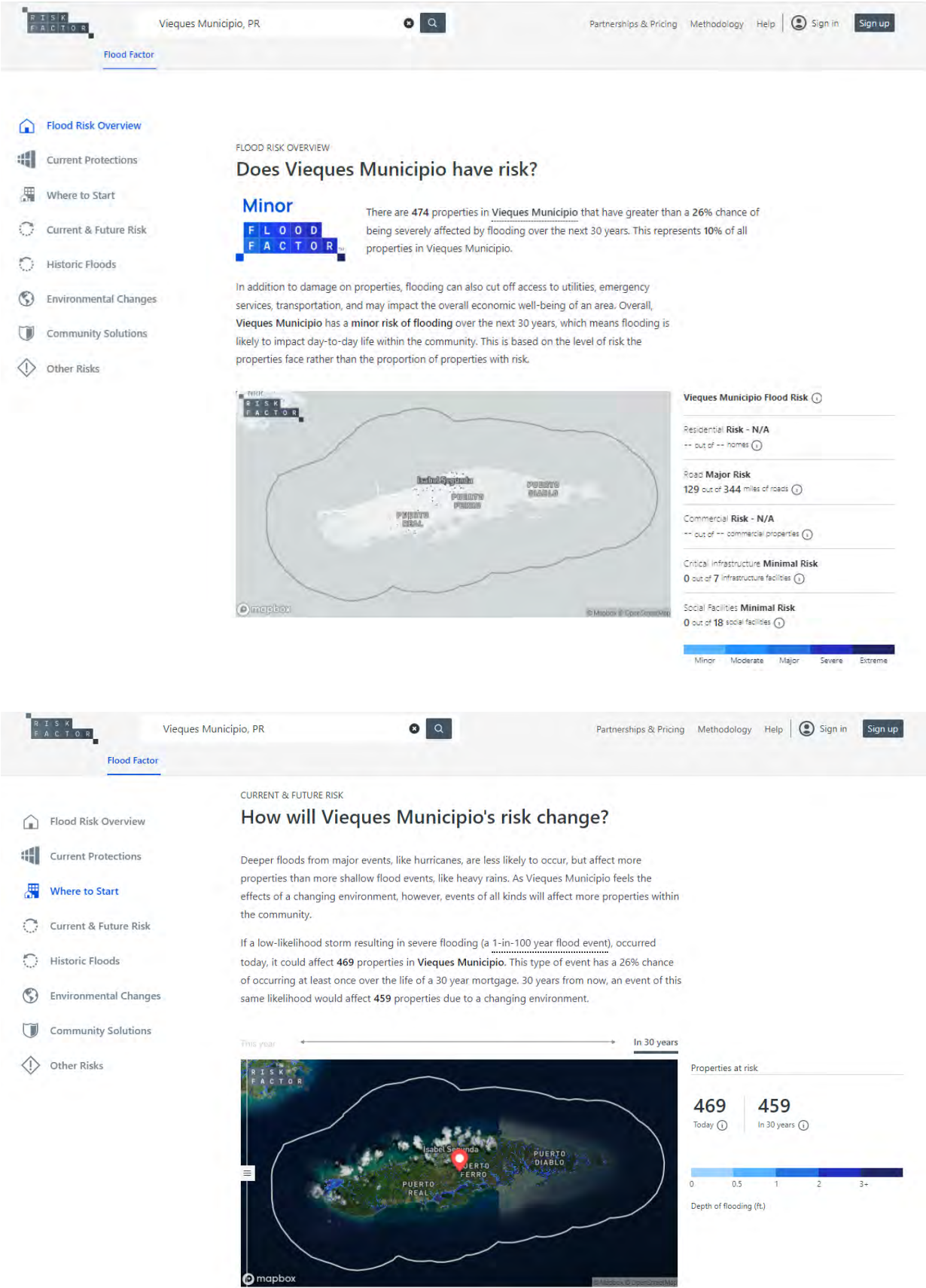
Climate Explorer

While Vieques-specific information in Climate Explorer is not available, information for the San Juan/Caguas areas on mainland Puerto Rico, located less than about 50 miles from Vieques, is suitably representative of Vieques. Therefore, the Climate Explorer output provided below maps were used to assess the five sites associated with the Second Five-Year Review.



Risk Factor

Vieques is determined to have a Minor Flood Factor.



SWMU 1 – Former Camp Garcia Landfill

Sea Level Rise

Image at current mean higher high water (MHHW).

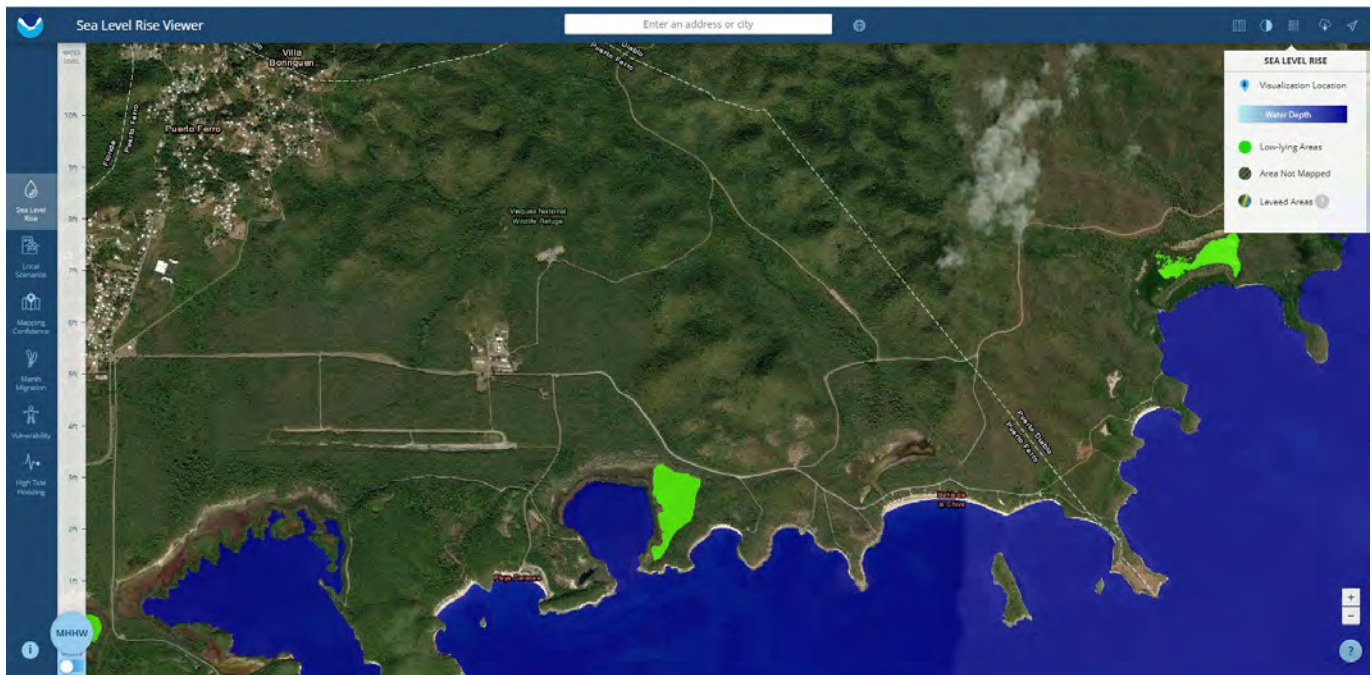
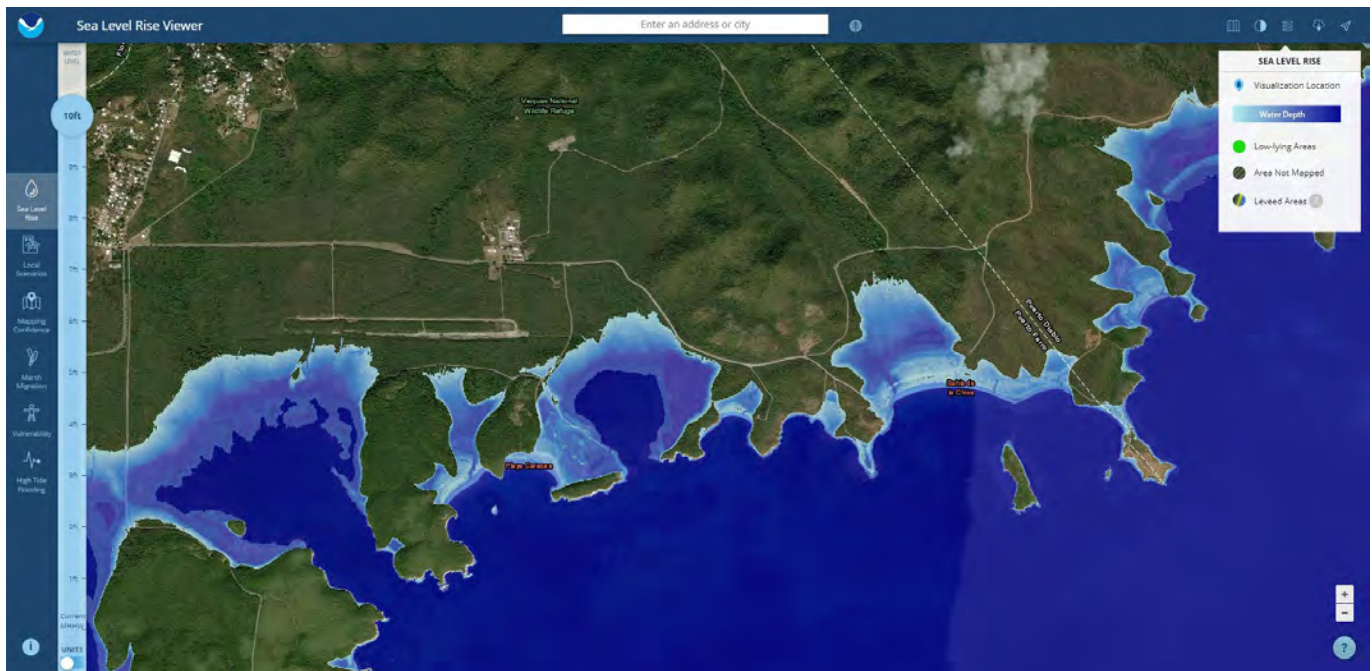


Image at 10-foot increase to mean higher high water (MHHW)



AOC E – Former Vehicle Maintenance UST and AST Site

Sea Level Rise

Image at current MHHW.

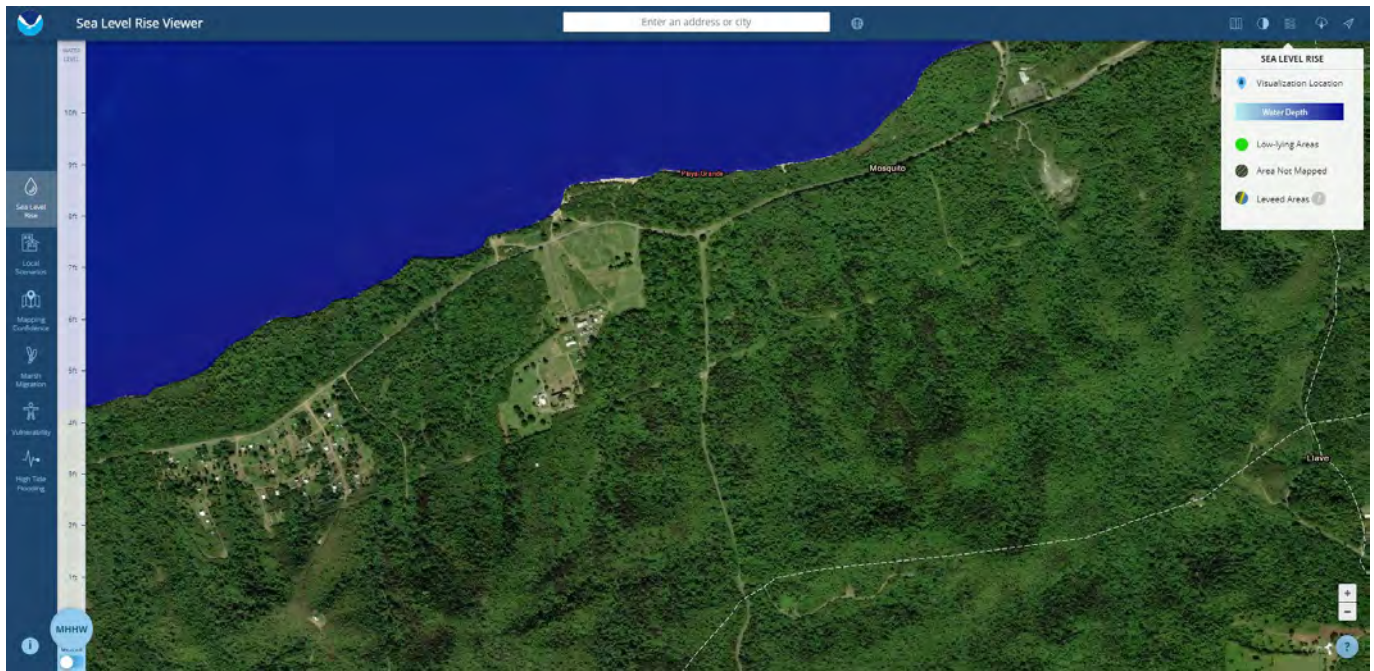
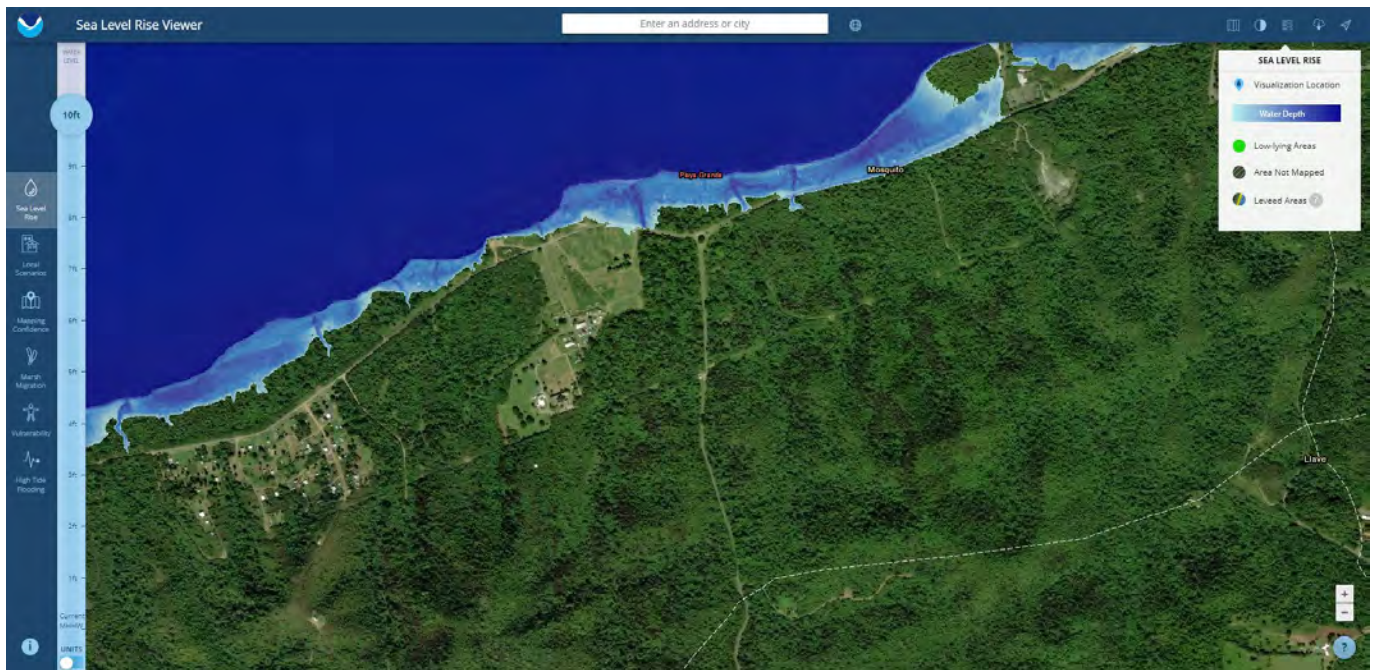


Image at 10-foot increase to MHHW.



UXO 1 – Eastern Conservation Area

Sea Level Rise

Image at current MHHW.



Image at 10-foot increase to MHHW.



UXO 18—Cayo La Chiva

Sea Level Rise

Image at current MHHW.

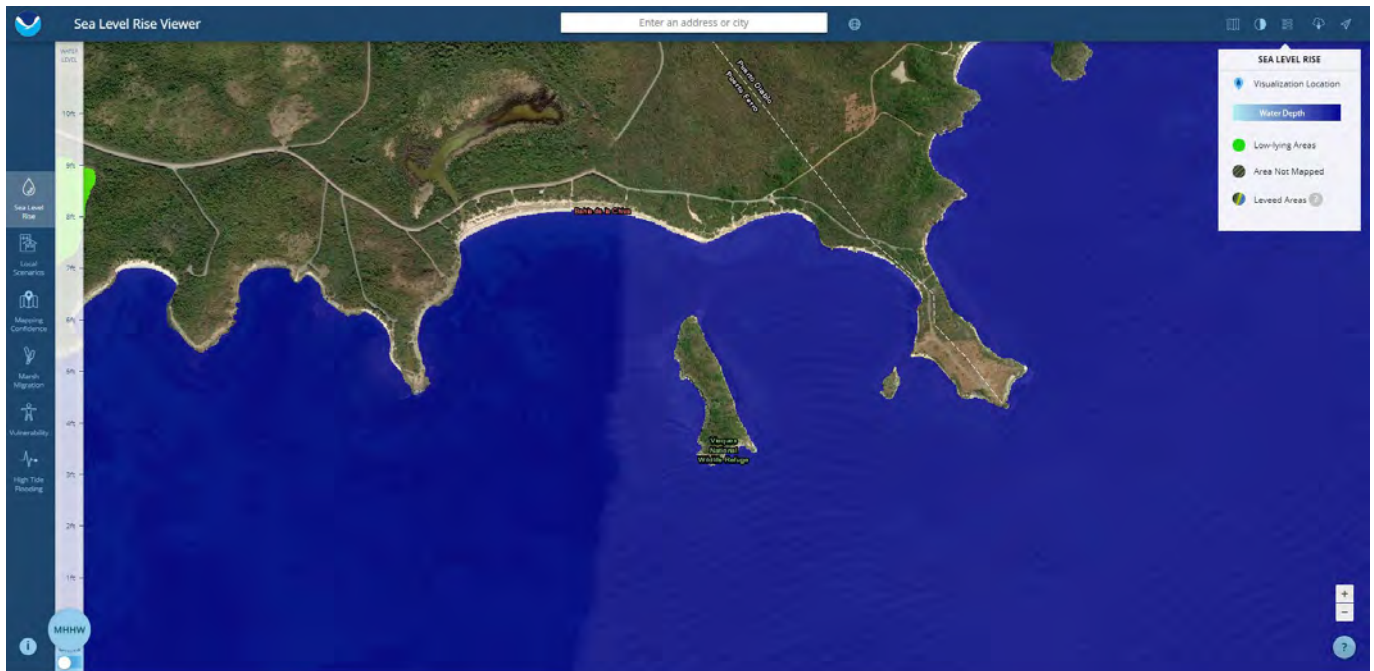
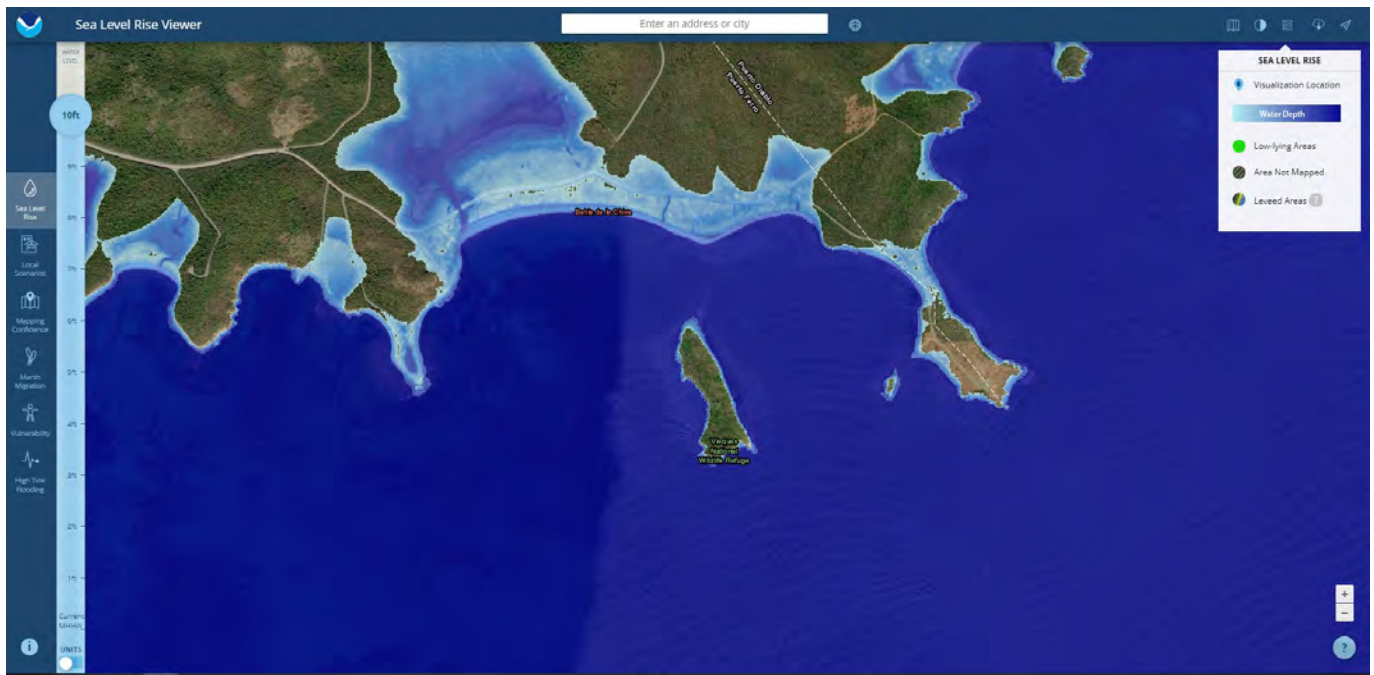


Image at 10-foot increase to MHHW.



SWMU 4 – Former OB/OD Area

Sea Level Rise

Image at current MHHW.

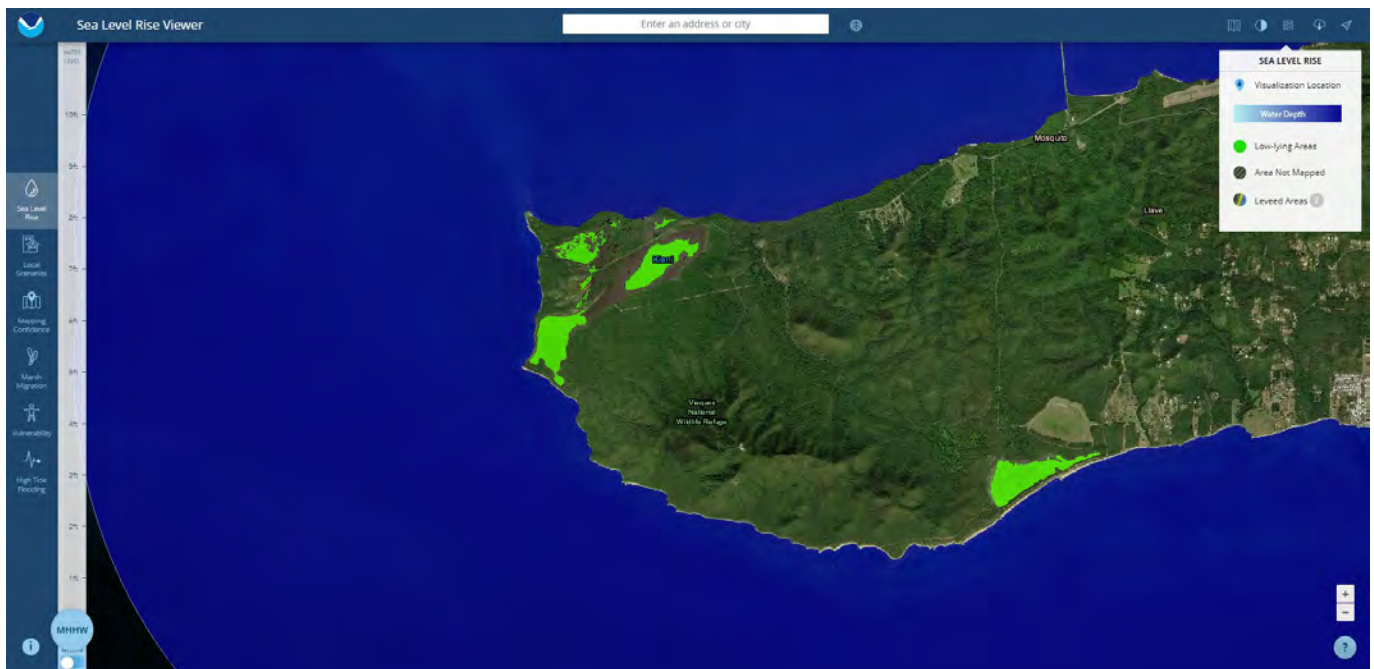
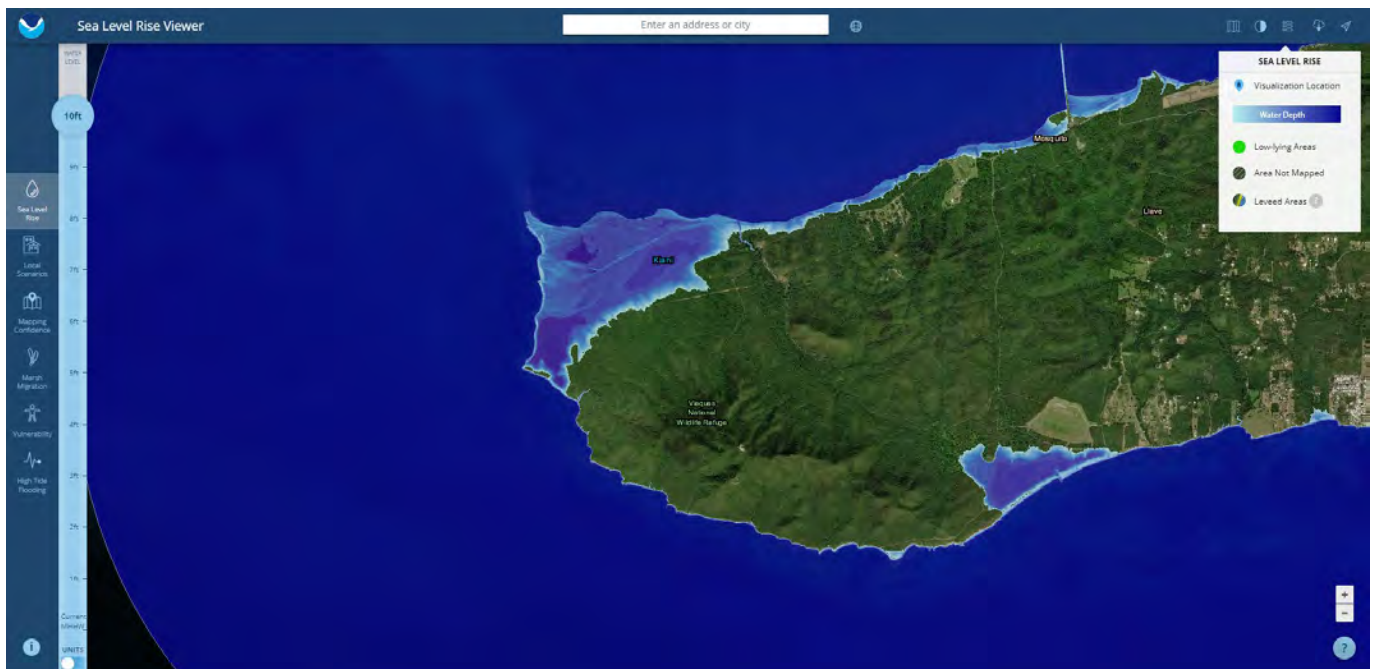


Image at 10-foot increase to MHHW.



Appendix H

Responses to Regulator Comments

Responses to Regulator Comments

**Navy Responses to EPA Comments on the Draft Second Five-Year Review Report,
Atlantic Fleet Weapons Training Area – Vieques, Vieques, Puerto Rico, May 2023
Dated, May 2023**

COMMENTS

1. **Page vii, Five Year Summary Form:** For future reference, the site inspection should take place within 9 months of the signature date in accordance with the EPA 2001 FYR Comprehensive guidance (OSWER 9355.7-03B-P).

Navy Response: Comment noted.

2. **Page 3-4, Section 3.3.3, Status of Implementation:** Please clarify in this section that the need for additional native soil cover was eliminated by the change to the selected remedy described in the ROD ESD.

Navy Response: The second sentence of Section 3.3.3 has been revised to read: “Based on this finding, the Navy and regulatory agencies concurred on temporarily removing the vegetation across the landfill in order to ensure surface debris at the landfill could be removed, thereby eliminating the need for additional native soil cover.”

3. **Page 3-5, Section 3.4, Progress Since the Last Review:** Please include the following language at the end of this section: “As such, the previous FYR did not include any issues and recommendations to evaluate during this FYR period.”

Navy Response: The requested sentence has been added to the end of the paragraph in Section 3.4.

4. **Page 3-5, Section 3.5.2, Data Review:** When discussing groundwater sampling results, please provide some details regarding all sampling data from the five-year period, not just the most recent (i.e., data review does not mention CGW1MW11 2020 MCL/PRWQS exceedance of bis(2-Ethylhexyl)phthalate, or that dissolved barium concentrations have been highest in this location during the last five years). The data discussion should also provide context for monitoring well locations (i.e., upgradient, downgradient, within- landfill) and extrapolate if the extent of contamination is fully delineated.

Navy Response: The following revisions have been made in Section 3.5.2:

- An additional figure (Figure 3-3) has been created that shows the pertinent groundwater analytical data (i.e., the data shown in the same figure included in the annual reports) for the four annual groundwater sampling events that took place during the current five-year period as well as historical sampling events.
- The first paragraph in Section 3.5.2 has been revised to read: “Four annual monitoring events (2019 through 2022) were completed since the first FYR. In addition to evaluating the condition of LUCs, each event included sampling of the six long-term monitoring wells the Navy and regulatory agency concurred provide the appropriate coverage of the internal landfill conditions and, most importantly, the downgradient conditions, as shown in Figure 3-2. Results of SWMU 1 annual monitoring are presented in the following documents:”

- The second bullet under “Evaluation of results of the four annual LTM and O&M event activities found” has been revised to read:
 - “Figure 3-3 provides the concentrations of every constituent for which there has been at least one detection above a regulatory screening level (i.e., PRWQS or MCL [and background for metals]) during the annual groundwater LTM events as well as historical sampling events. These are the same data that have been shown and discussed in the various annual reports. All groundwater samples were analyzed for VOCs, SVOCs, pesticides, PCBs, and metals during each LTM event. Key observations based on these data are:
 - No VOCs, pesticides, or PCBs have been detected in groundwater during LTM
 - SVOCs have been primarily not detected in groundwater and when detected, the long-term data suggest their detections are low (i.e., near reporting limits), anomalous (i.e., generally non-detect in the preceding and succeeding events), and do not demonstrate increasing trends and other patterns. For example:
 - bis(2-Ethylhexyl)phthalate was detected in intra-landfill well MW08 (1.4 µg/L, below the regulatory screening levels) in 2020, but not before or since.
 - bis(2-Ethylhexyl)phthalate was detected in downgradient well MW02 (1.3 µg/L, below the regulatory screening levels) in 2021 for the first time since 2016, when it was detected at a similar concentration (0.88 µg/L). It was not detected in this well in 2022 or 2023.
 - bis(2-Ethylhexyl)phthalate was detected in downgradient well MW11 (6.8 µg/L, above the regulatory screening levels) in 2020, but not before or since.
 - Five SVOCs were detected in downgradient well MW10 (concentrations between about 0.08 and 0.1 µg/L, above the PRWQS) in 2021, but not before or since.
 - In 2022, di-n-butylphthalate was the only SVOC detected in SWMU 1 groundwater (in intra-landfill well MW08), but it was below the regulatory screening levels.
 - Mercury is the only metal that has been detected above a regulatory screening level (i.e., PRWQS) during LTM. Chromium was detected above regulatory screening levels (PRWQS and MCL) in downgradient well MW03 in 2016, but not before or since. With respect to mercury:
 - Its concentrations in the two wells where it is most frequently detected (i.e., intra-landfill well MW08 and downgradient well MW02) have been relatively consistent since LTM monitoring began and as far back as 2004 and demonstrate no increasing trend.
 - Data collected during the 2016 through 2022 groundwater annual events support the historical conclusions for groundwater in the RI and documented in the ROD that leaching from the landfill is not a concern. Specifically, no increasing trends of chemical concentrations have been observed and comparison of the annual data suggest that groundwater conditions beneath the landfill have remained consistent over the last 18 years.
 - All fencing and signs are in place and functioning as anticipated.”

5. Page 3-7, Section 3.7, Issues/Recommendations:

- The bullets included in this section are specifically notes as relating to optimization (i.e., sample reduction frequency and fence removal). Since these bullet points do not include formal issues/recommendations impacting protectiveness, this information should be included under Other Findings.

Navy Response: Everything except the first paragraph of Section 3.7 has been moved to Section 3.8.

- A sitewide reduction in the groundwater monitoring frequency does not seem appropriate based on the groundwater data. It may be appropriate to reduce the sampling frequency to once every five years for wells that have consistently been either stable or non-detect, but wells with more variable data trends including MW-02, MW-08, MW-10, and MW-11 should be sampled more frequently such as every two years.

Navy Response: Given that the objective for groundwater LTM is to identify whether there are releases from the landfill, a sustained upward trend is the characteristic that would demonstrate a release. Concentration variability is an expected, innate characteristic of groundwater and is not indicative of a release. Further, at concentrations as low as are being observed in the SWMU 1 wells, even small influences associated with sample collection or the groundwater conditions at the time of the particular sampling events can account for the low-magnitude variability observed.

The data from well MW13 is an example of the characteristic described above. MW13 is the background well, upgradient of potential influence by the landfill and its data demonstrate expected low-magnitude variability with time. This is the same characteristic that is demonstrated by the data for wells MW02 and MW08. In both wells, low-magnitude variability has been observed since monitoring began, with no upward trend. In fact, concentrations in the latest round of sampling (2023) are essentially the same as those observed nearly two decades ago, a characteristic that is not indicative of a release.

At the three other wells included in the LTM program (MW03, MW10, and MW11), the data show an anomalous result in only one event in over a decade of monitoring, not seen before or since. Were those results indicative of a release, continued, increasing concentrations would have been observed.

Given that for all wells included in the LTM program nearly two decades of monitoring data show no upward trend and low-magnitude variations that are consistent with innate groundwater characteristics, a sampling frequency of every 5 years to coincide with each five-year review will ensure both sufficient data are collected to assess remedy protectiveness and prudent commitment of resources.

EPA Evaluation of Response: Since the purpose of SWMU 1 groundwater LTM is to identify whether there are releases from the landfill, EPA approves the reduction in groundwater monitoring frequency for once every five years.

However, the future groundwater data will need to be evaluated conservatively in the context of the existing groundwater dataset: if data collected during the every-five-year sampling indicate anomalously high concentrations when compared to the existing dataset, the Navy and regulatory agencies should discuss whether it is appropriate to perform a supplemental confirmatory sampling event to evaluate if the data suggests a release has occurred.

Navy Response to EPA Evaluation: Comment noted.

6. **Page 3-7, Section 3.8, Other Findings:** This section briefly mentions that PFAS sampling in groundwater was performed at SWMU-1, but that all detections “were below risk-based levels”. The sampling results, as well as the risk-based criteria used to interpret those results, should be discussed under the Data Review and Question B. This may also be appropriate under Progress Since the Last Review. The discussion should include information on media sampled and ranges of PFAS detections. Please also indicate whether further investigation is recommended at this time.

Please note EPA expects that PFAS samples will be screened using updated Regional Screening Levels (RSLs). If re-screening against updated RSLs will not be completed at the time of this FYR, please add this as an issue with the timeline for addressing this issue under recommendations.

Navy Response: The referenced paragraph of Section 3.8 has been moved to be the second paragraph of Section 3.7 and revised to read: “In 2022, groundwater sampling for per- and polyfluoroalkyl substances

(PFAS) analysis was conducted at SWMU 1 given historical records indicating aqueous film-forming foam (AFFF) was potentially available for firefighting use at the former base. The results of the sampling are provided in the Draft Site Inspection for Per- and Polyfluoroalkyl Substances Report (CH2M, 2023e). While PFAS were detected in groundwater, the concentrations were below risk-based levels available at the time the draft report was prepared. Recognizing the report is still under regulatory consideration and because screening levels continue to be updated, discussion of PFAS data evaluation is not included herein, but will be presented in the final PFAS Site Inspection Report and used to make decisions regarding whether further investigation or action is warranted. However, as with other contaminants potentially attributable to the SWMU 1 landfill, monitoring and maintenance of SWMU 1 LUCs and that potable water for Vieques is from the main island of Puerto Rico are effective mechanisms to prevent potable groundwater use at SWMU 1.”

7. **Table 3-2, SWMU 1 Groundwater Detections and Exceedances:** The data table should have a shading indicator for results that were non-detect but the detection limit was higher than the EPA MCLs or PRWQS (i.e., dissolved mercury non-detect limits are often higher than the PRWQS – 0.11U µg/L vs. 0.05 µg/L). In addition, the table should include the PFAS detections from 2022 and the screening levels they were compared to.

Navy Response: The data table is of the same format utilized in the annual LTM reports. Any potential impact on data usability from various factors, including reporting limits relative to screening values, are discussed in the Data Quality Evaluation (DQE) that is contained in every annual report. The DQE findings are then factored into the conclusions and recommendations made in each annual report, which are reviewed and concurred upon by the regulatory agencies and form the basis for the conclusions and recommendations made in this FYR report. Adding shading associated with non-detect values above reporting limits would therefore not impact the findings presented in this FYR report and therefore, for consistency, the Navy recommends retaining the table in the existing format.

Please see the response to Comment #6 in regard to PFAS.

8. **Figure 3-2, SWMU 1 Monitoring Well Locations:** Groundwater flow direction should be indicated on this figure.

Navy Response: The groundwater flow direction has been added to both Figure 3-2 and new Figure 3-3.

9. **Page 4-4, Section 4.4, Progress Since the Last Review:** Similar to the “Progress Since the Last Review” section on page 3-5, the text only includes the protectiveness statement from the last FYR. Although there were no issues/recommendations related to this AOC in the last FYR, this section should provide an update on progress toward achieving the protectiveness designation included later in the document. Please include the following information: “The previous FYR did not include any issues and recommendations related to AOC E. However, as stated in Section 4.3.3, implementation of Contingency Plan 2 has demonstrated a decline in benzene and 1,2-DCA to levels below the RGs. MTBE has also exhibited a decrease and will continue to be monitored.”

Navy Response: The requested text has been added as the second paragraph of Section 4.4.

10. **Page 4-5, Section 4.5.2, Data Review:** Please include more discussion related to the concentrations of the COCs observed in the monitoring wells evaluated and provide context for monitoring well locations. Is MW-05 a downgradient well? When were the sentinel wells last sampled and was the groundwater plume delineated?

Navy Response: The following revisions have been made in Section 4.5.2:

- Figure 4-2 has been revised to:
 - Include groundwater flow direction
 - Add MW06 (a water level monitoring well), which was inadvertently left off the figure
 - Distinguish between performance monitoring wells (MW01, MW04, and MW05, which are sampled for COCs) and water-level monitoring wells (MW02, MW03, MW06, MW07, and MW08, which are used to help interpret groundwater flow direction)
- Figure 4-3 has been revised to:
 - Include groundwater flow direction
 - Add MW06 (a water level monitoring well), which was inadvertently left off the figure
- The first paragraph in Section 4.5.2 has been revised to read: “Four annual monitoring events (2020 through 2023) were completed since the first FYR. In addition to evaluating the condition of LUCs, LTM included groundwater level monitoring and groundwater sampling at the wells shown in Figure 4-2. All eight monitoring wells were used for groundwater level monitoring and wells MW01, MW04, and MW05 were used for groundwater sampling. This approach was deemed appropriate by the Navy and regulatory agency because the area of contamination is confined to a very localized area and historical data have shown contamination has not migrated further downgradient, likely due to the relatively low permeability of the saturated zone. Results of AOC E annual monitoring are presented in the following documents:”
- The following has been added before the first bullet under “Evaluation of results of the four annual event activities found”:
 - “Figure 4-3 provides the concentrations of the three remaining COCs (benzene, 1,2-DCA, and MTBE) during the 2020 through 2023 annual sampling events as well as historical sampling events. These are the same data that have been shown and discussed in the various annual reports. Pertinent information regarding groundwater monitoring at AOC E are:
 - As conventionally interpreted, there is no groundwater “plume” at AOC E. The area of contamination is very small and localized, delimited by three monitoring wells spaced 20 feet or less apart. Historical sampling of wells located further downgradient of these three wells (i.e., MW02, MW07, and MW08), as well as those located upgradient (MW03) and sidegradient (MW06) historically showed no impact from site-related contamination over a decade or more of monitoring. These wells were either never included in LTM sampling (MW02 and MW06) or subsequently eliminated from LTM sampling (MW03, MW07, and MW08) with regulatory concurrence based on continued demonstration of no impact from site-related contamination.
 - 1,2-DCA (PRWQS-based RG = 3.8 µg/L)
 - 1,2-DCA was non-detect in the most down-gradient well currently included in the LTM sampling program (MW04) in the two informational events conducted in 2019 and 2020, the three subsequent events conducted in 2021 through 2023, and as far back as 2008.
 - Within the original source area (represented by wells MW01 [former tank location] and MW05 [former piping location]), 1,2-DCA has been mostly non-detect, with sporadic detections below the reporting limit and an order of magnitude below the RG since the contingency ISCO injection was performed in 2018.
 - Benzene (MCL and PRWQS-based RG = 5 µg/L)
 - Benzene has been non-detect in downgradient well MW04 in each sampling event performed since the 2018 ISCO injection.

- Similarly, benzene has been consistently below the MCL/PRWQS RG in the two source area wells, with no indication of increasing concentrations, since the 2018 ISCO injection.
- MTBE (risk-based RG = 120 µg/L)
 - Following the first applications of ISCO at the site in 2010, MTBE concentrations have been about an order of magnitude or more below the RG in downgradient well MW04 during each sampling event. The same is true of source area well MW01
 - Following the 2010 ISCO injection, MTBE concentrations declined in source area well MW05 by about 100 µg/L or more, but remained above the RG until the 2023 sampling event, when the concentration in the well was measured as 42 µg/L.”

11. **Page 4-6, Section 4.6.2, Question B:** The second paragraph of Question B states, “Current concentrations of COCs are significantly lower than when the RGs were established, suggesting the cumulative risk upon which the MTBE RG was established warrants reconsideration.” As explained in EPA’s response to the Recommended AOC E Groundwater Performance Monitoring Optimization Technical Memorandum, this method of developing and revising the RGs is inconsistent with the NCP and EPA procedures. EPA reiterated that the proposed modification to the MTBE remediation goal was unacceptable in comments on the AOC E Remedial Action Annual Status Report 2022. Please remove this discussion from Question B.

Navy Response: The referenced text has been removed as requested.

EPA Evaluation of Response: Please include the following in place of the removed text, “However, no changes to the RG will be made at this time.”

Navy Response to EPA Evaluation: The recommended text will be added.

12. **Page 4-7, Section 4.9, Protectiveness Statement:** The header for Section 4.9 currently reads “No other findings were identified. Protectiveness Statement”. Please modify the Section 4.9 header and move the statement that no other findings were identified to Section 4.8.

Navy Response: The formatting has been corrected as requested.

13. **Figure 4-2, AOC E Land Use Controls:** Groundwater flow direction should be indicated on this figure.

Navy Response: The groundwater flow direction has been added Figure 4-2.

14. **Figure 4-3, Pre-ROD and Post-ROD Sampling Results:** Groundwater flow direction should be indicated on this figure.

Navy Response: The groundwater flow direction has been added Figure 4-3.

15. **Page 5-3, Section 5.3.3, Status of Implementation, Physical Demarcation and Institutional Controls:** This section is titled “Physical Demarcation and Institutional Controls”, however, only demarcation measures and engineering controls are discussed. Please identify the institutional controls here.

Navy Response: The following has been added as the second paragraph in the referenced subsection: “Institutional controls that have been implemented and maintained are USFWS’ Comprehensive Conservation Plan that includes no public use or access to UXO 1 and access restriction and explosive safety educational messaging that is made available to the public through the Navy’s Vieques cleanup website,

social media postings, public outreach events (e.g., RAB meetings, public school student awareness training, etc.), and educational kiosks posted in various public-use areas within the Vieques National Wildlife Refuge.”

16. **Page 6-5, Section 6.7, Issues/Recommendations:** The second paragraph regarding monitoring frequency should be included under Other Findings, since it impacts O&M, rather than protectiveness.

Navy Response: The referenced paragraph has been moved under “Other Findings” and revised to read: “Based on the findings and observations”

17. **Page 7-3, Section 7.3.3, Status of Implementation:**

- As stated in EPA’s comments on the Draft SWMU 4 Interim Remedial Action Completion Report, EPA no longer uses IRACRs. Instead, Remedial Action completion should be declared when the remedy is in place and determined to be fully functional. The achievement of the cleanup goals should later be documented in the site closeout report. EPA requested the SWMU 4 IRACR be renamed a RACR. Please update the text to reflect this change.

Navy Response: Although the final document has not been issued, it is anticipated to be issued in August 2023. Therefore, consistent with the Navy’s response on the referenced EPA comment, the sentence in Section 7.3.3 has been revised to remove the word “Interim” and the reference in the Reference section has been updated to remove the word “Interim” and “Draft” and revise the issue date to “September.”

- Please discuss any trends in groundwater contaminant data or plume extent and projections of a cleanup timeframe in this section.

Navy Response: To be consistent with the other two sites where post-ROD groundwater monitoring is conducted (i.e., SWMU 1 [Section 3] and AOC E [Section 4]), contaminant data evaluation is presented in Section 7.5.2. Please see the response to Comment #18 below. Accordingly, the last sentence of Section 7.3.3 has been revised to read: “Groundwater monitoring was initiated in July and December 2022; the results are discussed in Section 7.5.2.”

18. **Page 7-3, Section 7.5.2, Data Review:** Please provide more detail on the groundwater monitoring program and include available groundwater sampling data from the Draft SWMU 4 2022 Annual Monitoring Report.

Navy Response: Figure 7-4 has been created that shows the perchlorate data collected during the initial LTM events (July and December 2022) as well as historical perchlorate data. In addition, the existing text in Section 7.5.2 has been replaced with the following:

“Groundwater monitoring as part of the SWMU 4 remedial action began with two rounds of data collected in July and December 2022. The event included sampling of monitoring wells the Navy and regulatory agency concurred provide the appropriate coverage within and downgradient of the OB/OD pits, which coincides with where perchlorate was historically detected in groundwater above 14 µg/L (used to establish the RG) as well as downgradient of these locations, as shown in Figure 7-4. The results are presented in the following document:

- Solid Waste Management Unit 4 Annual Status Report, 2022 Groundwater Monitoring, Atlantic Fleet Weapons Training Area-Vieques, Former Naval Ammunition Support Detachment, Vieques, Puerto Rico (CH2M, 2023d)

Evaluation of the results of the two initial LTM events found:

- During the July 2022 sampling event, both wells in each of monitoring well pairs MW08/MW09 and MW07/MW20 were sampled to determine if there was vertical variability in perchlorate concentrations at these locations and, ultimately, to select the well from each pair that would continue to be sampled as part of LTM. As shown in Figure 7-4, the perchlorate concentrations in both sets of well pairs were low-to-non-detect. Based on that, the wells in which perchlorate was detected (i.e., MW19 and MW07) were retained in the LTM program.
- Evaluation of the initial LTM results considers natural attenuation, but also includes historical perchlorate concentrations, as shown in Figure 7-4, as well as other potential influences, to aid in understanding long-term trends. The concentrations of perchlorate observed in July 2022 are comparable to those observed during historical sampling, with exceedances of the perchlorate RG in the same wells (MW02, MW09, and MW18) where concentrations above 14 µg/L were historically observed. The perchlorate concentrations in these three wells shows a significant decline between the July 2022 and December 2022 sampling events. Based on evaluation of the data, the potential reasons for the significant decline in perchlorate concentrations between January 2022 and December 2022 are:
 - Natural decline or attenuation of perchlorate concentrations
 - Seasonal variation
 - A unique series of sequential precipitation-producing weather events just prior to December 2022 sampling event
- Evaluation of potential reasons for the substantial decline in perchlorate concentrations between July and December 2022 is significantly aided by the availability of historical perchlorate data over a period of many years. As shown in Figure 7-4, the perchlorate concentrations in wells MW02, MW09, and MW18 have been relatively consistent for over a decade and the concentrations detected during this time do not appear to be significantly influenced by Vieques' two seasons (i.e., "dry" and "wet") because multiple samples have been collected in both seasons and the data are relatively consistent. Therefore, neither natural attenuation nor seasonal influence alone are likely the reason for the significant decline. Another potential reason for the significant decline may be the unique weather circumstances that occurred in the 2 months prior to the December 2022 sampling event. Hurricane Fiona in late September and several significant rain-producing storms in October and November 2022 brought approximately 35 inches of rain in the 2 months prior to the December groundwater sampling event. Confirmation of the likely reason for the perchlorate concentration decline will be confirmed through evaluation of additional rounds of LTM groundwater data."

**Navy Responses to EPA Evaluation of Navy Response to Comments on
Draft Second Five-Year Review Report,
Atlantic Fleet Weapons Training Area – Vieques, Vieques, Puerto Rico, May 2023**

ADDITIONAL COMMENTS

1. **Page 3-7, Section 3.7, Issues/Recommendations:** Please revise the last sentence of the second bullet as follows: “Where signs are currently located on the fencing, sign posts will be installed and the existing signs affixed to the posts.”

Navy Response: This text was moved to the second bullet under Section 3.8 as requested on EPA original comment #5. The text, now in Section 3.8, has been revised as requested.

2. **Page 3-7, Section 3.8, Other Findings:** Please change indicting to indicating in the second sentence of this section.

Navy Response: Text has been revised as requested.

**PRDNER Review of Draft Second Five-Year Review Report,
Atlantic Fleet Weapons Training Area – Vieques, Vieques, Puerto Rico, May 2023**

From: [Hannah, Bill](#)
Subject: FW: Draft Second Five-Year Review Report
Date: Friday, September 8, 2023 11:46:00 AM

From: Juan J Baba Peebles <juanbaba@drna.pr.gov>
Sent: Friday, September 8, 2023 11:36 AM
To: Hannah, Bill <Bill.Hannah@jacobs.com>; Mollin, Jessica <mollin.jessica@epa.gov>; Treinen, Karyn <Treinen.Karyn@epa.gov>; Padron, Silmarie <silmarie_padron@fws.gov>
Subject: [EXTERNAL] RE: Draft Second Five-Year Review Report

Hi Bill:

After the review of the above-mentioned document and the conducted site visit to the investigated areas, DNER concurs that the sites are protective for human health and the environment according to the remedial action objectives (RAOs). All Institutional Controls are continuing to be effective and in place. Therefore, no additional recommendations will be necessary at this time pending to the completion of others remedial determinations. If you have any concerns or questions, please contact me.

V/r,

Juan J. Babá-Peebles

Federal Facilities Coordinator
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**Navy Responses to USFWS Comments on the Draft Second Five-Year Report
Atlantic Fleet Weapons Training Area – Vieques, Vieques, Puerto Rico, May 2023**

The U.S. Fish and Wildlife Service (USFWS) has reviewed this document and participated in the second five-year site visits at the Vieques National Wildlife Refuge and offers the following comments and reminder for upcoming actions that pertain to UXO 1:

The report stated the following, "Vegetation Restoration Although not necessary to satisfy the RAOs, completed vegetation restoration on Playa Blanca conducted in August 2018 with no MEC identified. As detailed in the UXO 1 Remedial Action Completion Report and associated memo to file (CH2M, 2019b) (Table 5-1); the upland dry forest vegetation restoration is also independent of RAOs and therefore not applicable to assessing remedy protectiveness."

For FY 2024, we still have two agreed upon vegetation restoration projects, pending. The first is for the USFWS to provide the final recommendations to finalize an action plan for the Blanca Beach, sea grape (*Coccoloba uvifera*) restoration. The second, we agree that the act of restoring dry forest vegetation is not primarily related to assessing remedy protectiveness. None the less, as it has been documented for other sites, the presence of vegetation onto a site does aid in keeping people off the site; thus, it facilitates remedy protectiveness. For this action there is still to complete the proposed UXO 1 upland dry forest of the former ECA (Eastern Conservation Area), where previous agreement was to transfer of \$100,000.00 from the Navy to USFWS. With this funding the USFWS will review natural succession that may have taken place and can identify areas to restoration within the site.

Navy Response: With respect to the sea grape restoration, please note the Navy met its obligation in 2018 with the planting of 200 sea grapes under oversight by Mitsuka Bermudez (USFWS), who directed and approved placement locations for each plant. Documentation of the completed sea grape planting was signed by Mike Barandiaran (USFWS) on August 3, 2018. Additionally, the Remedial Action Completion Report (RACR) for UXO 1, which includes a summary of the Playa Blanca vegetation restoration, states: "In accordance with the [Remedial Action Work Plan], any monitoring of the newly planted sea grapes, invasive species control, and/or replacement of dead sea grapes will be the responsibility of USFWS." The RACR was signed by all stakeholder agencies, including USFWS, represented by Susan Silander who signed the RACR on August 20, 2019.

With respect to the upland dry forest vegetation, USFWS made a similar comment on the 2021 UXO 1 Annual Status Report (CH2M, February 2022). The response provided at that time (shown below and in Appendix C of the 2021 Annual Report) remains applicable.

"As agreed upon in the MOA meetings, the Navy was awaiting 1) USFWS' construction of the greenhouse after Hurricane Maria and notification that you are ready to proceed with the propagation of plants, and 2) USFWS' re-evaluation of the upland dry forest area to evaluate how much restoration is needed, since it has been years since the removal action and that there has been regrowth in the area. The Navy has evaluated and collected photographs from 2013 to 2022 that show significant natural regrowth within the ECA upland area. Please note that USFWS did not provide the results of the regrowth evaluation to the Navy; therefore, it is unclear how the original plan remains valid. Upon receiving the results of the USFWS regrowth evaluation, the Navy will support USFWS and provide funding for the restoration."