

# Proposed Remedial Action Plan

UXO 17 Potential Area of Concern EE  
Atlantic Fleet Weapons Training Area - Vieques  
Former Vieques Naval Training Range  
Vieques, Puerto Rico  
May 2022

## 1. Introduction

This Proposed Plan identifies the preferred alternative and associated rationale for Potential Area of Concern (PAOC) EE, which is part of UXO 17 located at the former Vieques Naval Training Range (VNTR) in Vieques, Puerto Rico. UXO 17 is also known as Operable Unit (OU) 27 in the Superfund Enterprise Management System (SEMS), which is a database maintained by the United States Environmental Protection Agency (EPA) to track the progress at hazardous waste sites. PAOC EE, comprising approximately 128 acres, is located in the south-central portion of the former Eastern Maneuver Area (EMA), which was established in 1947 to provide areas and ranges for the training of Marine amphibious units and battalion landing teams in exercises that included amphibious landings, small-arms fire, artillery and tank fire, shore fire control, and combat engineering tasks. PAOC EE is a location where military training activities associated with beach landings occurred.

The Proposed Plan summarizes this OU's history, the results of previous environmental investigations and removal actions, and the preferred alternative to address the conditions at PAOC EE, and it solicits and facilitates public review of and comment on the preferred alternative as well as the other alternatives presented.

### Mark Your Calendar for the Public Comment Period

May 25 through June 24, 2022

#### Submit Written Comments



The Navy and EPA will accept written comments on the Proposed Plan during the public comment period. To submit comments or obtain further information, please refer to the insert page.

### Attend the Public Meeting

June 1, 2022, at 5:00 p.m.



Access this link to join the meeting via MS Teams Platform MS Teams

<https://tinyurl.com/VQS-RAB-65>

Join by phone by dialing: 1-787-650-6946

Meeting ID: 648 097 628#

The Navy will hold a public meeting to present and discuss the preferred remedial alternative as well as the other alternatives considered. Verbal and written comments will also be accepted at this meeting.

### Location of Administrative Record File

Online at: <https://go.usa.gov/xRHxY>

This document is issued by the Department of the Navy (Navy), Naval Facilities Engineering Systems Command (NAVFAC) Atlantic, EPA Region 2, and the

Department of the Interior (DOI), in consultation with the Puerto Rico Department of Natural and Environmental Resources (PRDNER). The Proposed Plan fulfills the public participation requirements in Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Section 300.430(f)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

Beginning in 2002, a number of investigations were conducted at PAOC EE to determine the nature and extent of munitions and explosives of concern (MEC) and contaminants that may have been released to the environment because of historical military training activities. Based on historical site use information and because the area includes a public beach, several munitions investigations and removals, including a time-critical removal action (TCRA), were implemented to evaluate and reduce potential explosive hazards in public use areas. As a result of these activities, munitions were removed from across the 128-acre PAOC EE area, including the beach and associated public use areas as well as adjacent areas.

Based on the munitions removal activities already performed, current and future anticipated land use as a recreational area within a wildlife refuge, and the results of the Remedial Investigation (RI), the preferred alternative for PAOC EE, is Land Use Controls (LUCs) and Subsurface Anomaly Removal in Planned Public Use Areas to address MEC that potentially remains onsite.

The Navy and EPA, in consultation with DOI and PRDNER, will make the final decision on the preferred alternative for PAOC EE after reviewing and considering all information submitted during the 30-day public comment period. If warranted, based on public comments and/or new information, the preferred alternative set forth in this document may be

modified or another alternative described in the Proposed Plan may be considered.

This Proposed Plan summarizes information that can be found in greater detail in the RI/Feasibility Study (FS) Report (CH2M, 2019) and other documents associated with the various investigations and TCRA (see Section 2.3), which are contained in the Administrative Record for PAOC EE. A glossary of key terms used in this document is presented in Section 10. These key terms are identified in bold print the first time they appear.

## 2. Site Background

### 2.1 Facility Description and History

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

The Navy purchased portions of Vieques in the early 1940s to conduct activities related to military training. Operations within the former Naval Ammunition Support Detachment (NASD), the western one-third of Vieques, consisted mainly of ammunition loading and storage, vehicle and facility maintenance, and some training. Operations within the former VNTR, the eastern one-half of Vieques, comprised various aspects of naval gunfire training, including air-to-ground ordnance delivery and amphibious landings, as well as housing the main base of operations for these activities at Camp García. In accordance with the January 30, 2000, Presidential Directive to the Secretary of Defense, the Navy ceased training exercises at the former VNTR on April 30, 2003, at which time the land was transferred to the DOI to be managed by the United States Fish and Wildlife Service (USFWS) as a National Wildlife Refuge. The former VNTR is approximately 14,600 acres and

comprises the EMA, Surface Impact Area (SIA), Live Impact Area (LIA), and Eastern Conservation Area (ECA) (Figure 2).

On February 11, 2005, the Atlantic Fleet Weapons Training Area – Vieques (also known as AFWTA-Vieques), comprising the former NASD and former VNTR, was added to the National Priorities List (NPL), which required all subsequent environmental

restoration activities to be conducted under CERCLA. On September 7, 2007, the Navy, DOI, EPA, and the Commonwealth of Puerto Rico finalized a Federal Facility Agreement (FFA) that established the procedural framework and general schedule for implementing the CERCLA activities for Vieques. The Navy retains the primary responsibility under the FFA for conducting the environmental investigations and cleanup of the property, as warranted.

Figure 1 – Regional Location Map

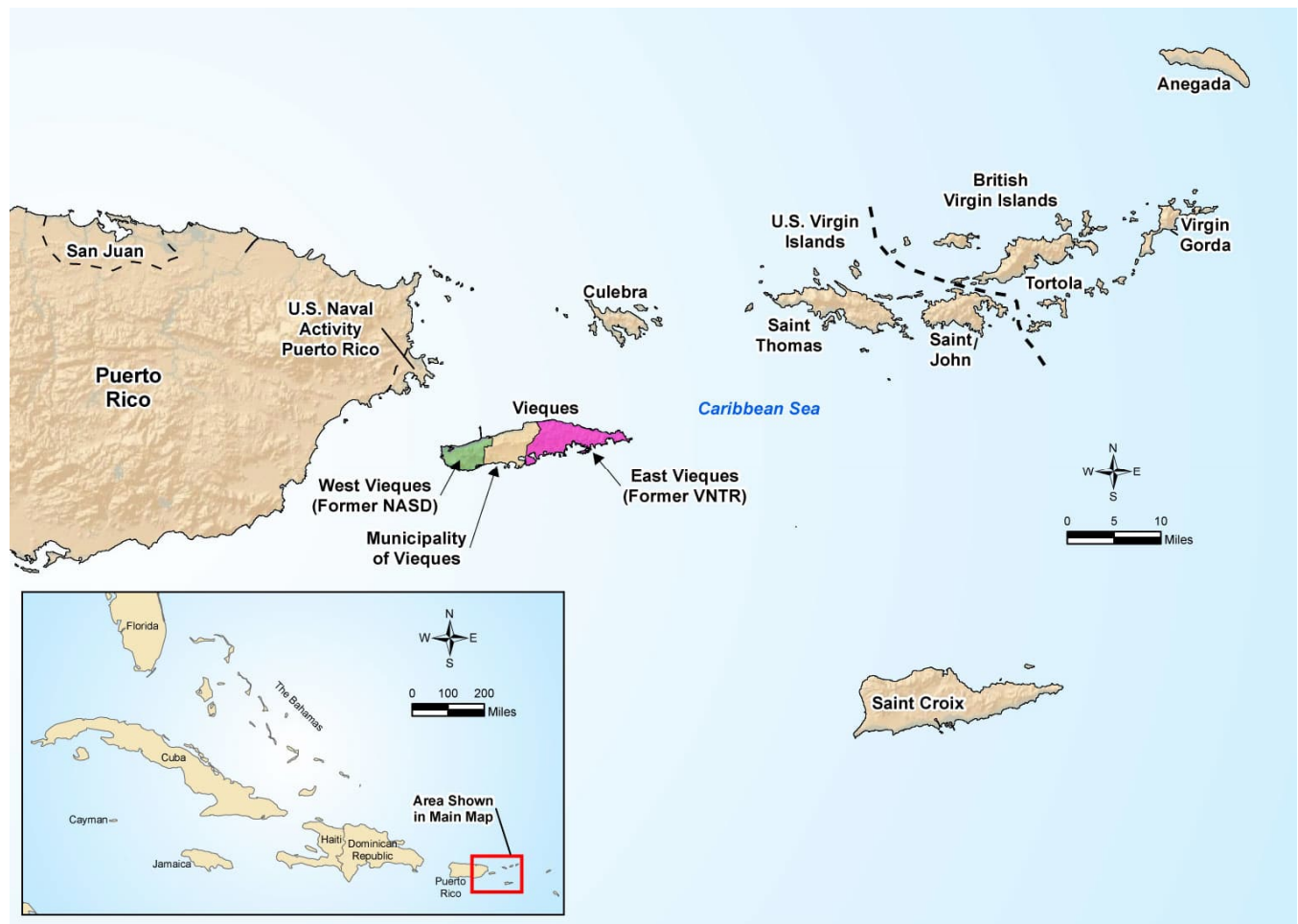
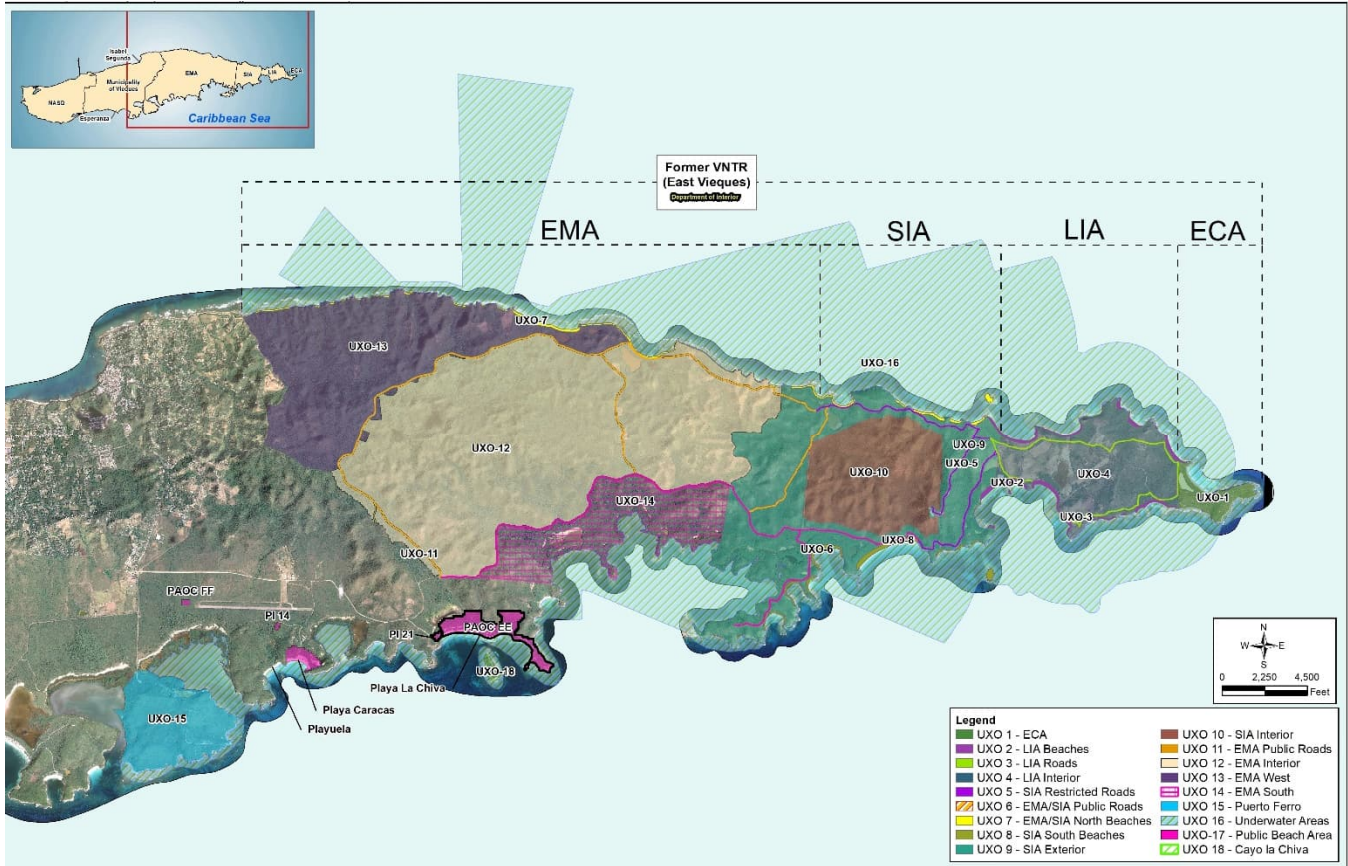


Figure 2 –PAOC EE Location Map



## 2.2 Site Description

UXO 17 is located in the south-central area of the EMA (Figure 2). There are two Photo-Identified (PI) sites (PI 14 and PI 21) and two PAOC sites (PAOC EE and PAOC FF) that are part of UXO 17. Two of these sites (PI 14 and PAOC FF) were investigated during the Environmental Baseline Study (EBS) and the Expanded Range Assessment/Site Inspection (ERA/SI). Based on the historical information, these sites were determined not to be historical munitions-use sites, required no action, and were closed out of the CERCLA process by a No Action Decision Document (CH2M, 2010). An additional site, PI 21, was investigated via an SI in 2013, determined not to be a historical munitions-use site, required no action, and was closed out of the CERCLA process by a No Action Decision Document (CH2M, 2014).

PAOC EE is the area where military training activities associated with beach landings at Playa La Chiva (known during military training as “Blue Beach”) occurred and includes the area where surface/subsurface material potentially presenting an explosive hazard (MPPEH) was found. No known historical live-fire activities occurred at the site, but the area was used for amphibious landings and other ship-to-shore activities. PAOC EE’s 128-acre boundary is shown in Figure 2.

Two other beach areas, Playa Caracas (also known as “Red Beach”) and Playuela (also known as “Garcia Beach”), were identified as potential UXO 17 sites due to their proximity to Playa La Chiva and potentially similar historical military use. However, following investigation of both beaches, it was determined only Playa Caracas was a candidate for inclusion as a site within UXO 17, but is not part of PAOC EE and

therefore will be addressed separately. The location of Playa Caracas is shown in Figure 2.

### *2.3 Summary of Previous Investigations*

Several environmental investigations and munitions removal activities, including a TCRA, were conducted at or including PAOC EE beginning in 2002. The following subsections summarize the purpose, scope, and results of environmental investigations and the munitions removal activities completed to date. The dates provided in the subsection headings refer to the dates the investigation/removal action fieldwork was performed. The findings of munitions investigations and removal are shown in Figure 3. Sample collection at PAOC EE occurred in 2017.

#### *MEC Investigation at Playa La Chiva (2002-2003)*

An Archive Records Search (ARS) was completed in conjunction with the Draft VNTR Preliminary Range Assessment (PRA) Report (NAVFAC, 2003) and showed that Playa La Chiva (Blue Beach) was formerly utilized for military training activities. Information from the ARS also indicated that only blank ammunition was used on this beach during training exercises (Tippetts et al., 1980). Although records indicate that no live-fire was performed, an MEC investigation was completed as a precautionary measure to ensure that Playa La Chiva and associated areas could continue to be accessed by the public. The sandy portion of the beach (area between the vegetation and water line) and beach access trails were investigated in December 2002 to confirm records that indicated no live fire was performed; no MEC was identified.

An additional munitions investigation of Playa La Chiva was conducted in association with the 2003 land transfer to inspect the sandy portion of the beach for MEC/MPPEH. The inspection consisted of performing a surface clearance for MEC and investigating subsurface anomalies that were identified through digital geophysical mapping (DGM). The DGM identified 330 anomaly locations. Of these, 244

anomalies (74 percent) were excavated to determine their source to ensure conclusions drawn for Playa La Chiva as a whole, including anomalies remaining in the subsurface, would be based on a statistically robust dataset. No MEC/MPPEH was identified on the ground surface or during the subsurface anomaly inspection, which provided a high level of confidence the anomalies remaining in the subsurface were not MEC/MPPEH. Three fired small arms casings were identified and recovered within the subsurface.

#### *Expanded Range Assessment/Site Inspection (2005 - 2009)*

During the ERA/SI, investigations at PAOC EE consisted of inspection of the ground surface on portions of Punta Conejo using an instrument-aided (handheld magnetometer) transect survey approach that included subsequent removal of the geophysical anomalies (CH2M, 2010). Fibrous matting, metallic debris, and small arms blank ammunition were identified on the eastern portion of Punta Conejo but there was no evidence that munitions had been stored in earthen berms discovered at the site and no MEC was observed on the ground surface. Further, none of the subsurface anomalies removed were MEC. Following removal activities, PAOC EE was recommended to be further investigated for the potential presence of MEC.

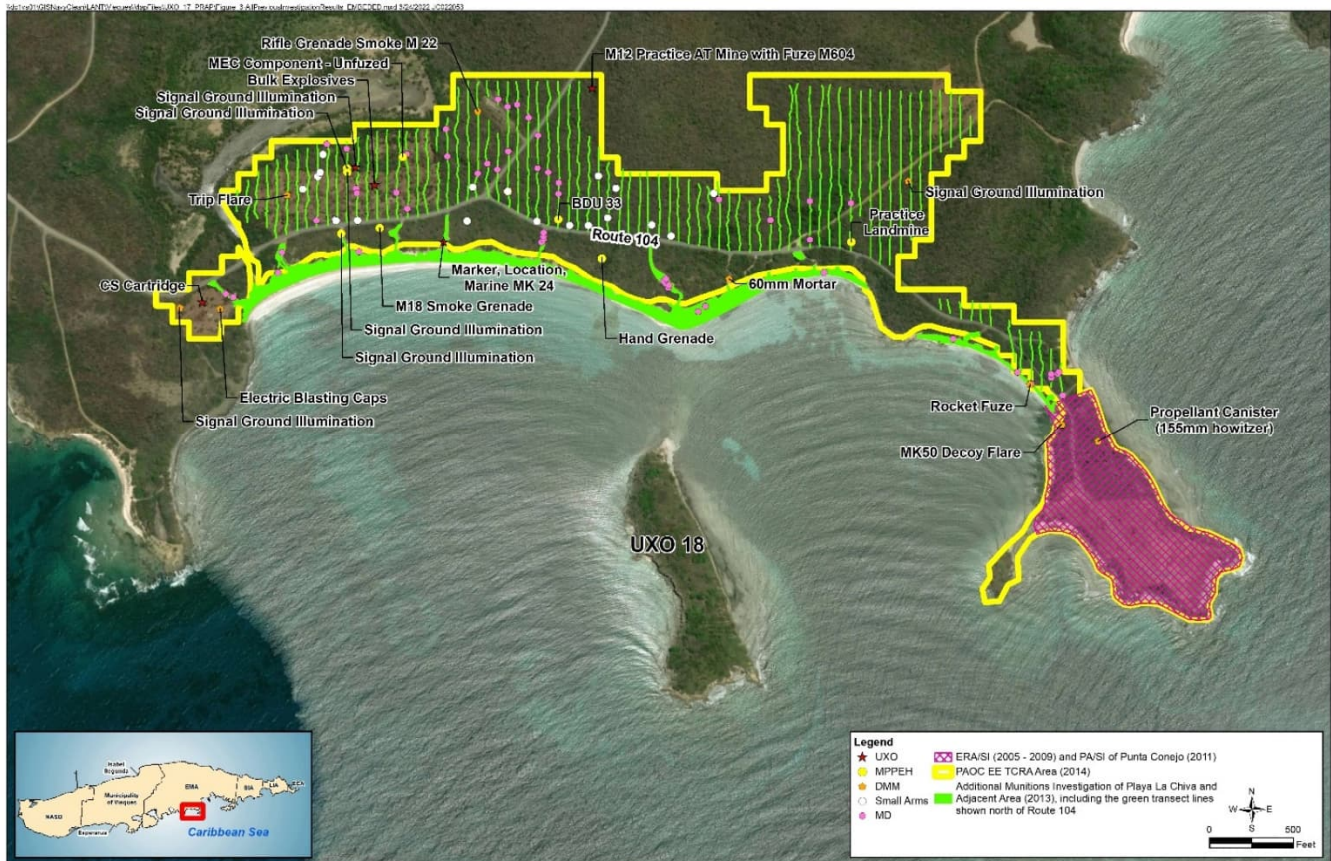
#### *Preliminary Assessment/Site Inspection of Punta Conejo (2011)*

In 2011, a Preliminary Assessment/Site Inspection (PA/SI) was conducted at Punta Conejo to further evaluate the potential presence of MEC/MPPEH within this peninsula based on the results and recommendations of the ERA/SI, as summarized above (NAVFAC, 2003). The inspection consisted of conducting a DGM survey across all 18 acres and excavating a number of anomalies to assess if MEC/MPPEH were present. The DGM identified 2,542 anomalies, of which 458 (18 percent) were excavated to determine their source. Two of the subsurface anomaly sources were classified as discarded military

munitions (DMM), consisting of an MK-50 decoy flare and an M203 propellant for a 155-millimeter (mm) howitzer (Figure 3). The remaining excavated anomalies consisted of small arms ammunition (SAA); range-related debris (RRD), such as targets, wire, and

matting; and non-munitions related debris, which is debris unrelated to military training activities, such as horseshoes, drink cans, and household trash. No additional MEC/MPPEH was identified.

Figure 3 – Items Identified during TCRA and Previous Investigations



### Additional Munitions Investigation of Playa La Chiva and Adjacent Area (2013)

In June 2013, a follow-up investigation of Playa La Chiva and adjacent area was conducted due to the results of the historical investigations and the findings at nearby UXO 18 (Cayo La Chiva), where five unexploded ordnance (UXO) items (MK-63 5-inch rockets) were identified; UXO 18 is a separate site and was addressed via its own Record of Decision (ROD) and remedial action.

The additional munitions investigation consisted of performing DGM on the sandy portion of the beach, the public parking areas and pathways, and transects

within the vegetated area north of Route 104, with subsequent excavation of all identified subsurface anomalies to a maximum depth of 2 feet north of Route 104 and a maximum depth of 4 feet south of Route 104, including the beach proper, associated parking areas, and the trails between them. Although no MEC/MPPEH were identified on the ground surface, the following MEC/MPPEH were identified upon excavation of the 864 subsurface anomalies identified:

#### MEC

- Bulk explosives (likely 1-lb HE filler from projectile/mortar) were identified in the area north of Route 104

#### *MPPEH*

- One signal, ground, illumination (commonly referred to as slap flare) was identified in a parking area
- Seven items (bulk explosives, flares, SAA, Bomb Dummy Unit (BDU) 33, and an M12 practice anti-tank mine (no explosive components installed) were identified in the area north of Route 104

#### *DMM*

- One rocket fuze (described as an MEC component) was identified at the eastern end of Playa La Chiva adjacent to Punta Conejo
- Two DMM (rifle grenade [smoke M22] and a trip flare) were found in the area north of Route 104

In addition to the MEC/MPPEH, approximately 1,000 SAA were found in one location in the area north of Route 104 and approximately 450 pieces of MD were identified in the investigation area. All of the MEC, MPPEH, DMM, SAA, and 93 percent of the MD were found within the first foot below ground surface (bgs). The locations of the munitions-related items found are presented in Figure 3.

#### [PAOC EE Time-Critical Removal Action \(2014\)](#)

Based on the findings of the investigations discussed previously, a TCRA was conducted in 2014 (CH2M, 2015) to reduce the explosive hazard due to the potential presence of surface and/or shallow subsurface MEC/MPPEH within the TCRA area (Figure 3), which is the area of planned public use (area south of Route 104) and immediately adjacent areas. For the purposes of the TCRA, "shallow" was defined as the top 1 foot because 98 percent of the total items found during the three investigations prior to the TCRA in and around Playa La Chiva were in the top 1 foot even though those investigations evaluated to deeper depths. In fact, only one DMM item was found deeper than 1 foot during the three previous investigations. In addition, the site history indicates the area was used for military maneuvers and there are no

records of munitions burial or munitions being fired at the site.

Surface and subsurface MEC clearance was conducted from May through October 2014 using a "mag-and-dig" approach throughout the entire PAOC EE area. The area was divided into grids to allow for complete inspection by the UXO technicians using magnetometers to locate potential MEC/MPPEH. The TCRA identified and removed over 100,000 metallic items from approximately 10,000 anomaly locations throughout the TCRA area. Of these items:

- 17 were classified as DMM
- 7 were classified as UXO
- 5 were classified as MPPEH

The remaining items were inert metal pieces or did not otherwise present a significant explosive hazard, including 3,596 SAA that were identified and removed from the site. Although unfired SAA do pose a very small explosive hazard, that hazard is not the same kind or as great as other military munitions or MEC for the following reasons:

- The small amount of propellant within unfired SAA does not detonate, it deflagrates using the resulting gases to propel the projectile.
- The consequences of an SAA initiating outside a weapon are localized. The propellant may rupture the cartridge case or eject the projectile in this scenario with the potential for likely minor injury and limited to a few feet.
- The likelihood of SAA firing or discharging outside of a weapon is very small. The most likely cause would be that the SAA is placed or thrown into a fire. In this scenario, the SAA does not explode, rather the propellant heats up building gases that either expels the projectile or ruptures the case. A projectile being expelled in this manner would not travel far because, without the confines of a barrel channeling the propellant, the gas created by the

propellant would dissipate quickly and there is no pressure building behind the bullet.

Figure 3 shows the distribution of the items with an explosive hazard and SAA identified and removed during the TCRA.

Approximately 3,500 locations (approximately 26 percent of total anomaly locations) were investigated to a depth of 1-foot bgs without identifying the source of the anomaly, suggesting that the anomaly source is at a depth greater than the maximum excavation depth of 1-foot bgs, or the item was identified within the top foot but extended deeper (e.g., wire and other non-munitions-related debris). It is important to note that of the 100,000 metallic items that were removed from 10,000 anomaly locations, only 29 were classified as MEC. In addition, as noted previously, 98 percent of the total items found during the three investigations in and around Playa La Chiva were in the top 1 foot and only one DMM was found deeper than 1 foot. Further, the site history indicates the area was used for military maneuvers using predominantly inert munitions and SAA and there are no records of munitions burial or munitions being fired at the site. Therefore, the number of anomalies below 1 foot likely to be MEC is very low. Detailed results for the TCRA are documented in the *UXO 17 Potential Area of Concern EE Time-Critical Removal Action After Action Report* (CH2M, 2015).

#### [PAOC EE Remedial Investigation/Feasibility Study \(2017\)](#)

An RI/FS (CH2M, 2019) was conducted at PAOC EE to assess the nature and extent of contamination, to assess potential risks to human health and the environment, and to evaluate remedial alternatives for the sites. The RI was implemented in two separate, but related components – one focusing on MEC and one focusing on chemical contaminants in soil.

Based on historical military training information and the MEC characterization component of the RI, it was concluded that relatively few MEC are potentially

present at PAOC EE, especially considering the significant amount of munitions removal conducted during the TCRA and previous investigations. This information was used to evaluate potential remedial alternatives to address potential MEC explosive hazards remaining at the site considering the planned future land use.

The environmental characterization component of the RI characterized the horizontal and vertical extent of contamination in the soil through the collection and analysis of 31 discrete surface soil samples, 8 discrete deeper surface soil samples, and 27 subsurface soil samples for munitions constituents. These data were evaluated in a human health risk assessment (HHRA) and ecological risk assessment (ERA) completed during the RI. The HHRA and ERA identified no unacceptable risks to human health or the environment due to past munitions-related activities at PAOC EE. Therefore, no remedial action is necessary to be protective of potential human and ecological receptors (current or future) with respect to chemical contaminants in environmental media.

Based on this information, an FS was conducted to evaluate potential remedial alternatives to address MEC potentially remaining at PAOC EE in accordance with EPA guidance. Four MEC remedial alternatives were developed and screened against feasibility evaluation criteria, as defined in the NCP, and discussed in further detail later in this Proposed Plan.

#### [UXO 17 Public Use Beaches Time-Critical Removal Action \(2021\)](#)

In 2020, work planning for a TCRA at UXO 17 public use beaches (i.e., Playa La Chiva, Playa Caracas, Playuela) was conducted. The need for a TCRA was the finding of an 81-mm mortar at Playa Caracas during an MEC Verification Evaluation conducted there in 2019. In 2021, the TCRA at Playa Caracas and immediately adjacent Playuela was conducted, during which no additional MEC was found at either site. Following evaluation of the Playa Caracas and



Playuela TCRA and historical information, the Navy and regulatory agencies concurred proceeding to a remedial action at Playa La Chiva rather than a TCRA is a more appropriate path forward based on the following:

- Playa La Chiva was included in the planned 2021 TCRA solely because of the expected similarity in historical military uses between Playa La Chiva and Playa Caracas. Because only one MEC item was found at Playa Caracas and no MEC was found at Playuela, there was no new information resulting from their TCRA that altered the understanding of the nature and extent of MEC at PAOC EE. Therefore, the various remedial alternatives considered in the PAOC EE FS remained valid.
- All areas included in the planned 2021 TCRA have already undergone MEC investigation and removal or are included in the recommended remedial action in this Proposed Plan. Specifically:
  - The sandy beach area and associated trails/parking area of Playa La Chiva underwent munitions investigations and associated removals in 2002, 2003, and 2013, the latter of which included a DGM survey across the entire beach/trail/parking area (the same area included in the planned 2021 TCRA) and excavation of subsurface anomalies to a maximum depth of 4 feet.
  - The unimproved road in the northeast portion of PAOC EE that was included in the planned 2021 TCRA underwent MEC removal to a maximum depth of 1 foot as part of the 2014 TCRA.
  - The unimproved roads within Punta Conejo underwent MEC investigations and associated removal in 2009 (see Expanded Range Assessment/Site Inspection [2005-2009] for findings) and 2011 (see Preliminary

Assessment/Site Inspection of Punta Conejo [2011] for findings), were part of remedial alternatives evaluated in the 2017 FS, and are included in the recommended remedial action in this Proposed Plan.

- The short unimproved road just west of the western PAOC EE boundary is included in the recommended remedial action in this Proposed Plan
- Accelerates remedy in place and avoids potential closing of the beach area twice (once for the TCRA and once for the remedial action implementation).

### 3. Site Characteristics

#### 3.1 Physical Characteristics

The ground elevation at PAOC EE ranges from over 30 feet mean sea level (msl) along the northern edge of the site to just above sea level near the coast. Laguna La Chiva is an approximately 10-acre estuarine lagoon, located immediately northwest of PAOC EE with a hydrologic connection to the Caribbean Sea that bisects the far western end of PAOC EE. Under normal conditions, the hydrologic connection to the Caribbean Sea at the southern end of the lagoon is blocked by a large accumulation of sand at Playa La Chiva, and this appears to be a well-established barrier to the sea that is infrequently breached by strong storm events. The interior of the lagoon contains extensive shallow water and large exposed mud flats and salt flats with sparse mangrove vegetation. Only one small ephemeral stream occurs within PAOC EE that drains to the ocean. Surface water within the ephemeral stream flows only for a short period of time after precipitation events. Elsewhere at the site, surface water from precipitation that does not infiltrate into the soil would follow the gently sloping topography to the south toward the ocean.

PAOC EE contains multiple environmental settings, including primarily thick thorn scrub over much of the site, a mangrove fringe to the northwest along Laguna La Chiva, and beach with some rocky outcrops along the southern boundary. The predominant vegetative community consists of forested areas of mixed invasive and native species.

Generalized groundwater flow across PAOC EE is anticipated to be consistent with what would be anticipated in that region, where groundwater flow would be predominantly through unconsolidated deposits southward toward the ocean. Due to the site's proximity to the ocean, groundwater at PAOC EE is likely shallow and brackish to saline from sea water intrusion.

### *3.2 Nature and Extent of Contamination*

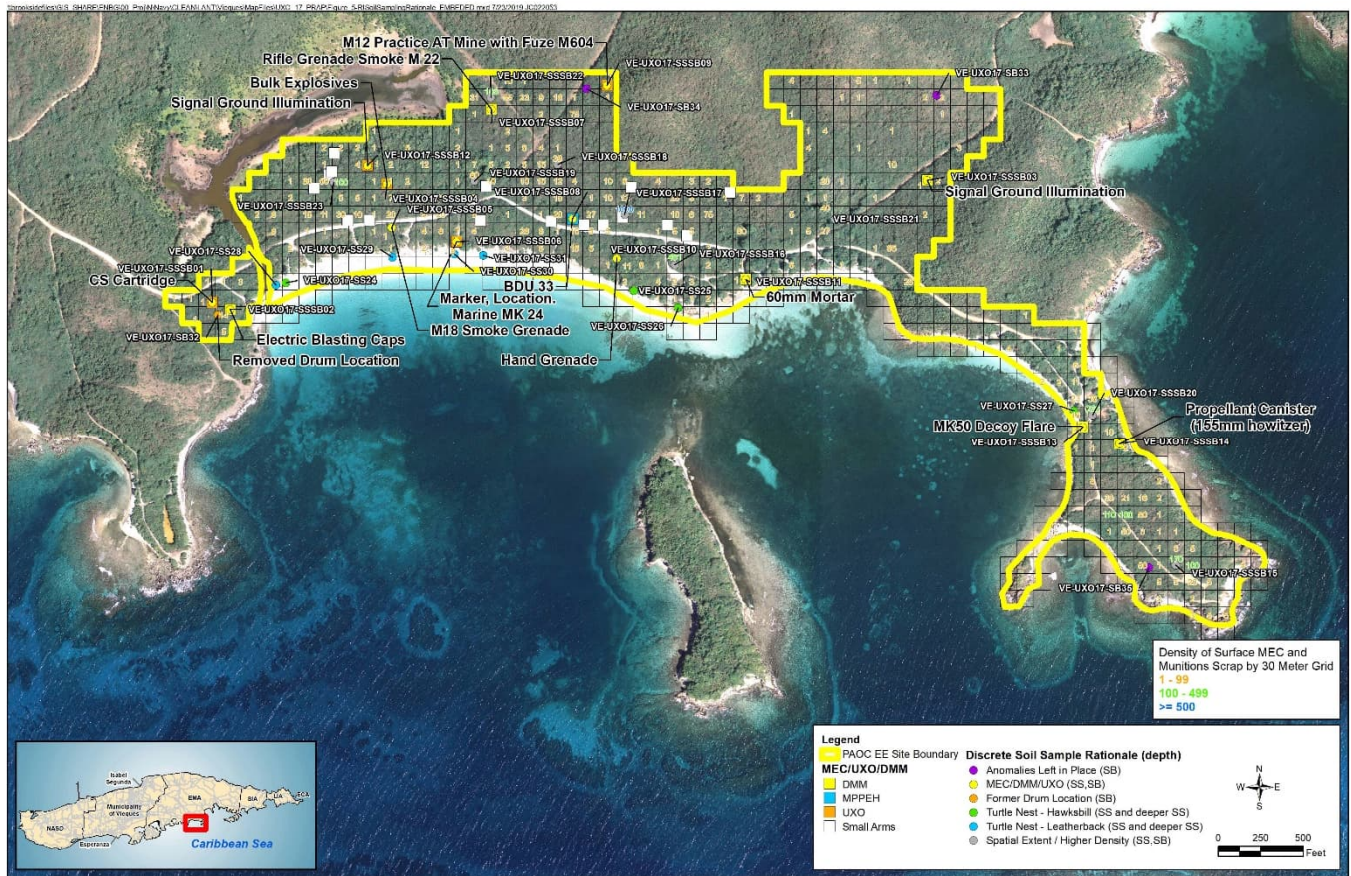
The MEC findings at PAOC EE support the historical information that suggests predominantly inert munitions and SAA were used during training exercises in this area. There is no record of munitions burial or explosive munitions being fired at the site. Relatively few MEC were found across the site (less than about 0.03 percent of items recovered) and 98 percent of the total items found during historical investigations and removals in and around Playa La Chiva were in the top 1 foot. Only one DMM was found deeper than 1 foot. It is important to note that of the 100,000 metallic items that were removed from 10,000 anomaly locations, only 29 were classified as MEC; therefore, the number of anomalies below 1 foot likely to be MEC is very low. All MEC discovered during historical investigations and the TCRA were removed and destroyed through controlled detonation.

The RI included the collection of 66 soil samples from 35 soil sample locations in 2017 (Figure 4). Soil

samples were analyzed for explosives and metals, and a subset of samples were also analyzed for polycyclic aromatic hydrocarbons (PAHs). To ensure appropriate characterization of the site, soil sampling activities focused on: (1) areas with the highest potential for contamination (i.e., locations with highest densities of MD, locations where munitions and explosives of concern [MEC/UXO/DMM] were identified, and a former drum location), (2) highest potential exposure areas (i.e., beach areas used by recreators and by sea turtles as nesting habitat), and (3) representative areas where subsurface anomalies were left in place during the TCRA.

Explosives were not detected in the majority of soil samples. In fact, only one explosive (nitroglycerin) was detected in soil, but its concentration was below risk-based criteria. Metals detections were evaluated following a process agreed to by all agencies, which is based on a scientific assessment of the concentration of each metal to determine whether it is associated with a munitions constituent, such as its location relative to other detections, whether it is a natural constituent of the soils, and whether it is present at levels consistent with background. The metals detected in samples collected at PAOC EE, including those contributing to unacceptable risk calculations, were determined to be unassociated with the munitions types found at the site (e.g., arsenic), present in trace amount in munitions (e.g., cadmium, selenium), or spatially isolated and insignificant with respect to potential exposure (e.g., copper). Further, the vast majority of metals concentrations detected were within the range of concentrations in the background dataset. The risk-based conclusions reached based on evaluation of the PAOC EE data are provided in Section 4.

Figure 4 – RI Soil Sampling Locations



## 4. Summary of Site Risks

Summaries of the HHRA and ERA results for PAOC EE are included in the following subsections and in Table 1. Figure 5 presents a graphical representation of the Conceptual Site Model (CSM) for PAOC EE, including the human and ecological receptors that are likely at PAOC EE and were considered in the HHRA and ERA. The complete HHRA and ERA are provided in the RI/FS Report (CH2M, 2019), which is available in the Administrative Record File (link provided on first page of this Proposed Plan).

While the munitions removal described in Section 2 reduced explosive hazards and relatively few MEC have been found at PAOC EE, potential explosive hazards associated with munitions on the surface and in the subsurface possibly remaining at PAOC EE will

be considered in the remedy selection process that is the subject of this Proposed Plan.

### 4.1 Human Health Risk Assessment

An HHRA was conducted to evaluate potential human health risks associated with exposure to constituents detected in soil at PAOC EE. Maximum detected concentrations of constituents were compared to EPA regional screening levels (RSLs), and constituents of potential concern (COPCs) were identified based on exceedances of these screening levels. Human health risks were then evaluated for these COPCs under current and potential future human exposure scenarios at PAOC EE. Exposure scenarios evaluated considered recreational users, maintenance workers, and land crab consumers. The recreational user exposure scenario was used to conservatively represent the trespasser exposure scenario.

Health risks are based on an estimate of the potential cancer risk and the potential non-cancer hazard, the latter of which is expressed as a hazard index (HI). A detailed explanation of how human health risk is assessed is provided in the “What is Human Health Risk and How is it Calculated?” informational box. No contaminants of concern (COCs) were identified; therefore, no unacceptable human health risks are present at PAOC EE.

#### *4.2 Ecological Risk Assessment*

The ERA evaluated potential ecological (plants and animals) risks associated with exposure to constituents detected in soil using established ecological effects values to assess risks from direct exposure by organisms as well as via the food chain. A detailed explanation of how ecological risk is assessed is provided in the “What is Ecological Risk and How is it Calculated?” informational box. No COCs were identified for soil or food web exposure at PAOC EE. Therefore, no unacceptable ecological risks were identified and no further evaluation or action is warranted for ecological receptors at PAOC EE.

#### *4.3 Principal Threat Waste*

MEC, specifically DMM or UXO, if any, that remains present at PAOC EE may constitute a principal threat waste (PTW) due to the potential for it to pose an explosive hazard if the material is moved, handled, or disturbed. The preferred alternative includes LUCs and inspections to limit the potential for people to encounter MEC. During historical investigations and munitions removal, a small quantity of MEC was found and removed from the site. If potential MEC is later found at PAOC EE, Department of Defense (DoD) explosive ordnance disposal personnel or similarly qualified personnel will evaluate the material to determine if it poses an explosive hazard. Material that is determined to pose an explosive hazard will normally be treated onsite or removed for destruction per applicable DoD explosives safety standards and environmental laws and regulations. In these cases,

the Navy, EPA, DOI, and the Commonwealth will consult, in accordance with the terms of the Vieques FFA, to make a determination as to whether the material should, as defined by CERCLA, the NCP, and EPA guidance, be classified as PTW. If the material is deemed to be PTW, the Navy will conduct the actions necessary to ensure protectiveness of human health and the environment to address unacceptable risks posed by the material designated as PTW.

Figure 5 – PAOC EE Conceptual Site Model

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**Sea Turtle Nesting Area:**  
Exposure of buried eggs to deeper surface soil (18-36 inches)

**Non-Beach Area Public Recreators:**  
Ingestion/dermal/inhalation exposure to surface soil; exposure to potential explosive hazard

**Non-Beach Area Public Trespassers:**  
Ingestion/dermal/inhalation exposure to surface soil; exposure to potential explosive hazard

**Beach Area USFWS Workers and Public Recreators:**  
Ingestion/dermal/inhalation exposure to surface and deeper surface soil (0 to 3 feet bgs); exposure to potential explosive hazard

**Non-Beach Area USFWS Workers:**  
Ingestion/dermal/inhalation exposure to surface soil and subsurface soil; exposure to potential explosive hazard

**Terrestrial Plants and Soil Invertebrates:**  
Direct exposure to surface soil in all upland areas

**Terrestrial Avian and Mammalian Species:**  
Food web exposures via ingestion of terrestrial prey items and incidental surface soil in all upland areas



Table 1 – PAOC EE Risk Assessment Results

Receptors	Human Health Risk
Current/Future Recreational Users (Trespassers) (Beach Area)	Adult – ELCR = $4 \times 10^{-7}$ and HI < 1.0 Child – ELCR = $1 \times 10^{-6}$ and HI < 1.0 Acceptable
Current/Future Recreational Users (Trespassers) (Non-beach Area)	Adult – ELCR = $6 \times 10^{-7}$ and HI < 1.0 Child – ELCR = $3 \times 10^{-6}$ and HI < 1.0 Acceptable
Current/Future USFWS Worker (Non-beach Area)	ELCR = $3 \times 10^{-7}$ and HI < 1.0 Acceptable
Potential Current/Future Land Crab Consumers	Adult – $2 \times 10^{-5}$ ELCR and HI > 1 (arsenic) Child – $1 \times 10^{-4}$ ELCR and HI > 1 (arsenic, selenium, copper, cadmium) Although calculations indicate unacceptable cancer risk for child consumers and unacceptable non-cancer hazard for adult and child consumers, metals concentrations responsible for calculated values are attributable to natural conditions; therefore, no unacceptable risk or non-cancer hazard associated with past munitions-related activities.
Notes/Definitions: Unacceptable ELCR = $> 1 \times 10^{-4}$ Unacceptable HI = $> 1$ ELCR = excess lifetime cancer risk HI = hazard index	
Receptors	Ecological Risk
Soil Organisms (invertebrates, plants)	HQs $\geq 1.0$ (hexavalent chromium, iron, lead, and manganese) Although calculations indicate unacceptable risk for soil organisms, metals concentrations responsible for calculated values are primarily attributable to natural conditions.
Turtle Nest Eggs	HQs < 1.0 Acceptable
Birds and Mammals	HQs < 1.0 Acceptable
Notes/Definitions: HQ = hazard quotient Unacceptable HQ = $\geq 1$ ; identified in the Baseline ERA as a contaminant of potential concern warranting further risk evaluation	

## What is Human Health Risk and How is it Calculated?

An HHRA estimates the likelihood of health problems occurring if no cleanup action were taken at a site. This is also referred to as “baseline risk.” HHRA’s are conducted using a stepped process (as outlined in Navy and EPA HHRA policy and guidance). To estimate baseline risk at a site, the Navy performs the following four-step process:

Step 1: Data Collection and Evaluation

Step 2: Exposure Assessment

Step 3: Toxicity Assessment

Step 4: Risk Characterization

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

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

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

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

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

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

- Two types of risk are considered: cancer risk and non-cancer hazard
- The likelihood of developing cancer as a result of site exposure is expressed as an upper-bound probability; for example, a “1 in 10,000 chance.” In other words, for every 10,000 people that might be exposed under the conditions identified in Step 2, one additional case of cancer may occur as a result of site exposure. Unacceptable risk exists when the Excess Lifetime Cancer Risk (ELCR) of  $1 \times 10^{-4}$  (1 in 10,000) is reached or exceeded.
- For non-cancer health effects, a “hazard index” (HI) is calculated. The HI represents the ratio between the “reference dose,” which is the dose at which no adverse health effects are expected to occur over a lifetime of exposure, and the RME dose for a person contacting COPCs at the site. The key concept here is that a “threshold level” (measured as an HI of 1) exists below which no non-cancer health effects are expected to occur. However, it should be noted that an HI > 1 does not mean that health effects will occur.
- The potential risks from the individual COPCs and exposure pathways are summed and a total site risk is calculated for each receptor.
- The uncertainties associated with the risk estimates are presented and their effects on the conclusions of the HHRA are discussed.

## What is Ecological Risk and How is it Calculated?

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

An ERA has three principal components:

### 1. Problem Formulation establishes the goals, scope, and focus of the ERA and includes:

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

### 2. Risk Analysis which includes:

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

### 3. Risk Calculation or Characterization:

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

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

1. **Screening-Level ERA (Steps 1-2; Tier 1)** – The Screening Level ERA (SLERA) conducts an assessment of ecological risk using the three principal components described above and very conservative assumptions (such as using maximum chemical concentrations).



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

## 5. Scope and Role of Response Action

In cooperation with EPA, PRDNER, and USFWS, and in accordance with the FFA and applicable guidance, the Navy performed investigations at PAOC EE to evaluate the nature and extent of contamination and to assess the potential risks to human health and the environment. In addition, munitions removal, including a TCRA, was conducted to remove surface and subsurface MEC from PAOC EE. Although a low density of munitions was identified at PAOC EE, there is still potential explosive hazards due to the possibility of munitions remaining at the site. The preferred alternative described in this Proposed Plan will address potential explosive hazard to ensure PAOC EE can be used for the planned recreational activities associated with the wildlife refuge, as described in USFWS' Comprehensive Conservation Plan (CCP) and subsequent Step-Down Plan for the area. The response action is intended to be the final remedy for PAOC EE and does not include or substantively affect other areas of UXO 17 or any other sites under the CERCLA process.

To date, a final remedy has been selected for four other munitions response sites (UXOs 1, 12, 14, and 18) located on the former VNTR in eastern Vieques and one munitions response site (Solid Waste Management Unit [SWMU] 4) located on the former NASD in western Vieques. UXO 16.1, the offshore area adjacent to SWMU 4, is still under investigation,

but remedy selection for this area is anticipated in 2022. None of the remedies associated with these other sites includes or affects the final remedy for PAOC EE.

## 6. Remedial Action Objectives

Remedial action objectives (RAOs) are standards that define the extent to which sites require cleanup to protect human health and/or the environment. The following RAO was developed to be protective of current and potential future receptors, in accordance with the current and intended future land use as a wildlife refuge with localized areas of planned recreational use:

- Reduce the risk of exposure to potential munitions-related explosive hazards to be consistent with current and anticipated future land use set forth in Public Law 106-398, as amended by Public Law 107-107, which requires the land containing PAOC EE to be managed by USFWS as a National Wildlife Refuge.

An RAO for groundwater has not been developed because soil data indicate general absence of low concentrations of potential contaminants and there are no leaching concerns. It should also be noted that data collected from nearby sites located at similar distances to the coastline indicate that groundwater at PAOC EE is brackish or saline and therefore unpotable without treatment. Potable water is provided to Vieques from the main island of Puerto Rico and there are no plans

to use groundwater at PAOC EE for potable purposes or agriculture. As a result, groundwater does not present an unacceptable human health or ecological risk. However, two wells will be installed so that long-term groundwater monitoring can be considered as a means to evaluate long-term trends in contaminant concentrations. Including the potential for long-term groundwater monitoring as part of the remedial action is a conservative approach because it provides a mechanism for assuring that the consideration of long-term impacts associated with potential source areas across the site, if any, are evaluated and addressed as appropriate.

## 7. Summary of Remedial Alternatives

The following four remedial alternatives were developed to address potential MEC explosive hazards:

- Alternative 1 – No Action
- Alternative 2 – Land Use Controls

- Alternative 3 – Land Use Controls and Subsurface Anomaly Removal in Planned Public Use Areas
- Alternative 4 – Land Use Controls and Subsurface Anomaly Removal in Planned Public Use Areas and Remainder of the Eastern Peninsula Area

These remedial alternatives were developed and evaluated in the RI/FS Report (CH2M, 2019). Following the screening of various technologies, the remedial alternatives summarized in Table 2 were selected for detailed evaluation and comparative analysis. To support evaluation of the alternatives, USFWS has identified and mapped locations of proposed, future recreational features and public use areas, including vehicular, ATV, biking, and/or horse riding along the road through PAOC EE; parking, picnic, and land crabbing areas; an observation tower and boat ramp on the peninsula; and beach access. Native tree species reforestation is also planned for the area. These proposed USFWS and public use areas are shown in Figure 6.

Table 2 – Remedial Alternatives

Alternative	Components	Details	Cost
1. No Action No action and no restriction on activities.	–	–	Capital Cost: \$0
2. Land Use Controls Manages MEC explosive hazards by reducing the potential for unauthorized access to portions of the site, guiding site users to areas intended for access, and performing periodic inspections to identify and remove exposed MEC.	<ul style="list-style-type: none"> <li>– LUCs, including physical mechanisms (e.g., educational kiosk/signs) and administrative processes (e.g., special use permits)</li> <li>– Long-term monitoring (LTM), including removal of any MEC identified</li> </ul>	<ul style="list-style-type: none"> <li>– Implementing LUCs (e.g., educational kiosk/signage and administrative mechanisms) to guide access to approved areas and discourage unauthorized access, including intrusive activities (i.e., digging) and groundwater use. Periodic inspections would likely be on a regular frequency but may also include inspections after such events as tropical storms/hurricanes that could impact remedy protectiveness. The specific LUC requirements, including the associated checklist, would be included in an LTM plan associated with the remedy that would be submitted for regulatory review. The LTM plan would include any groundwater monitoring requirements.</li> </ul>	<ul style="list-style-type: none"> <li>Capital Cost: \$191,000</li> <li>Present Value of Future, Annual LTM Costs: \$700,000</li> <li>Total Present-Worth Cost: \$891,000</li> <li>Assumed timeframe: 30 years (including LTM)</li> </ul>

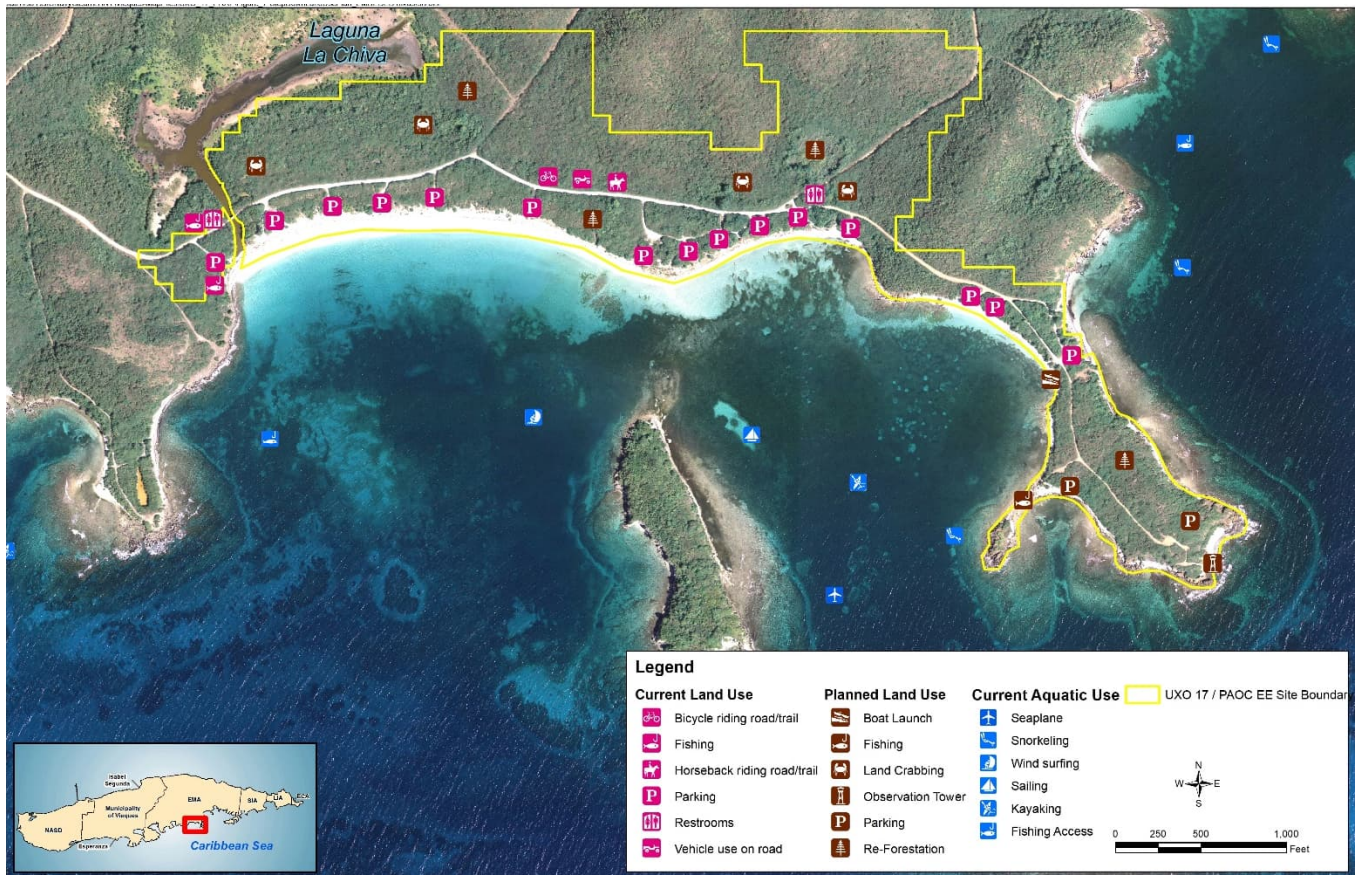
Table 2 – Remedial Alternatives

Alternative	Components	Details	Cost
		<ul style="list-style-type: none"> <li>– An MEC LTM program would be established, including periodic site inspections for trespassing, erosion, MEC/MD recurrence in public-access areas, and the integrity and effectiveness of physical LUCs. Any MEC/MD discovered during implementation of the LTM program would be removed and properly disposed.</li> </ul>	
<p>3. Land Use Controls and Subsurface Anomaly Removal in Planned Public Use Areas</p> <p>Manages MEC explosive hazards by removing additional subsurface MEC to support potential future recreational activities, reducing the potential for unauthorized access to portions of the site, guiding site users to areas intended for access, and performing periodic inspections to identify and remove exposed MEC.</p>	<ul style="list-style-type: none"> <li>– LUCs (as described under Alternative 2)</li> <li>– LTM (as described under Alternative 2)</li> <li>– Subsurface MEC clearance</li> </ul>	<ul style="list-style-type: none"> <li>– Implementing LUCs as described under Alternative 2</li> <li>– Habitat survey and vegetation clearance with MEC avoidance support would be required for subsurface clearance</li> <li>– Subsurface MEC clearance within the public use areas where subsurface clearance has not already taken place during historical investigation and removal activities would be performed. Specifically:                             <ul style="list-style-type: none"> <li>○ Removal of subsurface anomalies previously identified but not removed within the beach area to an assumed maximum depth of 4 feet bgs</li> <li>○ Removal of subsurface anomalies at and immediately around the Punta Conejo boat ramp and planned observation tower to an assumed maximum depth of 4 feet bgs</li> <li>○ Removal of subsurface anomalies within the Punta Conejo road and planned parking areas and the unimproved road at the western boundary of PAOC EE to an assumed maximum depth of 2 feet bgs</li> </ul> </li> <li>– An MEC LTM program similar to what is described under Alternative 2</li> </ul>	<p>Capital Cost: \$979,000</p> <p>Present Value of Future, Annual LTM Costs: \$700,000</p> <p>Total Present-Worth Cost: \$1,679,000</p> <p>Assumed timeframe: 30 years (including LTM)</p>
<p>4. Land Use Controls and Subsurface Anomaly Removal in Planned Public Use Areas and Remainder of the Eastern Peninsula Area</p> <p>Manages MEC explosive hazards by removing subsurface MEC to support potential future recreational activities and within the entire Eastern Peninsula Area, reducing the potential for</p>	<ul style="list-style-type: none"> <li>– LUCs (as described under Alternative 2)</li> <li>– LTM (as described under Alternative 2)</li> <li>– Subsurface MEC clearance</li> </ul>	<ul style="list-style-type: none"> <li>– Implementing LUCs as described under Alternative 2</li> <li>– Habitat and vegetation clearance with MEC avoidance support would be required for the recreational areas and entire Eastern Peninsula where subsurface clearance has not already taken place during historical investigation and removal activities</li> <li>– Subsurface MEC clearance as described under Alternative 3 with the addition of MEC clearance to an assumed maximum depth of 2 feet bgs for the entire Eastern Peninsula not already MEC-cleared</li> </ul>	<p>Capital Cost: \$1,877,000</p> <p>Present Value of Future, Annual LTM Costs: \$700,000</p> <p>Total Present-Worth Cost: \$2,577,000</p> <p>Assumed timeframe: 30 years (including LTM)</p>

Table 2 – Remedial Alternatives

Alternative	Components	Details	Cost
unauthorized access to portions of the site, guiding site users to areas intended for access, and performing periodic inspections to identify and remove exposed MEC.		– An MEC LTM program similar to what is described under Alternative 2	

Figure 6 - USFWS Land Use Plan



Inclusion of the No Action Alternative is required by the NCP as a basis of comparison for the other alternatives. Each remedial alternative for PAOC EE was evaluated with respect to the first seven evaluation criteria provided in the NCP. The alternatives were then compared to one another with respect to each NCP criterion. Following the public comment period on this Proposed Plan, the preferred alternative will be evaluated further against the

remaining two criteria (Commonwealth acceptance and community acceptance).

The NCP outlines the approach for comparing remedial alternatives. Evaluation of the alternatives uses nine evaluation criteria, which consist of “threshold,” “primary balancing,” and “modifying” criteria (Table 3). To be considered for selection as the preferred alternative, a remedial alternative must meet the two threshold criteria. The five primary balancing

criteria, which are technical criteria based on environmental protection, cost, and engineering feasibility, are then considered to determine which alternative provides the best combination of attributes. Finally, upon receipt of public comments on this Proposed Plan, the preferred alternative is evaluated further against the two modifying criteria.

### *7.1 Relative Evaluation of Alternatives*

The comparative analysis of alternatives with respect to the first seven evaluation criteria is summarized in the remainder of this section. The PAOC EE RI/FS Report (CH2M, 2019) provides a more-detailed discussion of the evaluation and includes tables that provide a relative ranking of the alternatives.

### *7.2 Threshold Criteria*

#### **Overall Protection of Human Health and the Environment**

Alternative 1 (no action) is not protective because the RAOs would not be attained. The remaining alternatives are protective of human health and the environment by reducing the exposure to MEC by guiding access to areas planned for public use, performing periodic MEC inspections, and/or conducting additional MEC removal.

#### **Compliance with Applicable or Relevant and Appropriate Requirements**

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) addresses whether a remedy will meet Federal and State (Commonwealth) requirements, standards, and criteria that are determined to apply specifically to the contaminant, location, or remedial action being considered or, if not applicable, are otherwise well-suited to the particular site.

All alternatives, except the no action alternative, have common ARARs associated with land use control implementation and periodic monitoring. Because these activities may involve construction or construction-like procedures, laws such as the Coastal

Zone Management Act, Migratory Bird Treaty Act, Endangered Species Act, Archaeological Resources Protection Act, as well as other regulations/protocol that govern management of military munitions and production of fugitive dust, noise, and waste are ARARs. All three remedial alternatives comprising or including land use controls would employ equipment/methodology that ensures compliance with these ARARs, such as resource avoidance and/or mitigation, adherence to Navy munitions management protocol, and use of techniques to control or manage fugitive dust, noise, and waste generation during the course of land use control implementation and monitoring.

Because Alternatives 3 and 4 involve potential land disturbance over a large area for munitions clearance activities, in addition to the regulations/protocol cited above, other laws governing erosion, stormwater pollution, and spills are also ARARs for these two remedial alternatives. Compliance with these ARARs would be ensured by implementing standard and/or site-specific controls in accordance with the associated Federal or Commonwealth regulations.

### *7.3 Primary Balancing Criteria*

#### **Long-Term Effectiveness and Permanence**

Alternative 1 does not provide additional long-term effectiveness. Alternative 2 provides long-term effectiveness and permanence using LUCs, whereas Alternatives 3 and 4 combine LUCs with additional MEC removal. Alternative 3 is anticipated to provide a marginally higher level of long-term effectiveness than Alternative 2 because additional subsurface anomaly removal would be performed in the planned public use areas. While Alternative 4 provides the highest amount of long-term effectiveness and permanence due to inclusion of MEC removal within the entire Eastern Peninsula, the additional level of protectiveness is likely minimal because only a small amount of MEC was identified within the peninsula during historical removal activities. While USFWS has no plans to

expand the areas of land management and/or public access within PAOC EE beyond what is provided in the current CCP step-down plan, even if expanded access is planned in the future, the additional level of protectiveness associated with Alternative 4 would likely be minimal due to the very low quantity of MEC estimated to be potentially remaining across the site.

### Reduction in Toxicity, Mobility, or Volume through Treatment

While removing MEC may not technically be considered treatment, it is substantively similar to treatment, especially with respect to consideration of this evaluation criterion. Alternative 1 does not result in any additional reduction in toxicity, mobility, or volume (TMV). Alternative 3 has slightly higher degree of reduction in TMV than Alternative 2 because it includes the screening for and, if present, removal of surface and subsurface MEC within planned recreational areas, versus removal of MEC only if discovered during LTM (or reported by the agencies or public). However, as noted previously, implementation Alternative 4 would likely produce a very small number of actual MEC. Therefore, Alternative 4 would result in only a marginally higher degree in reduction of TMV compared to Alternative 3.

### Short-Term Effectiveness

Alternative 1 has the least short-term impacts because no remedial construction activities are associated with the alternative; however, Alternative 1 would not meet short-term-effectiveness goals because no additional actions would be taken. Alternative 2 can be implemented almost immediately after a ROD and remedial action work plan are finalized because it involves implementation of LUCs and periodic monitoring with the potential for future MEC removal, which has the least short-term construction impacts of the three active remedial alternatives. Alternatives 3 and 4 will require a somewhat longer time to complete because of the additional vegetation clearance and MEC removal associated with increased construction activities compared to Alternative 2; Alternative 4

would take longer to implement than Alternative 3 due to the larger area where MEC clearance would take place. Recognizing erosion-control measures would be implemented for both Alternatives 3 and 4, the risk of erosion and runoff from de-vegetated areas to the adjacent ocean is higher for Alternative 4 than Alternative 3 because a much larger area (approximately 18 acres) would require de-vegetation for Alternative 4..

### Implementability

Alternative 1 requires no further action or implementation but does not meet the RAOs. Alternative 2 is technically feasible and could facilitate public and USFWS access in the areas intended for this use by USFWS through the use of LUCs. Alternative 3 is technically and administratively feasible but would be logistically more challenging than Alternative 2 because of the construction and vegetation, munitions, and waste management logistics associated with the MEC removal. Alternative 4 would be considerably more logistically challenging than Alternative 3 due to the larger area requiring de-vegetation and the proximity of the peninsula to the ocean.

### Cost

Alternative 1 is the most cost effective but does not meet the RAOs. Alternatives 2, 3, and 4 meet the RAOs and have present-worth costs of \$891,000, \$1,679,000, and \$2,577,000, respectively.

## 7.4 Modifying Criteria

*Commonwealth Acceptance.* Commonwealth involvement has been continual throughout the CERCLA process for PAOC EE and PRDNER supports the preferred alternative. However, PRDNER's formal concurrence is pending following the review of all comments received during the public comment period.

*Community Acceptance.* Community acceptance will be evaluated after the public comment period for

the Proposed Plan, and substantive public comments will be documented and addressed in a

responsiveness summary as part of any ROD for PAOC EE.

Table 3 – Evaluation Criteria for Comparative Analysis of Alternatives

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

## 8. Preferred Alternative

The Navy and EPA, in consultation with DOI and PRDNER, have identified Alternative 3 – Land Use Controls and Subsurface Anomaly Removal in Planned Public Use Areas as the preferred alternative for PAOC EE (Figure 7). Based on evaluation of the

data, information currently available, and the comparative analysis of potential remedial alternatives, the preferred alternative meets the statutory requirements of CERCLA for protection of human health and the environment under current and projected future land use as a recreational area within the wildlife refuge.

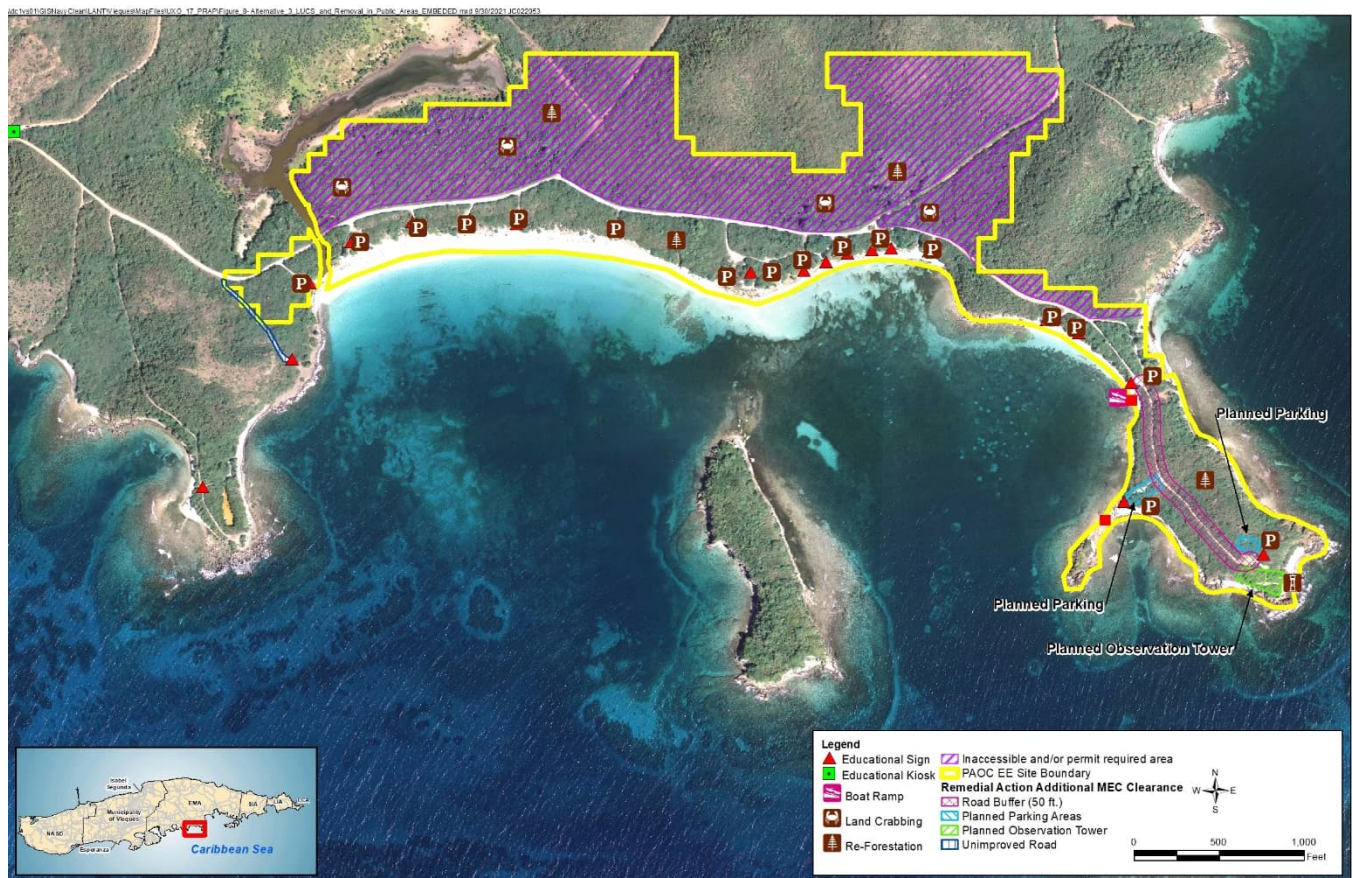
Key elements that make Alternative 3 the preferred alternative are:

- Meets the RAOs and is compatible with the planned land use, based on the USFWS CCP and associated step-down plan.
- Reflects significant surface and subsurface MEC removal conducted as part of historical munitions removal activities, including the TCRA, from the areas identified by USFWS for future recreational and refuge use.
- Performs additional subsurface MEC searches and, if discovered, removal in areas planned for recreational use and implements an MEC LTM

program to monitor for and remove MEC identified in the future.

- Does not cause unnecessary vegetation and ecological habitat disruption and eliminates the erosion potential that would be produced by large-scale removal of vegetation and ecological habitat associated with MEC removal on the Eastern Peninsula (Alternative 4) that would not substantively reduce explosive hazard.
- Implements, monitors, and maintains LUCs to guide access to approved areas and discourage unauthorized access, including intrusive activities (i.e., digging).

Figure 7 – Alternative 3 Layout



## 9. Community Participation

A community relations program has been ongoing for the Vieques environmental restoration program since 2001. The community relations program fosters two-

way communication of investigation and remediation activities between the stakeholder agencies (Navy, EPA, USFWS, and PRDNER) and the public. A Restoration Advisory Board was formed in 2004 to



provide for expanded community participation. Regular meetings are held to provide an information exchange among community members, stakeholder agencies, and the Municipality of Vieques. These meetings are open to the public and are held approximately every 3 months.

Public input is a key element in the decision-making process. Nearby residents and other interested parties are strongly encouraged to use the comment period to relay any questions and comments about the preferred alternative or any of the other alternatives identified in this Proposed Plan for PAOC EE. Following the public comment period, the Navy will summarize and respond to substantive comments in a responsiveness summary, which will become part of any ROD documenting the selection of a remedy for PAOC EE.

This Proposed Plan fulfills the public participation requirements of CERCLA Section 117(a), which specifies that the lead agency (the Navy) must publish a plan outlining any remedial alternatives evaluated for a site and identify the preferred alternative. The Community Involvement Plan and technical reports supporting the preferred alternative for PAOC EE are available for public review in the Administrative Record at: <https://www.navfac.navy.mil/vieques>

Additionally, paper copies of the PAOC EE Proposed Plan are available at the EPA office in Vieques.

The public comment period for the Proposed Plan provides an opportunity for input regarding the remedy selection process for PAOC EE. The public comment period will be from May 25 to June 24, 2022, and a public meeting will be held on June 1, 2022, at 5:00 p.m. by connecting to the Virtual Meeting on MS Teams <https://tinyurl.com/VQS-RAB-65> or

Join by phone by dialing 1-787-650-6946,

Meeting ID: 648 097 628#

All interested parties are encouraged to attend the public meeting to learn more about the preferred

alternative for PAOC EE. The meeting will provide an additional opportunity to submit comments on the Proposed Plan.

Comments on the preferred alternative, or this Proposed Plan, must be postmarked no later than June 24, 2022. On the basis of comments or new information, the Navy, EPA, and DOI, in consultation with PRDNER, may modify the preferred alternative or choose another alternative. The comment page included as part of this Proposed Plan may be used to provide comments to the Navy. However, questions or comments can be submitted to any of the individuals listed in the box below during the public comment period.

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

## 10. Glossary

**Acceptable Risk and Non-Cancer Hazard:** EPA's human health acceptable risk range for Superfund hazardous waste sites is  $1 \times 10^{-4}$  to  $1 \times 10^{-6}$ , meaning there is 1 additional chance in 10,000 ( $1 \times 10^{-4}$ ) to 1 additional chance in 1 million ( $1 \times 10^{-6}$ ) that a person may develop cancer if exposed to contaminants at a site that is not remediated. EPA's acceptable non-cancer hazard (risk) threshold for Superfund sites is a hazard index less than or equal to 1, meaning that if the exposure at a particular site is less than or equal to the threshold, there is not a concern for potential non-cancer effects associated with exposure to potentially site-related contaminants. For ecological health, acceptable risk is the result of a weight-of-evidence assessment that finds ecological exposure pathways to site chemicals are incomplete, or that contaminant exposure concentrations are below ecological toxicity values, are not bioavailable, and/or are attributable to background.

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

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

**Background Concentration:** Concentrations of naturally occurring and anthropogenic (because of human activities) constituents, such as inorganic constituents, found in groundwater, soil, sediment, and

surface water at levels not influenced by site-specific releases. Background concentrations of some inorganics and other constituents are often at levels that may pose a risk to human health or the environment. However, background concentrations of site chemicals are factored into risk management determinations to ensure remedial actions are not implemented for constituents whose concentrations are attributable to background conditions and not indicative of a site-related release.

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

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

**Constituent of Potential Concern (COPC):** A chemical at the site that may be hazardous to human health or the environment due to its detected concentrations.

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

**Department of the Interior (DOI):** Landowner of the National Wildlife Refuge.

**Ecological Risk Assessment (ERA):** A qualitative and quantitative evaluation of the risk posed to ecological receptors (i.e., plants and animals) by the presence of specific pollutants. Elements include

identification of the hazardous substances present in the environmental media; assessment of exposure and exposure pathways; assessment of the toxicity of the site's hazardous substances; and characterization of ecological risks.

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

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

**Federal Facility Agreement (FFA):** A legal agreement between the Navy, DOI, EPA, and the Commonwealth of Puerto Rico that establishes the procedural framework and general schedule for implementing the CERCLA activities for Vieques.

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

**Hazard Index (HI):** The HI represents a measure of the potential for non-carcinogenic effects from exposure to COPCs. A "threshold level" (measured as an HI of 1) exists below which no non-cancer health effects are expected to occur.

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

pathways; assessment of the toxicity of the site's hazardous substances; and characterization of human health risks.

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

**Material Potentially Presenting an Explosive Hazard (MPPEH):** designation given to potential munitions items that have been found but have yet to have their explosive hazard determined.

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

**Munitions and Explosives of Concern (MEC):** Distinguishes specific categories of military munitions that may pose unique explosive risks.

**Munitions Debris (MD):** Non-explosive remnants of munitions remaining after munitions use, demilitarization, or disposal.

**National Oil and Hazardous Substances Pollution Contingency Plan (NCP):** The Federal regulations (Code of Federal Regulations [CFR], Volume 40, Part 300 [40 CFR Part 300]) that guide determination of the sites to be addressed under both the Superfund (CERCLA) program and the program to prevent or control spills into surface waters or elsewhere.

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

**National Wildlife Refuge:** A protected area within the United States managed by the United States Fish and Wildlife Service for the conservation of wildlife and plants.

**Non-Cancer Hazard:** Non-cancer hazards (or risk) are expressed as a quotient that compares the potential exposure to contaminants at a particular site

to the acceptable level of exposure. There is a level of exposure (the reference dose) below which it is unlikely for even a sensitive population to experience adverse health effects.

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

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

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

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

**Puerto Rico Department of Natural and Environmental Resources (PRDNER):** The agency responsible for protecting natural resources, Commonwealth-owned conservation areas, submerged lands, and the coastal zone in the Commonwealth of Puerto Rico.

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

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

**Remedial Action Objectives (RAOs):** Statements that define the extent to which sites require cleanup to protect human health and the environment.

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

**Risk-based Screening Level (RSL):** A screening criterion designed to evaluate constituent concentrations in environmental media for potential risk to human health.

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

**Unacceptable Risk:** Excess lifetime cancer risk that exceeds EPA's acceptable risk range for Superfund hazardous waste sites of  $1 \times 10^{-4}$  to  $1 \times 10^{-6}$  or a non-cancer hazard in excess of EPA's target level of 1.

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

**United States Fish and Wildlife Service (USFWS):** The Federal agency responsible for the management of the Department of the Interior-owned land and the protection of trust species (e.g., threatened and endangered species and migratory birds) on Vieques.



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Place  
stamp  
here

NAVFAC Atlantic

Attention: Code EV31 / Mr. Kevin Cloe

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