Culebra, Puerto Rico Restoration Advisory Board Projects Briefing

U.S. Army Corps of Engineers
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1.0 Introduction

As a member of the Culebra Restoration Advisory Board, we value your perspective on our restoration activities and appreciate your willingness to serve. We understand that you want to know what is going on and want to be able to communicate that information with your neighbors. This briefing document provides detailed information on each of the projects.

As you know, the entire island of Culebra and nearby cayos are within a Formerly Used Defense Site. To better manage the restoration activities, the Corps has divided the island and cayos into 14 areas (projects). Please see Table 1 for a list of the projects and Figure 1 for a map of the areas. Area 14 was investigated previously, and because no evidence of contamination from the military's use was identified, no further action is necessary.

Project 00 is the only non-munitions project on Culebra. The status of this project is detailed in Section 2.

The remaining areas are known as Munitions Response Sites indicating the potential for munitions to be present based upon the way the military used the land. A Remedial Investigation/Feasibility Study is underway on all of them, including a newly awarded underwater investigation around Culebrita and adjacent cayos. The status of these projects is detailed in Section 3.

Table 1: List of Projects in Culebra with Phase of Work and Contractor

Contractor	Phase	Project Area	Project Name
CH2M Hill	SI	00	Navy Camp
		01	Not Used
EOTI	RI/FS	02	Cerro Balcon Mortar Range & Adjacent Cayos (Land)
Parsons/USA Environmental	RI/FS	02, 07	Water Areas Around Culebrita and Adjacent Cayos
TetraTech	RI/FS	03	Flamenco Bay Water Area
EOTI	RI/FS	04	Flamenco Lagoon Maneuver Area
EOTI	RI/FS	05	Mortar and Combat Range Area
USA Environmental	RI/FS	06	Artillery Firing Area
EOTI	RI/FS	07	Culebrita Artillery Impact Area (Land)
USA Environmental	RI/FS	08	Cayo Norte Impact Area
USA Environmental	RI/FS	09	Soldado Point Mortar and Bombing Areas
USA Environmental	RI/FS	10	Defensive Firing Area 1
USA Environmental	RI/FS	11	Defensive Firing Area 2
TetraTech	RI/FS	12	Luis Pena Channel Water areas
USA Environmental	RI/FS	13	Cayo Luis Pena Impact Areas
No Action Required		14	Airport

Figure 1: Map Showing Project Areas

2.0 Non-Munitions Site Inspection (Lower Camp Area) Project 00

2.1 Background

The Former Lower Camp Debris Site encompasses a 40,000-square foot section (100 feet by 400 feet) of marine wetland located along the eastern shoreline of Ensenada del Cementerio. (Please see Figure 3.) The area is adjacent to the Department of Conservation automotive shop and is currently under the jurisdiction of the Commonwealth of Puerto Rico and the Authority for Conservation and Development of Culebra.

From the early 1900s until 1980, the Navy and/or Marine Corps used an area east of the wetland for administrative offices, housing and encampments. The concrete foundation for the Marine Corps restroom is now part of the Department of Conservation's automotive shop. Various discarded materials have been discovered in the wetland areas west of the bathroom facility.

A Site Inspection is underway at the Former Lower Camp Debris Site. The purpose of the Site Inspection is to confirm or deny the presence of potential contamination as a result of the military's use of the area.

Figure 2: Axle and Tires in Lower Camp Area

Figure 3: Map of Project 00 Lower Camp Area

2.2 Investigation Results

2.2.1 Previous Investigation

In 1996, E&E investigated the Lower Camp area. The investigation included a visual inspection and environmental sampling. Their general observations are as follows.

- Debris was scattered along approximately 400 feet of the shoreline and extended from 20 feet to 100 feet into the wetland.
- The highest concentration of debris encompassed an area of approximately 4,800 square feet (40 feet by 120 feet). The debris consisted primarily of rusted metal building materials such as steel beams and reinforcing rods, corrugated steel sheeting and bolts.
- Other material observed in the wetland area included broken glass and automobile parts.
- The eastern edge of the wetland is approximately 180 feet west (down slope) of a 35-foot by 160-foot concrete pad. The pad was part of a Navy restroom facility, but is now used by the Department of Conservation as an automotive maintenance facility.
- The hillside between the automotive maintenance facility and the wetland area is scattered with auto body parts and corrugated steel sheeting that appears relatively new (within 10 to 15 years as of 1996).

Soil and Groundwater Investigation

A total of three environmental samples were collected (two soil and one water) in 1996 and were analyzed for petroleum products and metals. Once collected, the samples were sent to a laboratory for analysis. The amount detected was compared to the appropriate screening level. The screening level is an amount established by the U.S. Environmental Protection Agency (EPA) (and/or state environmental regulators) above which there could be a risk to people or the environment. The level is adjusted according to the media (soil, sediment, water) and the exposure (direct human contact in a residential, commercial or industrial setting; potential impact to the environment).

Two substances (benzo(k)fluoranthene and chromium) were detected above the EPA level for direct contact with the soil in a residential setting. EPA also has established guidelines on leachability which refers to the potential for chemicals to seep, or leach, into groundwater. Five substances were detected above the leachability levels (benzo(k)fluoranthene, arsenic, barium, lead and selenium). Since only a limited number of samples were collected, the data is not sufficient to draw strong conclusions. Based on the potential for contamination, a Remedial Investigation/Feasibility Study (RI/FS) is recommended. The Remedial Investigation will include environmental sampling that will better characterize the potential contamination.

Drinking water for Culebra is provided from the main island and is not impacted by any potential contamination from the Lower Camp Area.

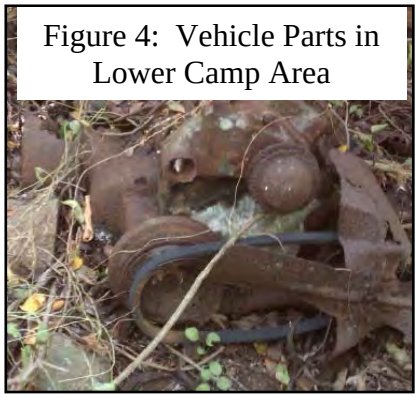

Figure 4: Vehicle Parts in Lower Camp Area

2.2.2 Current Investigation

A contract was awarded to CH2M HILL to expand upon the work previously conducted for the Site Inspection. In addition to evaluating the data from the previous investigation, CH2M HILL visited the site and conducted a visual inspection as well as a geophysical (subsurface) screening. A concrete septic tank associated with the Navy's housing was identified. Additionally, a large amount of debris was identified, both on the surface and subsurface.

The debris consists of broken bottles, building materials such as bricks and mortar, pipes, beams, mattress springs and other household items, tires and other vehicle parts, concrete storm water pipes and the like. Figure 6 is a map showing the location of the debris.

Figure 5: Water Valve in Lower Camp Area

Figure 6: Map Showing Debris Field in Lower Camp Area

2.3 Lower Camp Area (Project 00) Site Inspection Conclusions

The final Site Inspection report is not complete. However, based upon the results of the previous investigation and CH2M HILL's fieldwork, a Remedial Investigation/Feasibility Study will be recommended.

3.0 Munitions Response Sites (MRSs)

3.1 Introduction

The Corps must follow the process specified by the U.S. Environmental Protection Agency known as the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in evaluating, and if necessary, remediating, Formerly Used Defense Sites. The process identifies a number of required steps and studies. In addition to the lengthy process required by law, there are some unique challenges that have to be addressed in Culebra – specifically searching underwater and the necessity of addressing environmentally sensitive areas (on land and underwater) in an appropriate manner.

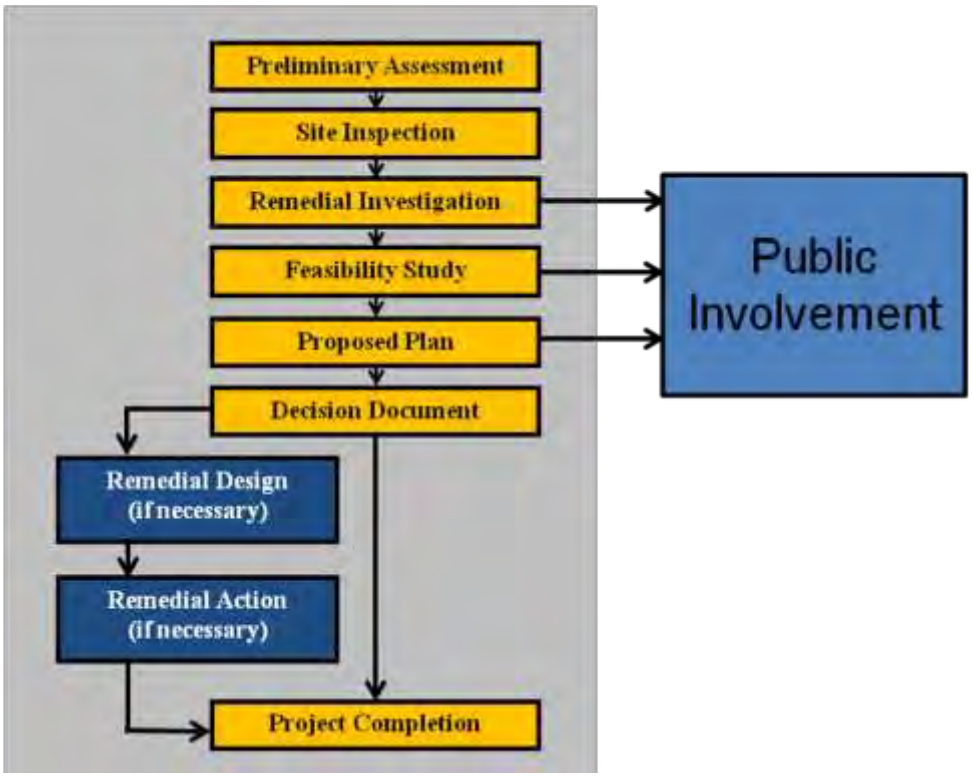

Figure 7: Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Process Chart

The following studies have been completed at Culebra.

- Inventory Project Report (1991)
- Archives Search Report (1995)
- Removal Action at Flamenco Bay Campground (1995)
- Engineering Evaluation and Cost Analysis (EE/CA) (1997)
- Removal Action at Cerro Balcon and Cayo Lobo (2004)
- Underwater Survey Demonstration (2005)
- Supplemental Archives Search Report (2005)
- Revised Inventory Project Report (2005)
- Site Inspection on Munitions Response Sites (MRS) (2005-2007)
- Flamenco Beach and Culebrita Beaches Removal Actions (2006-2007)
- Marine Towed Array Demonstration (2007)
- Northwest Peninsula/Flamenco Beach Inspection (2011)

All of the munitions projects are now in the Remedial Investigation/Feasibility Study (RI/FS) phase. The purpose is to characterize the nature and extent of the potential contamination – in this case munitions. In other words, the Corps wants to define what type of munitions may be present (nature) and where they are (extent). This is not a removal action; it will determine if a removal action is necessary. If a removal action is required, that work will be awarded under a separate contract.

The Remedial Investigation/Feasibility Study includes searching for metallic objects using both analog (hand-held) and digital metal detectors (digital geophysical mapping) along paths known as transects, digging select objects to identify what they are and collecting environmental

samples. The process is similar on both land and water, and the method for each MRS will be explained in the following sections.

After the fieldwork is completed, the contractor analyzes the data and submits a Remedial Investigation/Feasibility Study report which consists of two reports. The Remedial Investigation report explains how the investigation was conducted and the results of the data collected. The Feasibility Study report recommends methods for addressing what was found. Then a Proposed Plan is drafted that presents the preferred alternatives to address what was found. That is presented to the public who will have 30 days to review and comment on it. The selected alternative is specified in the Decision Document.

3.2 MRSs 02, 04, 05 and 07 (Land Areas)

3.2.1 Historical and Current MRS Use

MRS 02 Cerro Balcon and Adjacent Cays

For this investigation, MRS 02 includes Cerro Balcon, Cayo Ballena, Cayo Lobo (also known as Cross Cay), Cayo Lobito, Cayo Del Agua (also known as Water Key), Cayo Yerba, Cayo Raton, Los Gemelos (also known as Twin Rock), Cayo Geniqui (also known as Palada Cay), and Cayo Sombrerito. The Northwest Peninsula of Culebra is also part of MRS 02 but was not investigated as part of this Remedial Investigation.

The Navy conducted fleet maneuvers and fleet landing exercises on MRS 02 (Cays) between 1923 and 1941. During these exercises, the surrounding cays were heavily bombarded with high-explosive bombs, projectiles and rockets, as well as illumination and practice rounds. Training continued through the 1950s and 1960s, and in the early 1960s aerial bombardment was expanded from the Northwest Peninsula, Los Gemelos, and Alcarazza to most of the cays on the east and west side of Culebra.

In 1980, the General Services Administration transferred 776 acres to the U.S. Fish and Wildlife Services to establish the Culebra National Wildlife Refuge. The remaining 936 acres were transferred to the Governor of Puerto Rico in 1982. Currently, the Fish and Wildlife Service manages the cays associated with MRS 02.

MRS 04 Flamenco Lagoon Maneuver Area

The 550-acre MRS 04 includes Flamenco Lagoon and the hillside east of the lagoon. Records show that Combat Range 2, located on the south side of Flamenco Beach, was used for direct and indirect fire of small arms and 81 mm mortars from firing positions on the hillside within MRS 04 during a fleet landing exercise in 1938. Firing positions for 75 mm projectiles used during another fleet landing exercise in 1939 were also located in MRS 04.

The majority of the MRS 04 is currently under private ownership. The Puerto Rico Department of Natural and Environmental Resources manage the property along the beaches on the northeastern side of the site.

MRS 05 Mortar and Combat Range Area

MRS 05 is the largest MRS totaling approximately 2,842 acres. It includes most of the landmass between Resaca Beach and Carenero Point. Historical training records indicate that many of the hills in this area may have been used for direct fire. (Cerro Balcon Mortar Range, part of MRS 02, is surrounded by MRS 05.) Unexploded ordnance has been identified near Cerro Balcon on

portions of the MRS 05 property. MRS 05 includes two 1936 combat training areas leased for combat, target and sweep-of-fire range training. Small arms and 81 mm mortars may have been used at Combat Range 1 in 1937. A 1924 standing barrage training area is also included in the MRS.

Historical records indicate that land within MRS 05 was leased in 1924 from Mr. A. Lugo for gun emplacements and other possible camp sites. The property was returned to Mr. A. Lugo in November 1939. Most of MRS 05 is privately owned, but the U.S. Fish and Wildlife Service manages a large portion of the property surrounding Mount Resaca and the Puerto Rico Department of Natural and Environmental Resources manages the property along the beaches on the northeastern side of the site.

MRS 07 Culebrita Artillery Impact Area

MRS 07 includes the northern portion of Culebrita as well as Cayo Botella (also known as Ladrone Cay). The Marines used this 375-acre area as an artillery impact area between 1936 and the late 1940s. The United States and the United Kingdom used Cayo Botella for an aircraft bombing/rocket target in 1969. Munitions used here included 20 mm projectiles, flares, live and practice bombs up to 500 pounds, and 2.75-inch rockets as well as British bombs and rockets.

Managed by the U.S. Fish and Wildlife Service, Culebrita beaches and trails are used recreationally.

3.2.2 Remedial Investigation/Feasibility Study (RI/FS)

The Corps contracted with EOTI to conduct the Remedial Investigation/Feasibility Study on MRSs 02, 04, 05 and 07. The fieldwork is complete, and EOTI is in the process of drafting the reports. The process for the fieldwork for this investigation included walking along transects (paths) to look for munitions using a metal detector to find metallic objects in the ground, digging up and identifying the metallic objects and collecting environmental samples.

EOTI searched almost 24 miles of transects across MRSs 04, 05 and 07. Additionally, four grids measuring 25 feet by 25 feet were investigated in areas where munitions were identified along the transects. (Grids are square or rectangular areas of various sizes that are selected for further investigation to better characterize the potential extent of the munitions.) One grid was located in MRS 04 and three were located in MRS 05. Portions of MRS 04 and 05 were not investigated because of heavy vegetation, rough terrain and/or right-of-entry allowing the team access to the property was not granted.

No investigations were conducted in MRS 02 because right-of-entry forms were not signed in the Cerro Balcon area and the inability of field teams to access the cays that comprise the remainder of MRS 02. (Field teams were unable to access the cays due to rough seas.) While access to all of the cays is prohibited, Cayo Lobo and Cayo Yerba are more accessible than the other cays.

A total of 466 metallic objects (anomalies) were investigated across MRS 04, 05 and 07. During the investigation, 49 pieces of munitions (called munitions debris) were found, totaling 43 pounds. Munitions debris does not pose an explosive hazard. The munitions debris included items associated with mortars, 3-inch projectiles, 20 mm projectiles, flares, fuzes, small arms ammunition and unidentifiable fragments. Two munitions were found in MRS 07 (a rocket warhead and demolition hose). The remaining metallic objects were pieces of scrap metal such as nails, barb wire and cans, referred to as cultural debris(sometimes called “other” debris).

Figures 8 through 13 show the transects in the MRSs, what was found and environmental sampling locations. Table 2 below quantifies the number of feet of transects, munitions and munitions debris in MRS 04, 05 and 07.

Table 2: Munitions and Munitions Debris Identified at MRS 04, 05 and 07

MRS	Transects	Munitions	Munitions Debris
04	2,512 feet	0	3
05	105,433 feet	0	123
07	9,557 feet	2	19

Environmental Sampling

A total of 28 soil samples and 7 sediment samples were collected from MRS 04, 05 and 07 and analyzed for explosives and metals (antimony, barium, chromium, copper, lead, mercury, and zinc) associated with munitions (known as munitions constituents).

Once samples are collected, they are sent to a laboratory for analysis. The amount detected is compared to the screening level. The screening level is an amount established by the U.S. Environmental Protection Agency (and/or state environmental regulators) above which there could be a risk to humans or the environment. The level is adjusted according to the media (soil, sediment, water) and the exposure (direct human contact in a residential, commercial or industrial setting; potential impact to the environment).

No metals or explosives were detected above the residential screening levels.

Table 3: Environmental Sampling Numbers, MRS and Rationale

MRS	Media	Number	Rationale
04	Soil	6	where munitions debris was located
	Sediment	3	random locations from lagoons and streams
05	Soil	14	where munitions debris was located
	Sediment	2	random locations from lagoons and streams
07	Soil	8	where munitions/munitions debris were located
	Sediment	2	random locations from lagoons and streams

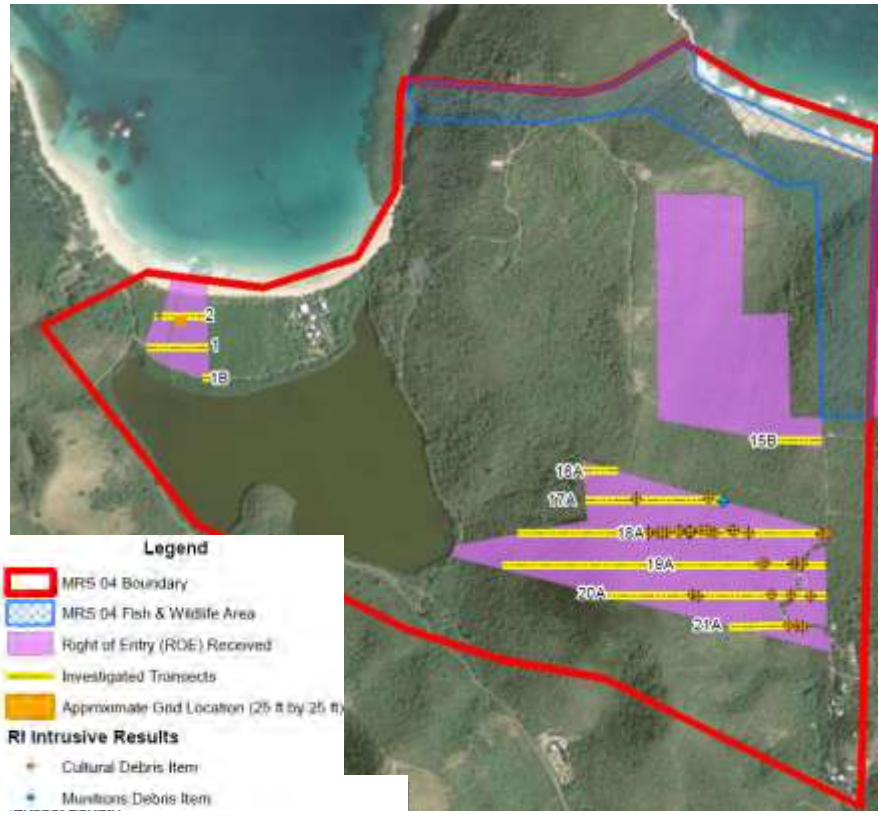

Figure 8: Map of MRS 04 Showing Locations of Transects

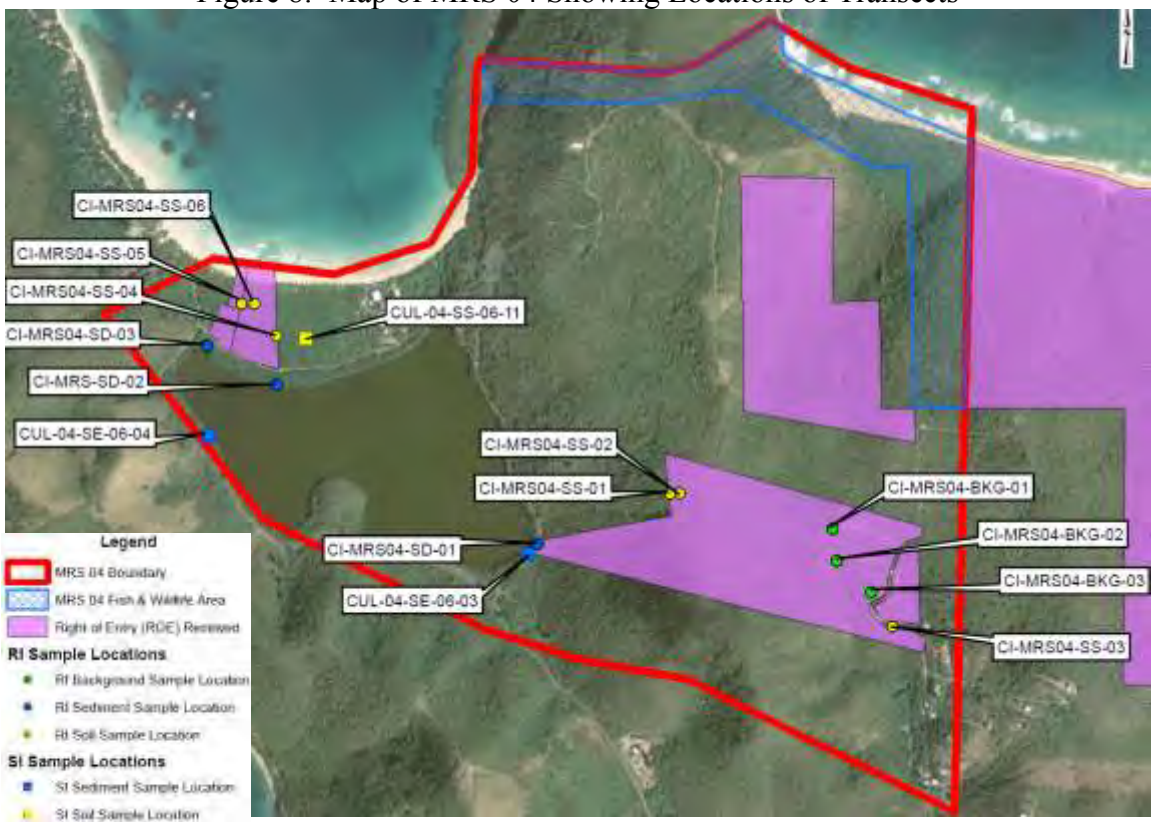

Figure 9: Map of MRS 04 Showing Locations of Environmental Samples

Figure 10: Map of MRS 05 Showing Locations of Transects

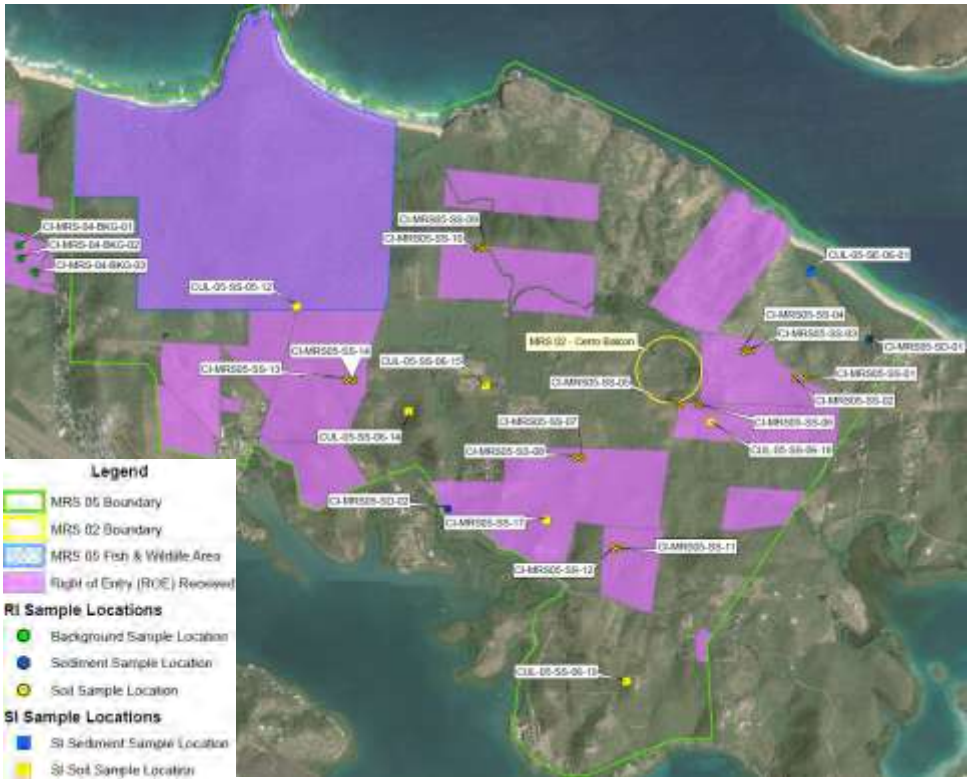

Figure 11: Map of MRS 05 Showing Locations of Environmental Samples

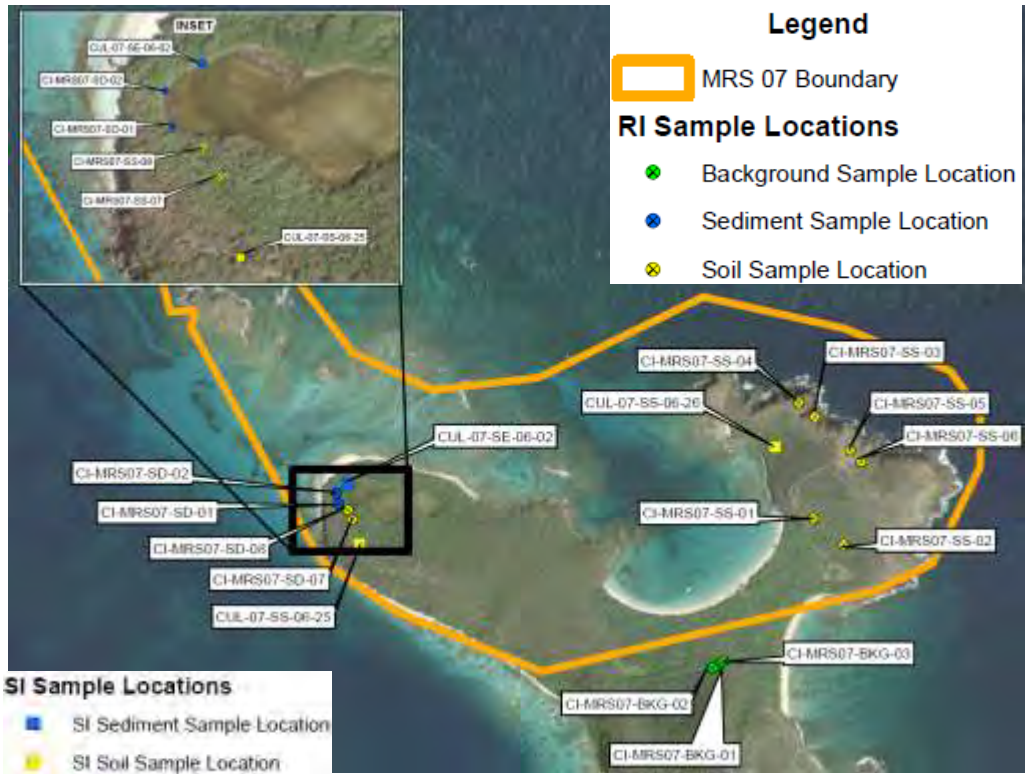

Figure 12: Map of MRS 07 Showing Locations of Environmental Sampling

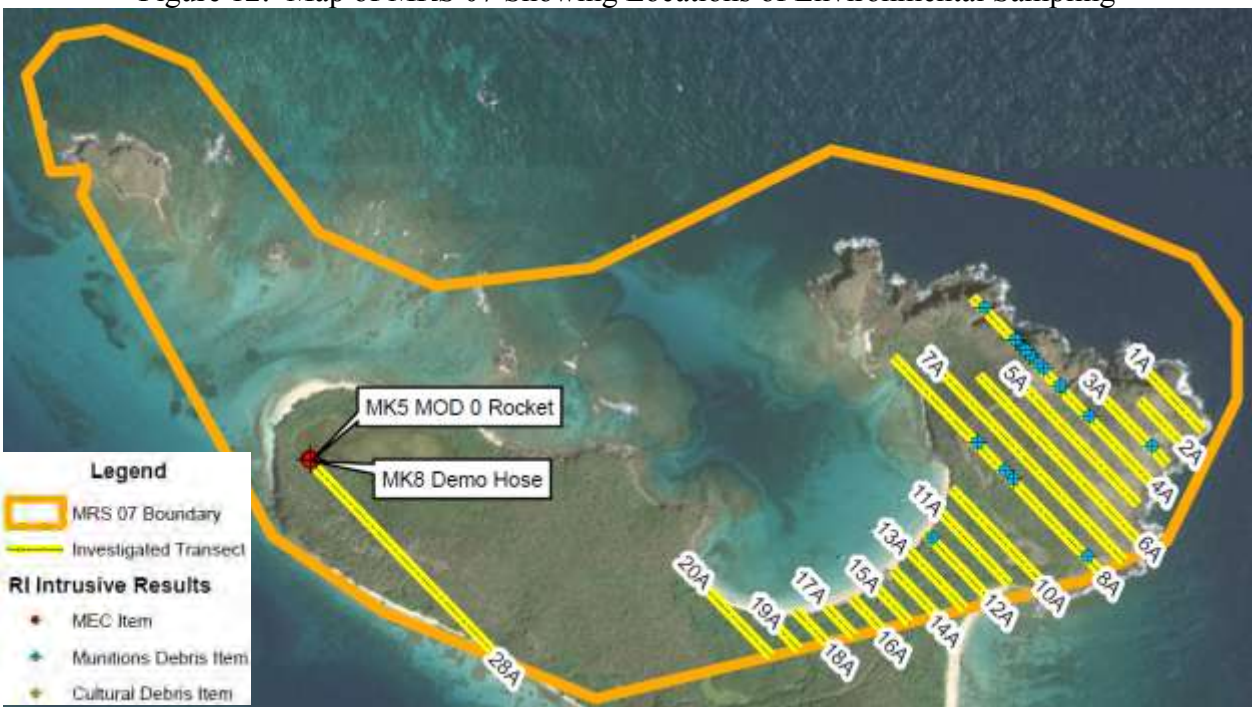

Figure 13: Map of MRS 07 Showing Locations of Transects

Conclusions

MRS 02 includes Cerro Balcon and the cays. Cerro Balcon is landlocked within MRS 05 with different access and receptors than the remainder of the cays. The cays also have varied accessibility. While access to all cays is restricted, Cayo Lobo and Cayo Yerba are known to be frequented by recreational users. The other cays are less accessible and visited less often. Based on this information, it is recommended that MRS 02 be split into three areas: Cerro Balcon MRS; Cayo Lobo and Cayo Yerba MRS; Remaining Cays MRS (Los Gemelos, Cayo Lobitto, Cayo Raton, Cayo Del Aqua, Cayo Ballena, Cayo Geniqui, and Cayo Sombrerito).

The U.S. Fish and Wildlife Service owns a portion of MRS 04 and 05. The land use varies in these areas when compared to the remainder of MRS 04 and 05. Therefore, it is recommended that the U.S. Fish and Wildlife Service property from MRS 04 and 05 be combined into a separate MRS. The rest of the land in MRS 04 and MRS 05 would remain as separate MRSs.

The team has developed a list of potential alternatives to evaluate in the Feasibility Study. Each alternative will be evaluated to determine if it will protect people and the environment and if it can be accomplished. The alternatives being evaluated for each MRS are identified in the sections below. The alternatives are evaluated based upon the following criteria.

- Overall Protection of Human Health and the Environment
- Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)
- Short-Term Effectiveness
- Long-Term Effectiveness and Permanence
- Reduction of Toxicity, Mobility or Volume
- Implementability
- Cost
- Regulatory Acceptance
- Community Acceptance

The Preferred Alternative along with analysis of all the alternatives will be included in the Proposed Plan. Once the Proposed Plan is presented to the community during a public meeting, the public will have 30 days to review and comment on it. It is anticipated that the Remedial Investigation/Feasibility Study Reports will be complete by late summer 2012, and a public meeting to introduce the Proposed Plan would (tentatively) be scheduled for late fall 2012.

MRS 02

The surface of the accessible areas for MRS 02 (not including the Northwest Peninsula) were cleared in previous investigations, so there is a negligible risk of people finding munitions on the surface. However, it is possible that there are munitions in the ground. No munitions were found during the investigation completed in 1997 nor have any residents reported finding munitions. Therefore, if munitions are present, they are probably not in high concentrations. The risk of munitions at Cerro Balcón is considered moderate.

The other areas within MRS 02 were not investigated during this effort. Data was evaluated from previous reports. Munitions or munitions debris have been identified at Cayo Lobo, Cayo Ballena, Cayo Geniqui, and Cayo del Agua. The surface area at Cayo Lobo was cleared previously, so the risk of people finding munitions on the surface is minimal, but munitions may remain in the ground. On other cays, it is possible for munitions to remain on the surface and in the ground. However, because of the limited access to these areas, the risk to people is minimal.

Cayo Lobo and Cayo Yerba are more accessible, so the risk of people encountering munitions is considered moderate.

Alternatives for MRS 02 Inaccessible Cays

- 1: No Action
- 2: Land Use Controls (LUCs) such as signs, public awareness and a permit to dig on public property
- 3: Land Use Controls and a surface removal of munitions along beaches only
- 4: Land Use Controls and a surface removal of munitions from the entire MRS

Alternatives for MRS 02 Cayo Lobo

- 1: No Action
- 2: Land Use Controls (LUCs) such as signs, public awareness and a permit to dig on public property
- 3: Land Use Controls and a subsurface removal of munitions in frequently visited areas (such as beaches and trails)

Alternatives for MRS 02 Cayo Yerba

- 1: No Action
- 2: Land Use Controls (LUCs) such as signs, public awareness and a permit to dig on public property
- 3: Land Use Controls and a surface removal of munitions in frequently visited areas (such as beaches and trails)
- 4: Land Use Controls and a surface/subsurface removal of munitions in frequently visited areas (such as beaches and trails)

Alternatives for MRS 02 Cerro Balcon

- 1: No Action
- 2: Land Use Controls (LUCs) such as signs, public awareness and a permit to dig on public property
- 3: Land Use Controls and a surface removal of munitions of entire MRS
- 4: Land Use Controls and a surface/subsurface removal of munitions of entire MRS

<u>MRS 04</u>

Munitions debris (three fragments from munitions) was identified during this investigation, but no munitions were found. An analysis of previous reports and the current land use indicate there is a low risk for people coming across munitions on the surface or in the ground within MRS 04.

Alternatives for MRS 04 Fish and Wildlife Service Lands

- 1: No Action
- 2: Land Use Controls (LUCs) such as signs, public awareness and a permit to dig on public property
- 3: Land Use Controls and a surface removal of munitions in frequently visited areas (such as beaches and trails)
- 4: Land Use Controls and a surface/subsurface removal of munitions in frequently visited areas (such as beaches and trails)

Alternatives for MRS 04 Land Not Managed by the Fish and Wildlife Service

- 1: No Action
- 2: Land Use Controls (LUCs) such as signs, public awareness and a permit to dig on public property
- 3: Land Use Controls and a surface removal of munitions of the entire MRS
- 4: Land Use Controls and a surface/subsurface removal of munitions of the entire MRS

MRS 05

While munitions debris was identified in MRS 05, no munitions have ever been found or reported within the area. The debris included two .30 caliber cartridges, three 81 mm mortars, a 4.2 inch mortar base and nine fragments from other munitions. Based on the site history, current land use and previous investigations, the risk in MRS 05 of people coming across munitions is low (both on the surface and in the ground).

Alternatives for MRS 05 Fish and Wildlife Service Lands

- 1: No Action
- 2: Land Use Controls (LUCs) such as signs, public awareness and a permit to dig on public property
- 3: Land Use Controls and a surface removal of munitions in frequently visited areas (such as beaches and trails)
- 4: Land Use Controls and a surface/subsurface removal of munitions in frequently visited areas (such as beaches and trails)

Alternatives for MRS 05 Land Not Managed by the Fish and Wildlife Service

- 1: No Action
- 2: Land Use Controls (LUCs) such as signs, public awareness and a permit to dig on public property
- 3: Land Use Controls and a surface removal of munitions of the entire MRS
- 4: Land Use Controls and a surface/subsurface removal of munitions of the entire MRS

MRS 07

Munitions (a rocket warhead and a demolition charge) and munitions debris were found on the surface in MRS 07 during this investigation. The munitions debris included an expended flare, 20 mm projectiles, pieces of fuzes and fragments from a 3-inch projectile.

Additionally, munitions and munitions debris have been found on Culebrita and Cayo Botella during previous investigations. The risk of people finding munitions on or in the ground is considering moderate to high.

Alternatives for MRS 07 Culebrita

- 1: No Action
- 2: Land Use Controls (LUCs) such as signs, public awareness and a permit to dig on public property
- 3: Land Use Controls and a subsurface removal of munitions in frequently visited areas (such as beaches and trails)

Next Step

EOTI is completing the Feasibility Study which will analyze alternatives for addressing each MRS. Each alternative will be evaluated to determine which is the most protective of people and

the environment. The Proposed Plan will present the Preferred Alternative, based upon the analysis in the Feasibility Study. The Proposed Plan will be presented at a public meeting, and the public will have 30 days to review and comment on the alternatives. The Remedial Investigation/ Feasibility Study Report should be complete by late summer 2012, and the public meeting for the Proposed Plan should be late fall 2012.

3.3 MRSs 06, 08, 09, 10, 11 and 13 (Land Areas)

3.3.1 Historical and Current MRS Use

MRS 06 Artillery Firing Area

MRS 06 is on the eastern end of Culebra extending from a point at the most northern tip of Mosquito Bay, northeast to a point just west of Duck Point, and east to the end of the island. This area consists of 826 acres and was used by the Marines for artillery firing points for exercises conducted between 1922 and the 1940s. Exercises involving small arms, Stokes mortars, 75 mm howitzers, 3-inch mortars, and 37 mm explosive rounds were conducted in Mosquito Bay in 1936. Beginning in 1936, the Marines fired 75mm projectiles from a firing point inland of Mangrove Bay at Weather Channel near Culebrita. Additionally, a 1937 U.S. Fleet Landing Exercise 4 involved use of the lagoon area at the back of Mosquito Bay. In 1939, the Marines fired from 1,000 yards northeast of Mosquito Bay toward the cays to the east. From Mosquito Bay, 37 mm rounds were fired west to water targets between Point Vaca and Snapper Shoal.

Currently, this MRS is almost entirely privately owned except for the water line, which is owned by the Puerto Rico Department of Natural and Environmental Resources (DNER) and US Fish and Wildlife Service (USFWS).

MRS 08 Cayo Norte Impact Area

MRS 08 includes only Cayo Norte and covers approximately 306 acres of land. The Marine Corps leased Cayo Norte for training. However, it has not been determined from historical records whether the site was ever used for training. The property was leased from Mrs. Alma Hasselroth in 1924 for erecting artillery targets for 75 mm artillery practice. This lease was ended as part of the agreement between the Navy and Mayor of Culebra in 1971. Notes from a Fleet Landing Exercise indicate that impact of Cayo Norte was planned but difficulties clearing people and cows from the island kept it from being used for an impact area. The surrounding waters to the east of the Cayo Norte may contain 5-inch high velocity aircraft rocket (HVAR) from adjacent MRSs. No unexploded ordnance has previously been identified on Cayo Norte.

Cayo Norte is privately owned with plans for residential development.

MRS 09 Soldado Point Mortar and Bombing Area

MRS 09 consists of 328 acres on the very southern tip of the southern peninsula of Culebra. Training exercises on Soldado Point and the bay northwest of Soldado Point during the 1930s and 40s included mortar firing, aerial bombing and strafing. The Supplemental Archives Search Report (ASR) mentions that 30 and 1,000 pound bombs were dropped in this area. Munitions used in the bay included 30-pound fragmentation bombs, 100-pound demolition bombs, 81 mm mortars and small arms.

The Governor of Puerto Rico acquired this property in a quitclaim deed from the Secretary of the Interior in 1982. The Puerto Rico Department of Natural and Environmental Resources manages the property. Several privately owned structures have been built along the water at Sueno cove.

MRS 10 Defensive Firing Area No. 1

MRS 10 comprises 547 acres on the southern peninsula of Culebra, south of the town of Dewey and north of Soldado Point. Marines conducted amphibious landing and ground maneuver training using 81 mm mortars on the beaches and hills in this area from the 1920s through the 1940s. Specifically, the hill on the north end of the MRS has been listed as a 1935 area of direct fire from 3 inch projectiles. Snug Bay was shown as a 1935 water area for direct fire. Additionally, a 1924 outpost and ammunition storage area was located on the north end of the MRS near Snug Bay.

MRS 10 has many residences and businesses. Most of the development is near the town of Dewey on the north end of the site, but houses are scattered throughout the southeastern side of this MRS. The land is almost entirely privately owned except for government properties such as the police and fire stations.

MRS 11 Defensive Firing Area No. 2

The approximately 719 acres of MRS 11 are on the west side of Culebra between the Northwest Peninsula (Flamenco Beach) and the town of Dewey. Several training exercises were conducted in this area including firing 75 mm and 155 mm rounds from Firewood Bay at Mono Cay and portions of Cayo de Luis Pena. During a Fleet Landing Exercise in 1936, small arms and 81 mm mortars were fired. A Fleet Landing Exercise in 1941 included boatto-beach firing of 5-inch and 6-inch projectiles.

Most of the southern portion of this MRS has been extensively developed for residential use. The areas along the beach and the west side of this site are less developed. The land is privately owned with some government property such as the school, hospital and government buildings.

MRS 13 Cayo Luis Pena Impact Area

MRS 13 is Cayo de Luis Pena. It includes of total of 864 acres, of which 484 acres are on land (the remaining acreage is underwater). Luis Pena is about one quarter mile off the western coast of Culebra. The northern tip of this island was used as a firing target during Marine exercises conducted between 1924 and 1941. Records show that 75 mm projectiles were fired at the Cayo in 1924 and that 155 mm, 37 mm, 8-inch and 6-inch rounds may have also been used. In the 1960s, an observation point was erected on the hill top on Luis Pena, including a run-in line, helipad, and living quarters.

Cayo de Luis Pena is part of the Culebra National Wildlife Refuge that the U.S. Fish and Wildlife Service manages.

3.3.2 Remedial Investigation/Feasibility Study

USA Environmental (USAE) has the contract for the land and water areas for MRSs 06, 08, 09, 10, 11 and 13. The fieldwork for the land portion was completed in October, and USAE is drafting the Remedial Investigation/Feasibility Study reports. (The land and water reports will be separate.) Their method varied according to the area being investigated (beaches or land). On land, USAE:

- conducted digital geophysical mapping (DGM) on transects (paths);
- analyzed the data to create density maps to identify where to place grids;
- obtained geophysical data in the grid areas;
- investigated selected anomalies in grid; and
- collected environmental samples.

Crews searched almost 20 acres of transects and investigated grids totaling 4.44 acres. Grids are 50 feet by 50 feet squares that are investigated based upon the low, medium or high density (amount) of metallic objects found along transects. (Figure 14 shows crews investigating a grid using a digital geophysical magnetometer.) In MRS 13, because of the concern about cutting vegetation, the investigation was limited to visual, surface sweeps along established trails and handheld (analog) metal detectors on the beaches.

Figure 14: Crews Using a Digital Geophysical Magnetometer to Investigate a Grid

The teams dug 1,882 items; the majority of the items were non-munitions related (miscellaneous metallic debris and rocks with iron in them). Two flares (considered munitions) were found in MRS 09. Munitions debris was also identified in MRS 06, 08, 09, 11 and 13 (4, 12, 8, 17, 12 in MRSs 06, 08, 09, 11 and 13, respectively). No munitions or debris were found in MRS 10.

Table 4: Results of Investigative Digs

MRS	Munitions	Munitions Debris	Other Metallic Debris	Metallic Rocks	Seed Items*
06	0	4	118	310	31
08	0	12	27	201	9
09	2	8	41	205	18
10	0	0	65	161	20
11	0	17	82	104	39
13	0	12	304	72	20
Total	**2**	**53**	**637**	**1053**	**137**
Seed Items are objects the quality control person plants to be sure the equipment is operating properly.					

Figure 15 through Figure 20 show the location of transects and the grids in each of the MRSs that USA Environmental investigated.

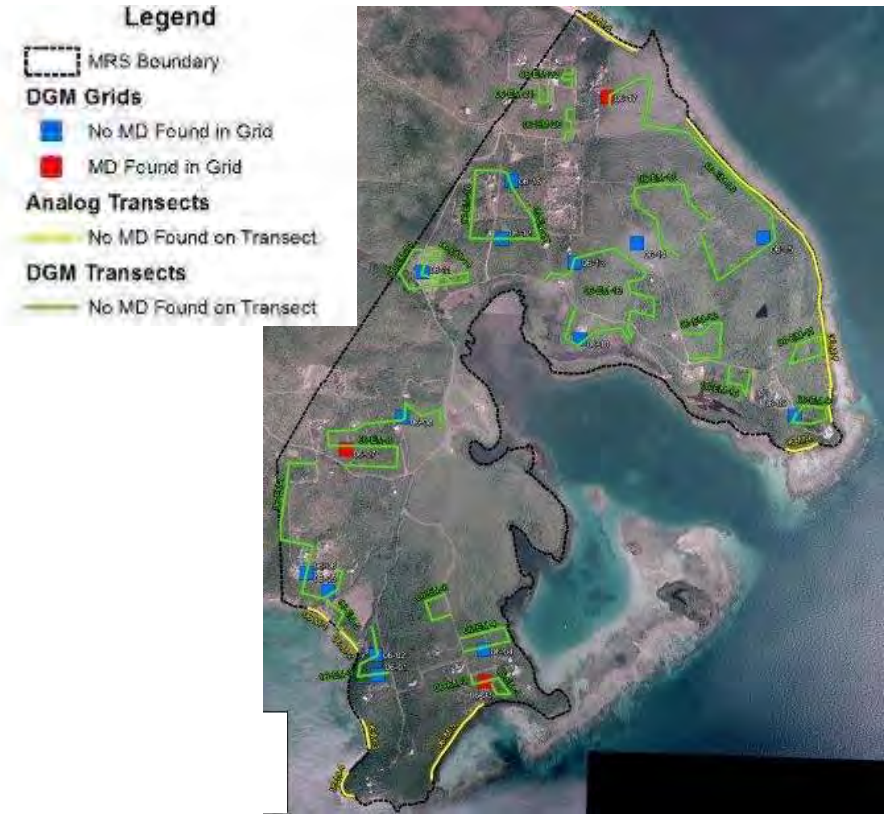

Figure 15: Map of MRS 06 Showing Transects and Grids

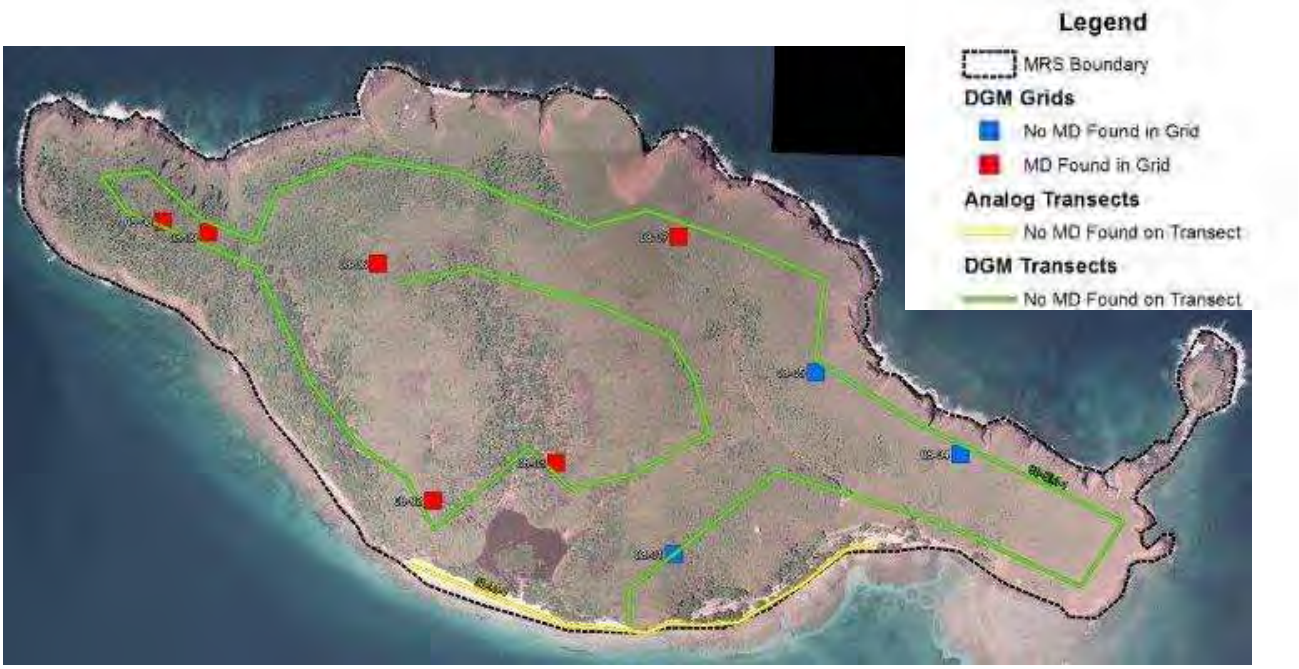

Figure 16: Map of MRS 08 Showing Transects and Grids

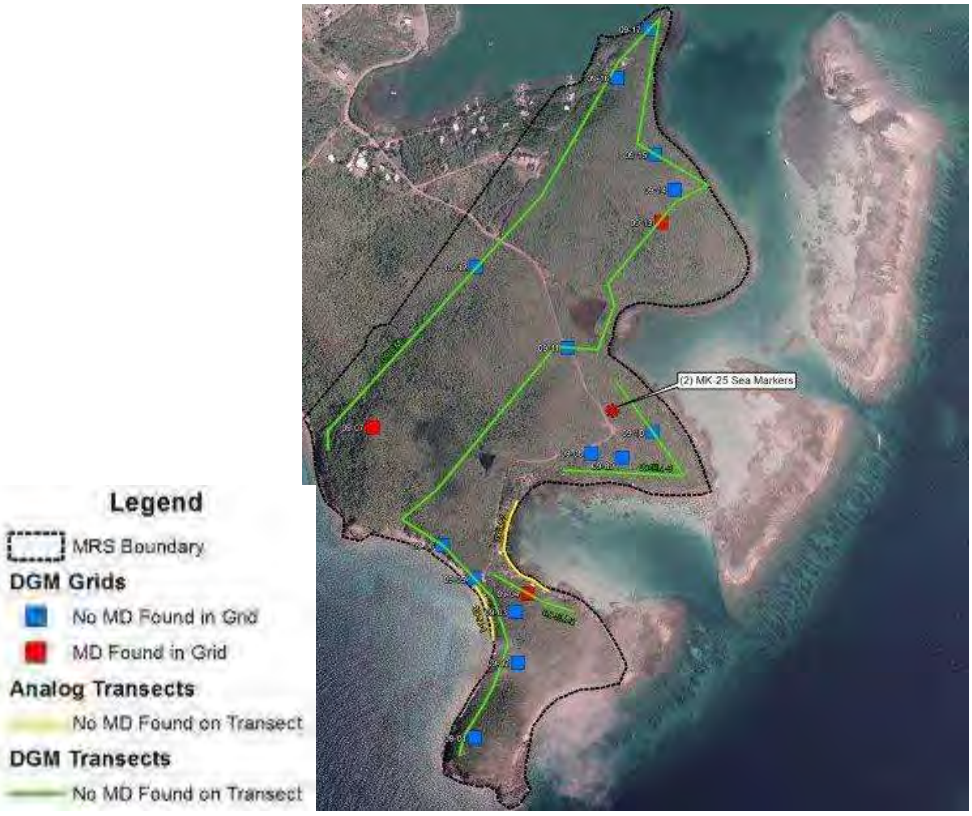

Figure 17: Map of MRS 09 Showing Transects and Grids

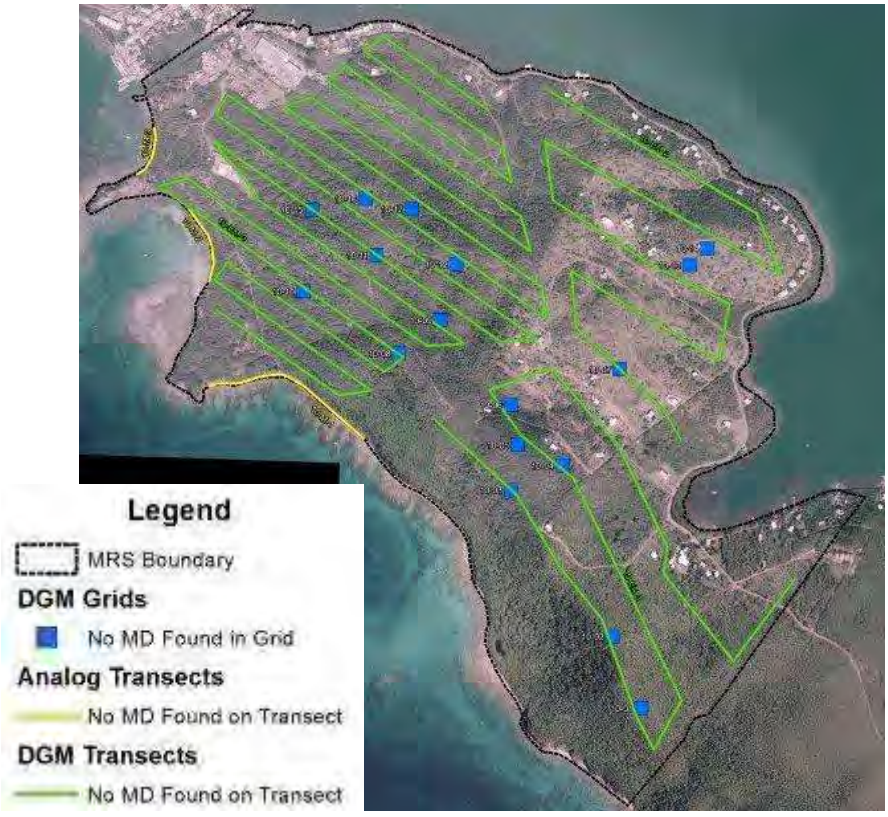

Figure 18: Map of MRS 10 Showing Transects and Grids

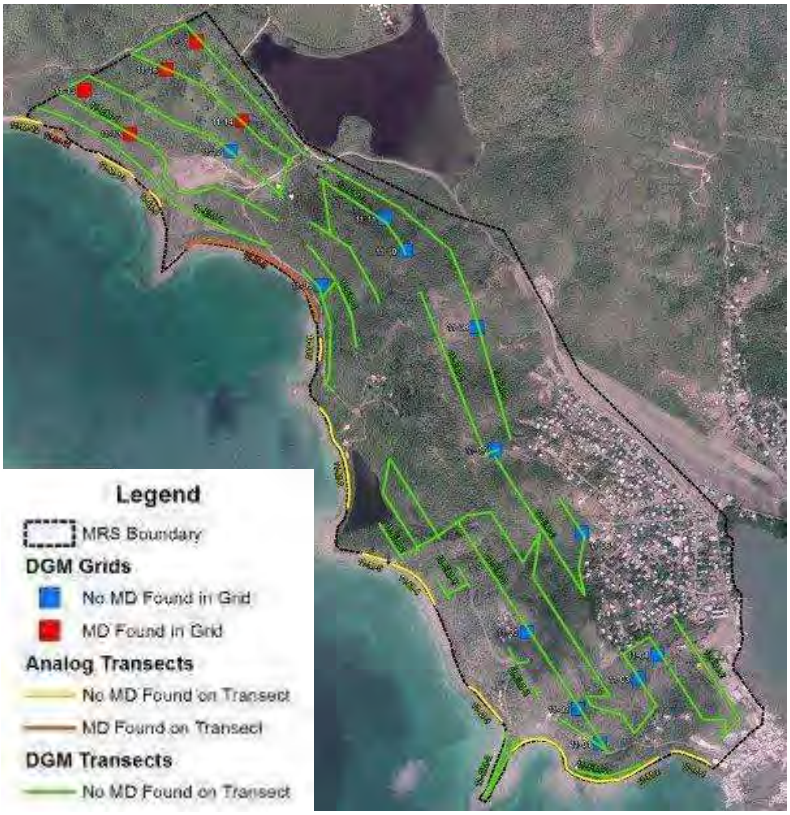

Figure 19: Map of MRS 11 Showing Transects and Grids

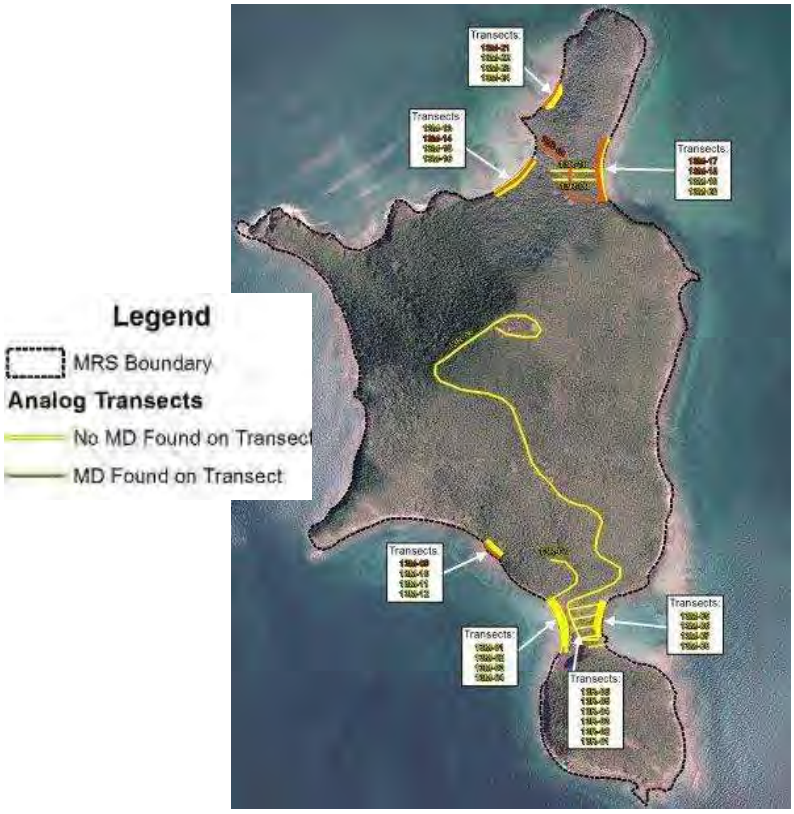

Figure 20: Map of MRS 13 Showing Transects and Grids

Environmental Sampling

Fieldwork activities included collecting samples from soil, sediment and surface water to test for metals and explosives associated with munitions (known as munitions constituents).

Table 5: Environmental Sampling Numbers, MRS and Rationale

MRS	Media	Number	Rationale
06	Soil	4	where munitions debris was located
08	Soil	12	where munitions debris was located
09	Soil Surface Water Sediment	8 3 3	where munitions/munitions debris were located/destroyed water and sediment samples down gradient from munitions
11	Soil	28	where munitions debris was located
13	Soil	32	where munitions debris was located

Once collected, the samples are sent to a laboratory for analysis. The amount detected is compared to the screening level. The screening level is an amount established by the U.S. Environmental Protection Agency (and/or state environmental regulators) above which there could be a risk to humans or the environment. The level is adjusted according to the media (soil, sediment, water) and the exposure (direct contact with people in a residential, commercial or industrial setting; potential impact to the environment).

The laboratory results do not indicate a risk to people (human health) or the environment (ecological) from munitions constituents.

Conclusions

Based on the results of the fieldwork, there is not a significant hazard from munitions in MRSs 06 and 10. There is the potential for people to encounter munitions at MRS 08 Cayo Norte Impact Area, MRS 09 Soldado Point Mortar and Bombing Area, MRS 11 Defensive Firing Area 2 (North) and MRS 13 Cayo Luis Pena Impact Areas.

The team has established alternatives, and all the alternatives will be evaluated for each MRS to determine which alternative will be the most protective for people and the environment. The alternatives that will be evaluated are as follows.

- 1: No Further Action
- 2: Educational Awareness with Five-Year Reviews
- 3: Fencing/Signage, Educational Awareness, and Five-Year Reviews
- 4: Remove Munitions on the Surface in High Use Areas, Fencing/Signage, Educational Awareness, and Five-Year Reviews
- 5: Remove Munitions on the Surface and Subsurface in High Use Areas, Fencing/ Signage, Educational Awareness, and Five-Year Reviews

The alternatives will be evaluated based upon the following criteria.

- Overall protection of human health and the environment
- Compliance with applicable or relevant and appropriate requirements (ARARs)
- Short-term effectiveness
- Long-term effectiveness and permanence
- Reduction of toxicity, mobility or volume
- Implement ability
- Cost
- Regulatory acceptance
- Community acceptance

The analysis of these alternatives will be included in the Feasibility Study. The Proposed Plan will present the Preferred Alternative, based upon the analysis in the Feasibility Study. The Proposed Plan will be presented at a public meeting, and the public will have 30 days to review and comment on the alternatives.

3.4 Underwater Areas

3.4.1 Background

The areas colored orange on Figure 21 indicate the underwater areas in Culebra that need to be investigated. There are two water MRSs (03 and 12). MRS 03 is Flamenco Bay, and Luis Pena Channel is MRS 12. There are additional underwater areas that are included within other MRSs such as 02, 07, 09 and 13.

The Corps has awarded three contracts for underwater investigations. USA Environmental is investigating the water areas around MRS 09 (Soldado Point) and MRS 13 (Luis Pena). USA Environmental has teamed with Parsons to do the underwater investigation around Culebrita (MRS 07) and adjacent cayos (MRS 02). TetraTech has the contract to investigate MRSs 03 and 12.

The U.S. Army Corps of Engineers has developed a "Standard Operating Procedures for Endangered Species Conservation and their Critical Habitat during Underwater Investigations" for this project. This Standard Operating Procedure is included in Appendix A. All contractors conducting underwater investigations are required to follow it.

Fieldwork in all the underwater MRSs should begin in the fall of 2012.

Figure 21: Underwater Areas with Potential for Munitions

3.4.2 Process

The process for the underwater investigation is being coordinated with Puerto Rico Environmental Quality Board, the U.S. Fish and Wildlife Service, the National Marine Fisheries, the National Oceanic and Atmospheric Administration, the U.S. Environmental Protection Agency and other related agencies and involves several steps which include the following.

- Environmental Baseline Survey
- Non-Intrusive Investigation of Underwater Transects
- Intrusive Investigation of Suspect Items
- Environmental Sampling

The contractors will draft a work plan for each of these steps that must be approved by the coordinating agencies before the contractors begin that phase of work.

Environmental Baseline Survey

The first step in the underwater Remedial Investigation is an Environmental Baseline Survey. This survey is an in-depth study designed to gather the data necessary to determine the underwater habitat within Culebra. The team will identify endangered species and their habitat, coral reefs, sea grass beds and other areas that need to be avoided. Using that information, the

contractors will be able to determine where to place their transects for the underwater geophysical survey (underwater metal detection).

Steps to complete the Environmental Baseline Survey include the following.

- Document the bathymetry within the water portions of the MRSs (hydrographic surveys)
- Verify the types of benthic habitats that are located within the proposed investigation areas (visual underwater investigation)

The teams will first use Multi-Beam Bathymetry and Side Scan SONAR (sound navigation and ranging) to define the conditions on the seafloor; this is known as conducting hydrographic surveys. (Hydrography refers to the measurement and description of features on the seafloor.) Multi-Beam Bathymetry is a method of mapping the seafloor using beams of sound. The sound beams bounce off the seafloor at different angles and are received at slightly different times. A computer processes the signals to determine water depths and makes a bathymetric map. (Bathymetry or bathymetric refers to underwater maps that show the terrain – similar to a topographic map on land; please see Figure 22.)

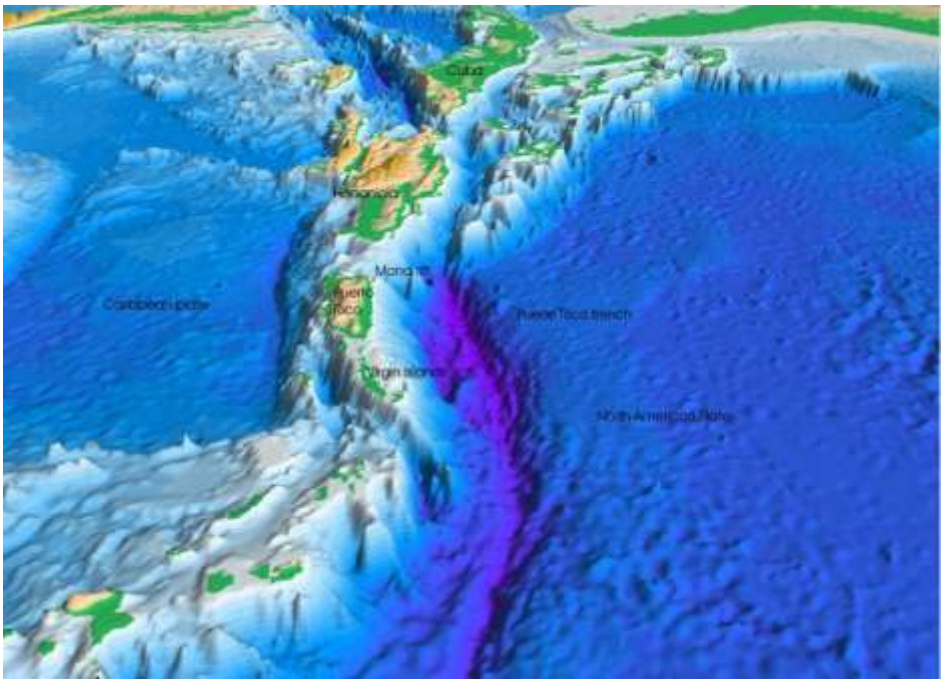

Figure 22: Example of a Bathymetry Map

Side scan sonar uses sound waves to locate and identify objects in the water. The sonar transmits a sound and analyzes the echo signal to a computer on a boat. The strength of the echo creates a picture of the ocean floor. Side scan sonar typically consists of three basic components: towfish, transmission cable and topside processing unit. Figure 24 shows the basic components, and Figure 25 presents an example of the sonar output.

After the hydrographic surveys are complete, the contractors will do a visual underwater survey using a remotely operated vehicle (ROV) with a global positioning system (GPS) and an underwater camera (see Figure 23). This allows the teams to verify the data collected in the hydrographic surveys. A marine scientist will review the data and will identify endangered

species and critical habitat. In shallow areas, snorkelers will do visual surveys of the seafloor to determine marine habitat and to collect underwater data (water depth, site conditions, etc.).

Figure 23: Remotely Operated Vehicle Used for Underwater Investigations

All of the data will be incorporated into an Environmental Baseline Survey Report which will be used to determine where to establish the transects for the Remedial Investigation. The Environmental Baseline Survey Report will include the following.

- Documentation of underwater habitat specifically identifying endangered species/critical habitat
- Determination of potential effects of transects
- Discussion of proposed mitigation processes

This report will be shared with the Culebra Restoration Advisory Board when it is completed.

If munitions are located as part of this initial effort, they will not be touched, moved or detonated during this phase.

More Details on Hydrographic Mapping

The contractors will do hydrographic surveys using several tools including multi-beam bathymetry (MBS) and side scan sonar (SSS). Hydrographic surveys will provide 100 percent coverage in accordance with the Environmental Baseline Survey quality objectives. Data collection will be the primary use of hydrographic data and will be used to create benthic contour maps for referencing in subsequent project activities (underwater geophysical and intrusive investigations). Hydrographic data will help assure the appropriate geophysical survey equipment will be use in the investigation. The data from the preliminary survey and previous underwater visual surveys will be used to refine the location of the geophysical survey transects to minimize environmental impact.

Figure 24: SONAR Components

The surveys will be conducted from a boat within each MRS in order to determine the actual water depths within the survey area and detect potential hazards (coral reefs or rock outcrops) for the geophysical survey equipment. An echo sounder will be used to verify how deep the water is. Side scan sonar will be used to acoustically image the seafloor to detect the presence of obstructions, debris, and help locate environmentally sensitive areas. Teams will also create benthic contour maps to use in other project activities.

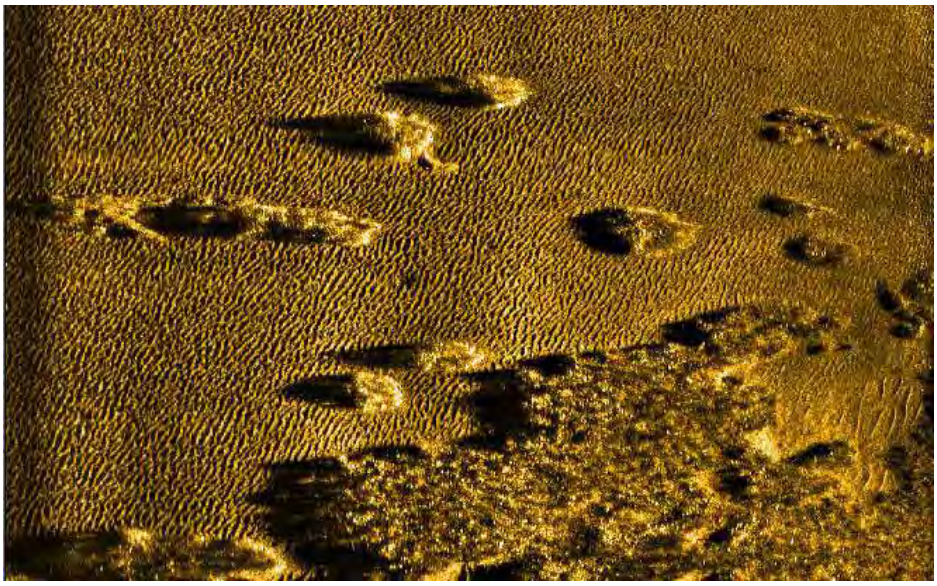

Figure 25: Example of Side Scan Sonar Showing Underwater Features

More Details on Visual Underwater Investigations

The contractors will do an underwater visual survey within the water areas of each MRS. Visual and positional data will be collected using a combination of a GPS-integrated underwater video system and remotely operated vehicle (ROV). The underwater visual survey will be conducted in accordance with the USACE "Standard Operating Procedures for Endangered Species Conservation and their Critical Habitat during Underwater Investigations."

Where water depths and site conditions allow access by small boat, a pole/hull-mounted underwater video camera will be used and monitored as the vessel progresses down each transect. The boat will be accurately maneuvered through use of a RTK-DGPS-integrated Personal Digital Assistant (PDA) displaying the transect line. An unexploded ordnance technician will monitor the video display real time and/or will review the video to identify potential munitions. Digital video footage will be recorded onto a laptop computer, noting the latitude and longitude of the camera position. A marine biologist will monitor the video feed to make preliminary notes of the various underwater benthic habitats. The ordnance technician will note any suspected munitions that may be encountered during the survey. Additionally, a marine biologist will review of the video footage to compare the visual data to documented underwater benthic habitat descriptions for Puerto Rico.

Items that reflect characteristics of munitions will be reacquired and investigated further with the remotely operated vehicle with a camera in order to capture the position, to record video footage of the item, and to document the surrounding underwater environment.

Where water depths and site conditions do not allow access by small boat, a visual survey will be completed using the ROV deployed from shore, or from a support boat in deeper water.

The boat operator will carry and consult appropriate NOAA nautical charts, NOAA benthic habitat maps and aerial photographs to locate potential coral reefs, colonized hard bottom and sea grass areas. Combining information from aerial photographs with hydrographic data will help to ensure that nautical charts are accurate. The boat operator and survey team will maintain a vigilant watch for coral reefs, colonized hard bottom and sea grass areas to avoid running

aground or striking protected species. Real-time data (e.g. GPS with nautical chart and depth finder on boat) will be continuously observed to verify water depths and vessel location. From the water's surface, some coral areas may appear golden-brown. These areas will be avoided to keep from running aground. The bottom of the boat will stay at a minimum of 4 feet from the top of coral. It will stay away from areas with corals and sea grasses. Operations will be conducted in such manner that bottom scour or prop dredging will be avoided when corals or sea grasses are present.

Geophysical Survey of Underwater Transects

After the Environmental Baseline Survey is complete, the contractors will identify where to place transects (paths) for the teams to do the underwater geophysical survey. The transect design will specifically avoid critical habitat and endangered species. As they do on land, the teams will use electromagnetic instruments to look for munitions. The type of equipment used can be modified for the specific area being searched in order to avoid contact with sensitive environments. A separate work plan will be drafted for this phase of work, and the stakeholders must approve this plan prior to the initiation of this work. After the area is mapped, technical experts will evaluate the data and will select specific items to be investigated further.

Figure 26 is a photograph taken from a video that USA Environmental captured in May 2011 during their initial investigation. Figure 27 through Figure 34 on the following pages show maps of the underwater investigation areas.

Figure 26: Photograph from the Underwater Survey at Cayo Luis Pena Showing a 5" Illumination Round

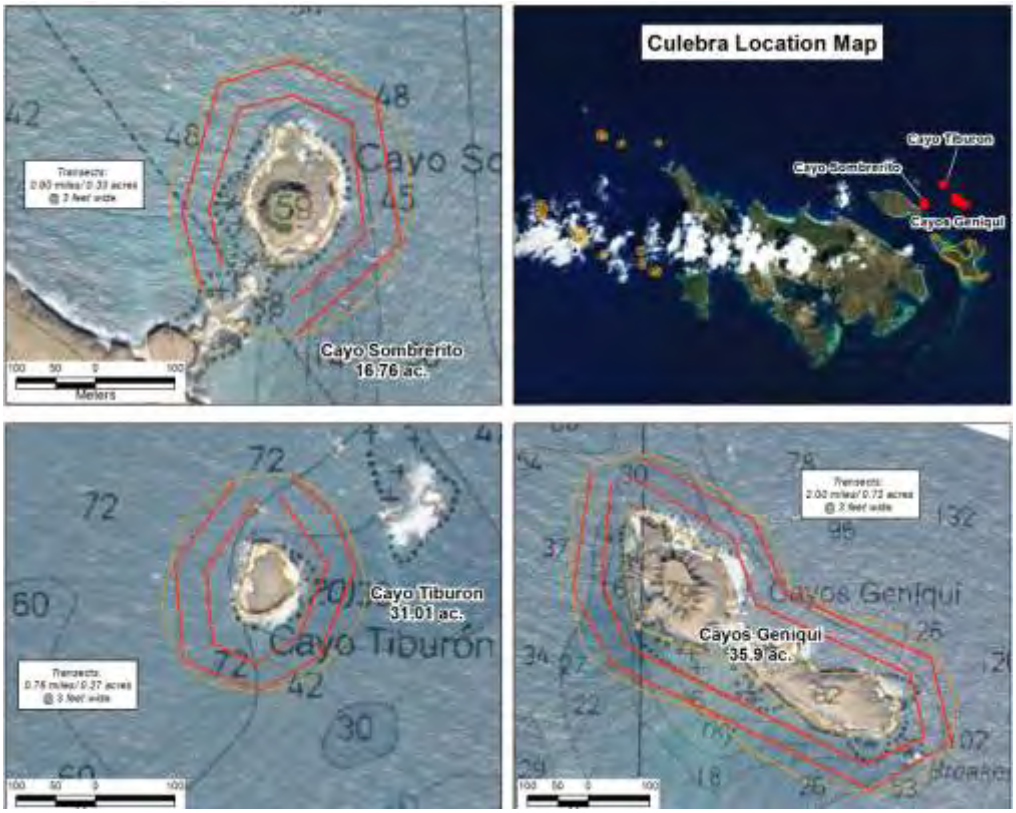

Figure 27: Map Showing Transect Design for Cayos Somberito, Tiburon and Genuqui

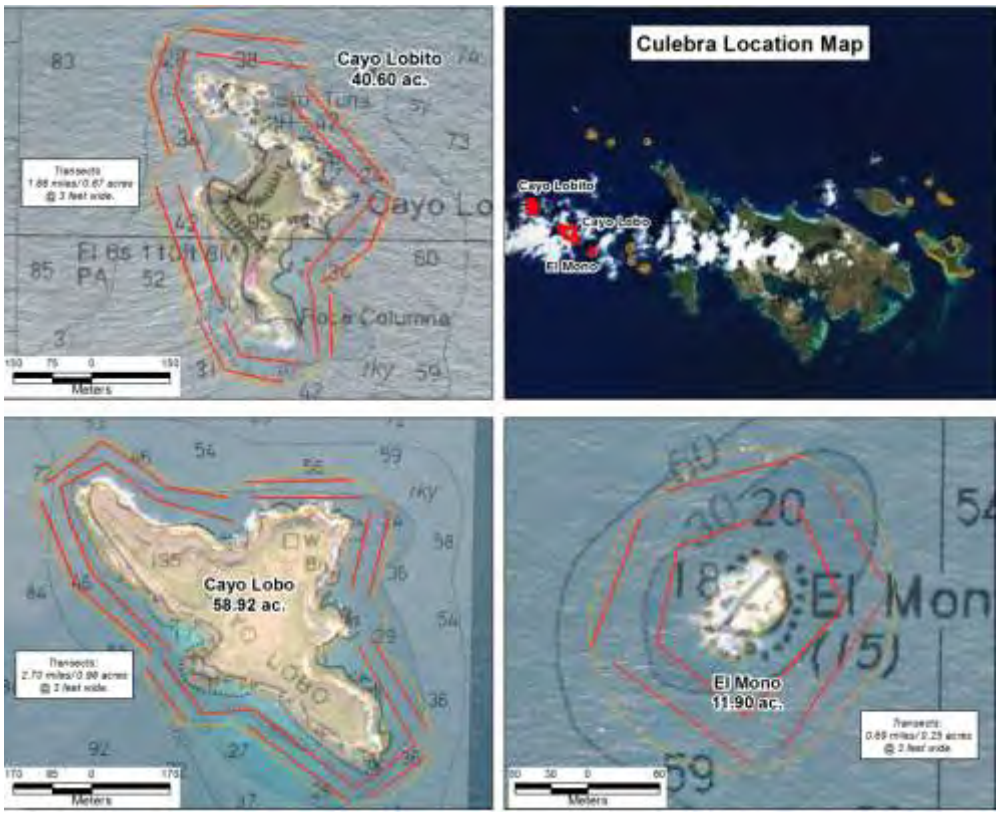

Figure 28: Map Showing Transect Design for Cayos Lobito, Lobo and El Mono

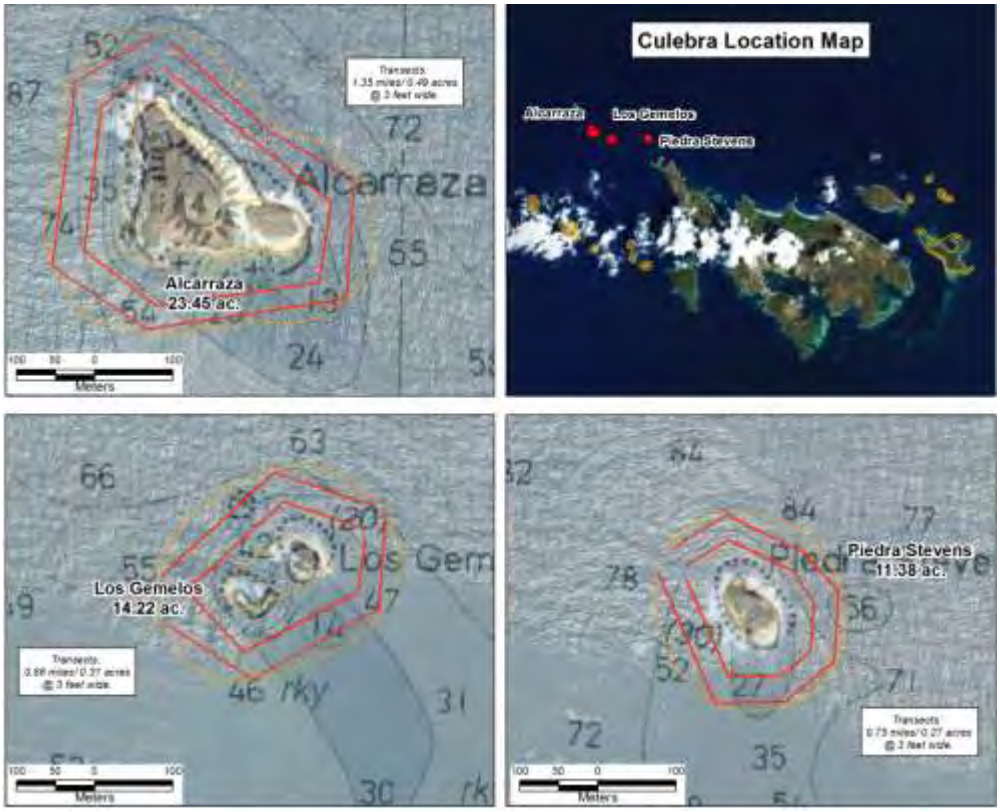

Figure 29: Map Showing Transect Design for Alcarraza, Los Gemelos and Piedra Stevens

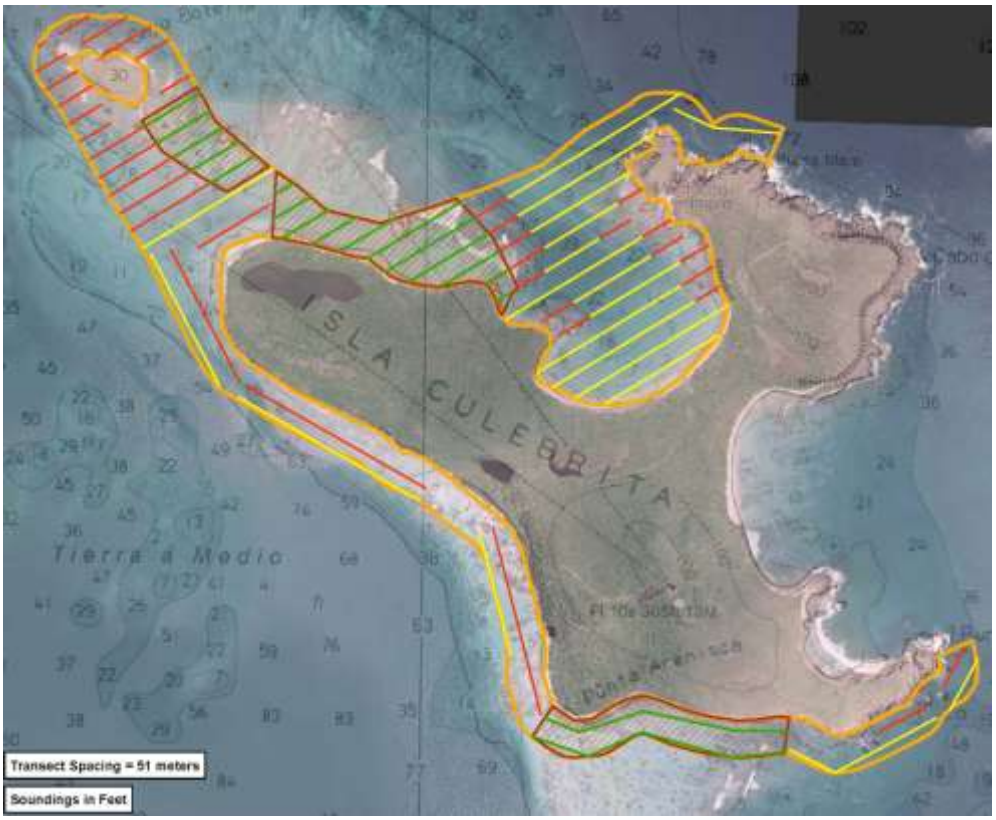

Figure 30: Map Showing Transect Design for Culebrita

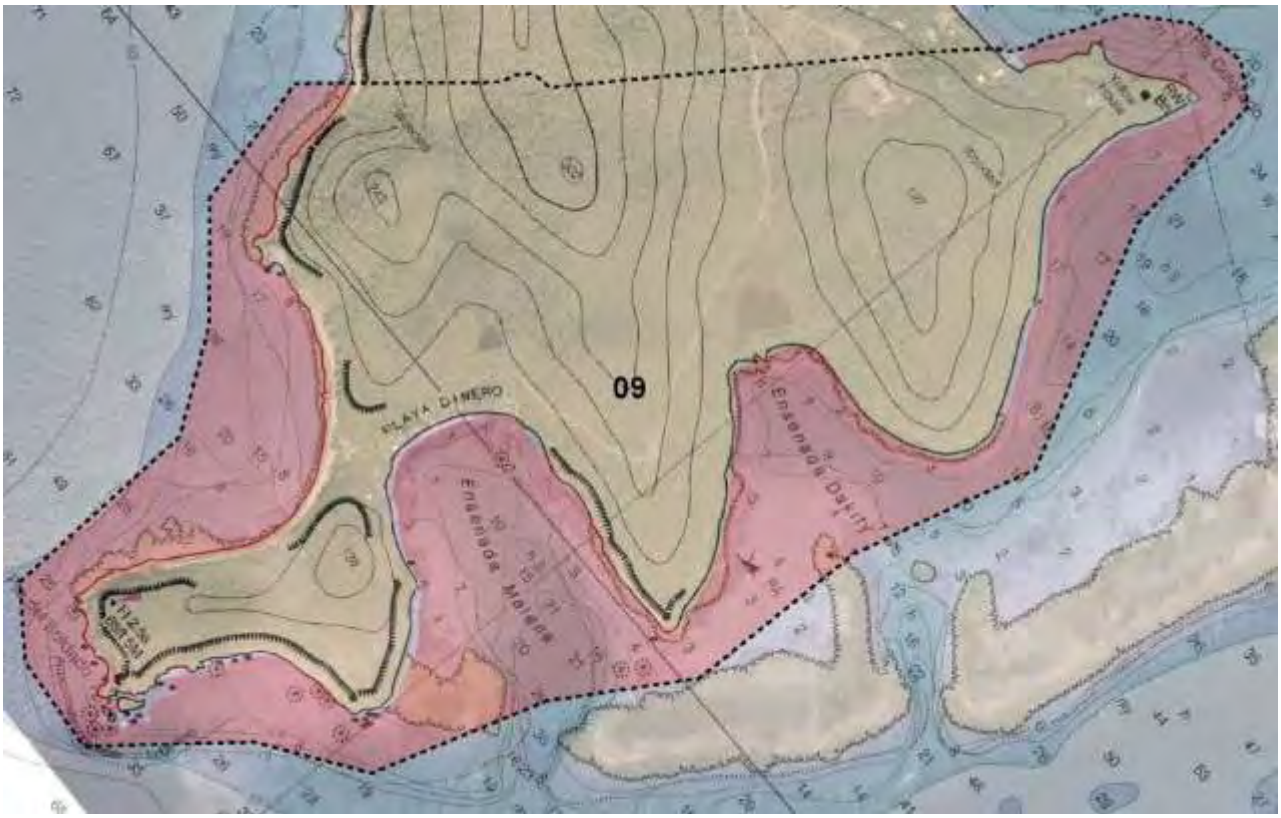

Figure 31: Map of MRS 09 Showing the Underwater Investigation Areas

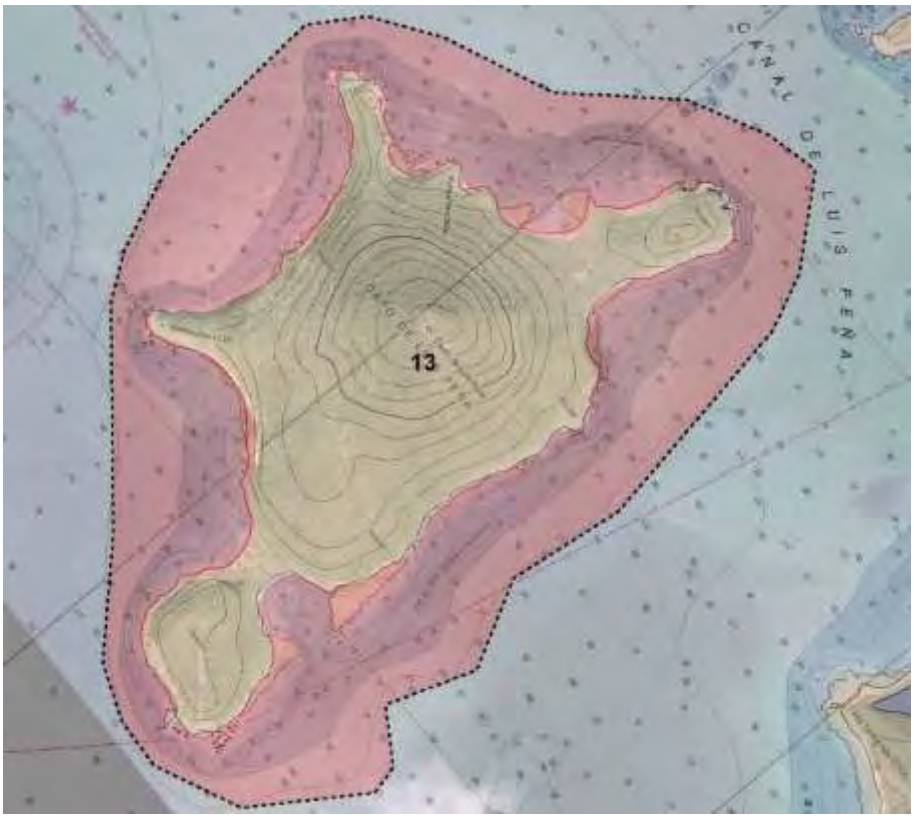

Figure 32: Map of MRS 13 Showing the Underwater Investigation Areas

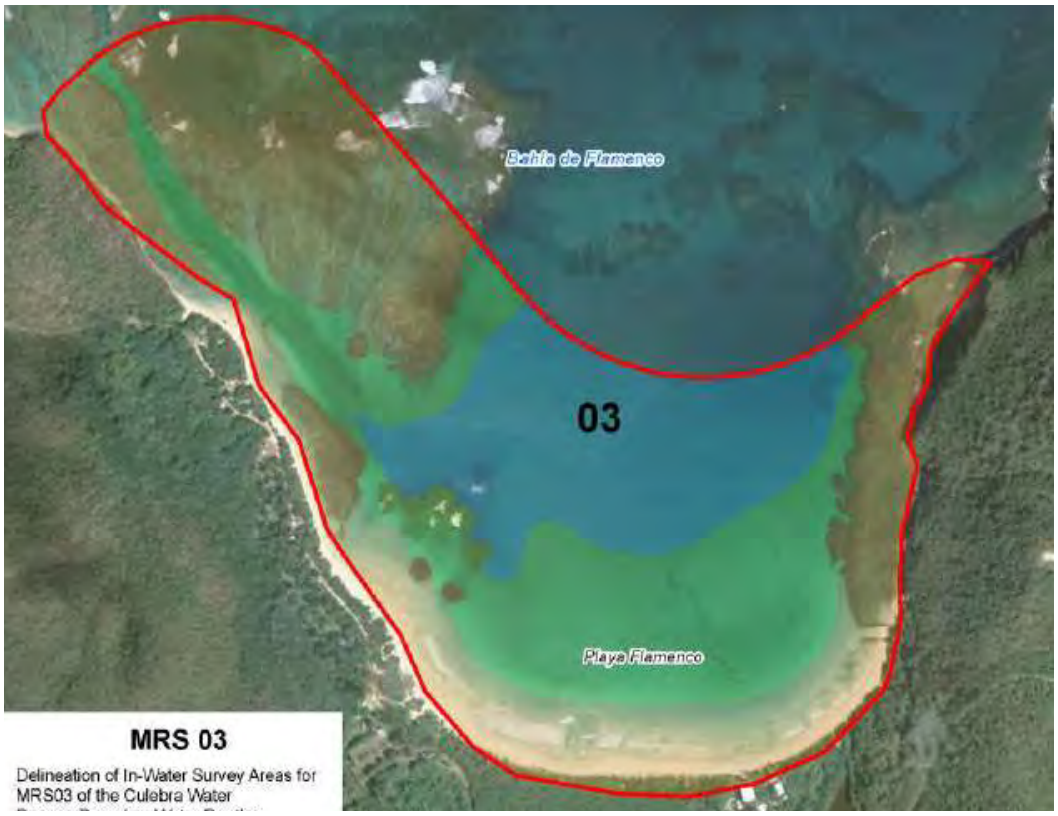

Figure 33: Map of MRS 03 Showing Underwater Investigation Areas

Figure 34: Map of MRS 12 Showing Underwater Investigation Areas

Digging Underwater

As noted previously, a separate Work Plan will be drafted for this phase of work. The Work Plan will be reviewed by the Puerto Rico Environmental Quality Board, the U.S. Fish and Wildlife Service, the National Marine Fisheries, National Oceanic and Atmospheric Administration, the U.S. Environmental Protection Agency and other related agencies, and the contractors cannot begin their operations until the Work Plan is approved. (The Work Plan for this phase will be developed after the underwater survey so that it can be based specifically upon the conditions encountered.) The contractors will follow the "Standard Operating Procedures for Endangered Species Conservation and their Critical Habitat during Underwater Investigations."

Technicians will determine which metallic objects need to be investigated further. Dive teams will then find the specific item using an underwater metal detector. (Figure 35 shows the process of finding the specific item to investigate.) Specially trained divers will then manually dig (by hand) to uncover the metallic object and identify it. If the teams locate live munitions, they will determine which disposal alternative is most appropriate, based upon the previously approved Work Plan. Potential alternatives for addressing munitions could include the following.

- Conceal and limit access (such as covering it with concrete)
- Remove the fuze using a high pressure water jet
- Use a tool to make the item release the explosive material slowly rather than exploding

Figure 35: Diver Using an Electromagnetic Device on a Sled

This phase of work will also include collecting sediment samples. The samples will be sent to a laboratory for analysis and compared against the appropriate screening level. Should there be any detections above the designated screening levels, the contractor will evaluate the risk and provide appropriate alternatives for addressing the areas of concern.

Remedial Investigation/Feasibility Study Reports

The reporting process for the underwater investigations is the same as for the Remedial Investigations/Feasibility Studies being conducted on land. Once the fieldwork is complete, the contractors will evaluate the data and draft a report. The reports are sent to the regulators to review and comment on them. Remedial Alternatives will be identified, and the teams will evaluate every alternative for each MRS. The evaluation of these alternatives will be presented in the Proposed Plan. USACE will identify which alternative is deemed most appropriate, and the public will have 30 days to review and comment on it following a public meeting.

3.5 Northwest Peninsula

Appendix B contains the full text of the study prepared for Congress, "Study Relating to the Presence of Unexploded Ordnance in a Portion of the Former Naval Bombardment Area of Culebra Island, Commonwealth of Puerto Rico," along with the transmittal letter from the Office of the Undersecretary of Defense to Governor Fortuno.

Appendix A: Culebra RAB Projects Briefing
USACE SOPs Endangered Species

FINAL

Standard Operating Procedures for Endangered Species Conservation and their Critical Habitat during Underwater Investigations

DERP-FUDS Property No. I02PR0068

Culebra, Puerto Rico

US Army Corps of Engineers

Jacksonville District

April 2012

US Army Corps of Engineers
Jacksonville District

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF FIGURES

LIST OF ACRONYMS

DERP	Defense Environmental Restoration Program
DNER	Department of Natural and Environmental Resources
EBS	Environmental Baseline Survey
EQB	Environmental Quality Board
ESA	Endangered Species Act
FUDS	Formerly Used Defense Sites
FWS	U.S. Fish and Wildlife Service
MC	Munitions Constituent
MEC	Munitions and Explosive of Concern
MRS	Munitions Response Sites
Navy	Department of Navy
NMFS	National Marine Fisheries Service
SOPs	Standard Operating Procedures
TPP	Technical Project Planning
UIT	Underwater Investigation Team
USACE	U.S. Army Corps of Engineers

STANDARD OPERATING PROCEDURES FOR ENDANGERED SPECIES CONSERVATION AND THEIR CRITICAL HABITAT DURING UNDERWATER INVESTIGATIONS AT DERP-FUDS PROPERTY No. I02PR0068, CULEBRA ISLAND, PUERTO RICO

1.0 INTRODUCTION

Culebra Island is located approximately 17 miles east of the island of Puerto Rico and is approximately 9 miles from the Island of Vieques (**Figure 1**).

Figure 1. Location Map of Culebra.

In 1901, Culebra's public land was placed under the Department of Navy (Navy) control. The Island and adjacent cays were used as impact areas and firing ranges for aerial bombs and rockets, missiles, mortars, small arms, artillery rounds, and naval projectiles by the Navy and U.S. Marine Corps from 1903 until 1975. In 1978, part of the public land was transferred to the Commonwealth of Puerto Rico and the rest to the U.S. Fish and Wildlife Service (FWS).

Lands were transferred to the Commonwealth through a Quitclaim Deed and a Cooperative Management Agreement signed by the Government of Puerto Rico and the Department of the Interior in 1982.

The Finding and Determination of Eligibility, dated December 24, 1991, qualified 2,660 acres of Culebra Island and adjacent cays as eligible for consideration under the Defense Environmental Restoration Program for Formerly Used Defense Sites (DERP-FUDS). However, upon subsequent review of historical material from the National Archives, it was determined that all of Culebra Island and the adjacent cays should be considered a FUDS, except the Northwest Peninsula which is not eligible under the 1982 Quitclaim Deed and Public Law 93-166, and the tract that was controlled by the Navy after 1986. The revised area covered by the DERP-FUDS projects for Culebra Island and adjacent cays consists of approximately 8,430 acres. **Figure 2** shows the DERP-FUDS project for Culebra.

Figure 2. DERP-FUDS Projects for Culebra.

The objectives of all the DERP-FUDS projects are to reduce risk to human health and the environment and reduce the hazards to public safety presented by military munitions through implementation of effective, legally compliant, and cost-effective response actions. In order to gather additional information that would help to determine the nature and extent of munitions constituent (MC) or munitions and explosive of concern (MEC) contamination on Culebra Island Munitions Response Sites (MRS), it was agreed by the Technical Project Planning Team (TPP Team) comprised of Federal and Commonwealth of Puerto Rico agencies to conduct underwater investigations and to prepare an Environmental Baseline Survey (EBS). The main objectives of the underwater investigations are: a) characterize and map benthic habitats within investigation areas, b) determine, identify and map endangered or threatened species, in particular coral colonies, c) gather the necessary information to determine potential effects (e.g. location of species versus location of suspected MEC) on endangered or threatened species during remedial investigations and cleanup activities, d) determine presence or absence of MC and MEC, e) characterize the nature and extend of MC and MEC presence, and f) determine if the MC or MEC pose an unacceptable risk to human health and the environment, which would require further considerations or a response action.

2.0 PURPOSE AND NEED

The purpose of this document is to develop a series of Standard Operating Procedures (SOPs) to avoid or minimize impacts to threatened and endangered species listed, pursuant to the Endangered Species Act (ESA), and their critical habitats during the DERP-FUDS underwater investigations on Culebra Island and adjacent cays. Also, serve as a guide for the underwater investigation team (UIT) providing them a general description of the listed species known to be found in the waters around Culebra and for which the surrounding waters and marine substrate were designated as critical habitat.

For the purpose of this document underwater investigation activities consist of visual observations, boating and diving operations, and remote sensing surveys. No intrusive investigation will be conducted. Based on the EBS results, additional SOPs or other measures would be developed and coordinated with the TPP for further investigation phases.

The information used to describe the listed species and their habitat was obtained from state/federal agencies fact sheets, recovery and management plans, petitions, the Federal Register and internet search, among other sources.

3.0 LISTED THREATENED OR ENDANGERED SPECIES

The purpose of this section is to provide a general description of threatened and endangered species that are known to occur or have the potential to occur in the waters around Culebra Island and adjacent cays. Species include the Loggerhead (*Caretta caretta*), Green (*Chelonia*

mydas), Leatherback (*Dermochelys coriacea*) and Hawksbill (*Eretmochelys imbricata*) sea turtles, West Indian manatee (*Trichechus manatus manatus*), Humpback (*Megaptera novaeangliae*), Finback (*Balaenoptera physalus*), Sei (*Balaenoptera borealis*), Sperm (*Physeter macrocephalus*) and Blue (*Balaenoptera musculus*) whales and Elkhorn (*Acropora palmata*) and Staghorn (*Acropora cervicornis*) corals.

3.1 Loggerhead Sea Turtle (*Caretta caretta*)

Description: The loggerhead is characterized by a large head with blunt jaws. The carapace and flippers are a reddish-brown color; the plastron is yellow. The carapace has five pairs of costal scutes with the first touching the nuchal scute. There are three large inframarginal scutes on each of the bridges between the plastron and carapace. Adults grow to an average weight of about 200 pounds (**Figure 3**). This species was listed as threatened on July 28, 1978.

Figure 3. Loggerhead Sea Turtle
Source: http://www.nmfs.noaa.gov/pr/species/turtles/loggerhead.htm

Nesting Season and Development: Nesting season extends from about May through August with nesting occurring primarily at night and it is infrequent in Puerto Rico. Loggerheads are known to nest from one to seven times within a nesting season (mean is about 4.1 nests per season) at intervals of approximately 14 days. Mean clutch size varies from about 100 to 126 along the southeastern U.S. coast. Incubation ranges from about 45 to 95 days, depending on incubation temperatures, but averages 55 to 60 days for most clutches in Florida. Hatchlings generally emerge at night. Remigration intervals of 2 to 3 years are most common in nesting loggerheads, but remigration can vary from 1 to 7 years. Age at sexual maturity is believed to be about 20 to 30 years. The species feeds on mollusks, crustaceans, fish, and other marine animals.

Distribution/Habitat: The loggerhead sea turtle can be found throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans. It may be found hundreds of miles out to sea, as well as in inshore areas such as bays, lagoons, salt marshes, creeks, ship channels, and the mouths of large rivers. Coral reefs, rocky places, and ship wrecks are often used as feeding areas. Loggerheads nest on ocean beaches and occasionally on estuarine shorelines with suitable sand. Nests are typically made between the high tide line and the dune front. Most loggerhead hatchlings originating from U.S. beaches are believed to lead a pelagic existence in the North Atlantic gyre for an extended period of time, perhaps as long as 10 to 12 years, and are best known from the eastern Atlantic near the Azores and Madeira. Post-

hatchlings have been found floating at sea in association with *Sargassum* rafts. Once they reach a certain size, these juvenile loggerheads begin recruiting to coastal areas in the western Atlantic where they become benthic feeders in lagoons, estuaries, bays, river mouths, and shallow coastal waters. These juveniles occupy coastal feeding grounds for a decade or more before maturing and making their first reproductive migration, the females returning to their natal beach to nest.

3.2 Green Sea Turtle (*Chelonia mydas*)

Description: The green sea turtle grows to a maximum size of about 4 feet and a weight of 440 pounds. It has a heart-shaped shell, small head, and single-clawed flippers. Color is variable. Hatchlings generally have a black carapace, white plastron, and white margins on the shell and limbs. The adult carapace is smooth, keelless, and light to dark brown with dark mottling; the plastron is whitish to light yellow. Adult heads are light brown with yellow markings. Identifying characteristics include four pairs of costal scutes, none of which borders the nuchal scute, and only one pair of prefrontal scales between the eyes (**Figure 4**). This species was listed under the ESA on July 28, 1978. The breeding populations in Florida and the Pacific coast of Mexico are listed as endangered; elsewhere the species is listed as threatened.

Figure 4. Green Sea Turtle
Photo: Andy Bruckner, NOAA
Source: http://www.nmfs.noaa.gov/pr/species/turtles/green.htm

Nesting Season and Development: The nesting season varies with the locality. In Puerto Rico, it is roughly June through October. Nesting occurs nocturnally at 2, 3, or 4-year intervals. Only occasionally do females produce clutches in successive years. A female may lay as a many as nine clutches within a nesting season (overall average is about 3.3 nests per season) at about 13-day intervals. Clutch size varies from 75 to 200 eggs, with an average clutch size of 136 eggs reported for Florida. Incubation ranges from about 45 to 75 days, depending on incubation temperatures. Hatchlings generally emerge at night. Age at sexual maturity is believed to be 20 to 50 years.

Distribution/Habitat: The green turtle is globally distributed and generally found in tropical and subtropical waters along continental coasts and islands between 30° North and 30° South. In U.S. Atlantic and Gulf of Mexico waters, green turtles are found in inshore and nearshore

(reefs and seagrass beds) waters from Texas to Massachusetts, the U.S. Virgin Islands, and Puerto Rico.

Critical habitat was designated in 1998 for green turtles in coastal waters around Culebra (**Figure 5**).

Figure 5. Green Sea Turtle Critical Habitat.

3.3 Leatherback Sea Turtle (*Dermochelys coriacea*)

Description: The leatherback is the largest, deepest diving, and most migratory and wide ranging of all sea turtles. The adult leatherback can reach 4 to 8 feet in length and 500 to 2000 pounds in weight. Its shell is composed of a mosaic of small bones covered by firm, rubbery skin with seven longitudinal ridges or keels. The skin is predominantly black with varying degrees of pale spotting; including a notable pink spot on the dorsal surface of the head in adults. A toothlike cusp is located on each side of the gray upper jaw; the lower jaw is hooked anteriorly. The paddle-like clawless limbs are black with white margins and pale spotting (**Figure 6**). Hatchlings are predominantly black with white flipper margins and keels on the carapace. Jellyfish are the main staple of its diet, but it is also known to feed on sea urchins, squid, crustaceans, tunicates, fish, blue-green algae, and floating seaweed. The leatherback turtle was listed under the ESA as endangered in 1970.

Figure 6. Leatherback Sea Turtle
Source: http://en.wikipedia.org/wiki/Leatherback_sea_turtle

Breeding Season and Development: On Culebra nesting occurs from about February to August with the peak occurring around April to May. Female leatherbacks nest an average of 5 to 7 times within a nesting season, with an observed maximum of 11 nests. The average interesting interval is about 9 to 10 days. The nests are constructed at night in clutches of about 70 to 80 yolked eggs. The white spherical eggs are approximately 2 inches in diameter. Typically incubation takes from 55 to 75 days, and emergence of the hatchlings occurs at night. Most leatherbacks return to their nesting beaches at 2 to 3-year intervals. Leatherbacks are believed to reach sexual maturity in 6 to 10 years.

In the U.S., small nesting populations occur on the Florida east coast (35 females/year), Sandy Point, U.S. Virgin Islands (50 to 100 females/year), and Puerto Rico (30 to 90 females/year). The leatherback is the most pelagic of the sea turtles. Adult females require sandy nesting beaches backed with vegetation and sloped sufficiently so the crawl to dry sand is not too far. The preferred beaches have proximity to deep water and generally rough seas. Culebra beaches most used by the species are Flamenco, Brava, Resaca and Soni Beach.

Distribution/Habitat: The leatherback turtle is distributed worldwide in tropical and temperate waters of the Atlantic, Pacific, and Indian Oceans. It is also found in small numbers as far north as British Columbia, Newfoundland, and the British Isles, and as far south as Australia, Cape of Good Hope, and Argentina.

3.4 Hawksbill Sea Turtle (*Eretmochelys imbricata*)

Description: The Hawksbill Turtle (*Eretmochelys imbricate*) is small to medium-sized compared to other sea turtle species. Adults weigh 100 to 150 lbs (45 to 68 kg) on average, but can grow as large as 200 lbs (91 kg). Hatchlings weigh about 0.5 oz (14 g). The carapace (top shell) of an adult ranges from 25 to 35 inches (63 to 90 cm) in length and has a "tortoiseshell" coloring, ranging from dark to golden brown, with streaks of orange, red, and/or black. The shells of hatchlings are 1-2 inches (about 42 mm) long and are mostly brown and somewhat heart-shaped. The plastron (bottom shell) is clear yellow. The rear edge of the carapace is almost always serrated, except in older adults, and has overlapping "scutes". The hawksbill turtle's head is elongated and tapers to a point, with a beak-like mouth that gives the species its name. Hawksbill turtles are unique among sea turtles in that they have two pairs of prefrontal scales on the top of the head and each of the flippers usually has two claws (**Figure 7**). This species was listed under the ESA as endangered in 1970.

Figure 7. Hawksbill Sea Turtle
Photo: Caroline Rogers, USGS
Source: http://www.nmfs.noaa.gov/pr/species/turtles/hawksbill.htm

Nesting Season and Development: The nesting season varies with locality, nesting occurs all year long. Hawksbills nest at night and, on average, about 4.5 times per season at intervals of approximately 14 days. In Florida and the U.S. Caribbean, clutch size is approximately 140 eggs, although several records exist of over 200 eggs per nest. They nest under the vegetation on the high beach and nests have been observed having the last eggs of the clutch as close as 3 inches from the sand's surface. Remigration intervals of 2 to 3 years predominate. The incubation period averages 60 days. Hawksbills recruit into the reef environment at about 35 cm in length and are believed to begin breeding about 30 years later. However, the time required to reach 35 cm in length is unknown and growth rates vary geographically. As a result, actual age at sexual maturity is not known.

Distribution/Habitat: Hawksbill turtles use different habitats at different stages of their life cycle, but are most commonly associated with healthy coral reefs. The ledges and caves of coral reefs provide shelter for resting hawksbills both during the day and at night. Hawksbills are known to inhabit the same resting spot night after night. Hawksbills are also found around rocky outcrops and high energy shoals. These areas are optimum sites for sponge growth, which certain species are the preferred food of hawksbills. They are also known to inhabit mangrove-fringed bays and estuaries, particularly along the eastern shore of continents where coral reefs are absent.

3.5 Antillean Manatee (*Trichechus manatus manatus*)

Description: Manatees are marine mammals found in marine, estuarine, and freshwater environments. The West Indian manatee, *Trichechus manatus*, includes two distinct subspecies, the Florida manatee (*Trichechus manatus latirostris*) and the Antillean manatee (*Trichechus manatus manatus*). While morphologically distinctive, both subspecies have many common features. Manatees have large, seal-shaped bodies with paired flippers and a round, paddle-shaped tail. They are typically grey in color (color can range from black to light brown) and occasionally spotted with barnacles or colored by patches of green or red algae. The muzzle is heavily whiskered and coarse, single hairs are sparsely distributed throughout the body. Adult manatees, on average, are about nine feet long (3 meters) and weigh about 1,000 pounds (200 kilograms). At birth, calves are between three and four feet long (1 meter) and weigh between 40 and 60 pounds (30 kilograms) (**Figure 8**). This species was listed under the ESA as endangered in 1967.

Figure 8. Antillean Manatee
Source: http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=A007

Behavior, Development and Diet: The manatee maneuvers through the water moving its paddle-like tail up and down and steering with its flippers. It often rests suspended just below the water's surface with only the snout above water. It feeds underwater, but must surface periodically to breathe. Although the manatee can remain underwater for as long as 12 minutes, the average time is 4-1/2 minutes.

Manatees reach breeding maturity between 3 and 10 years of age. The gestation period is approximately 13 months. Calves may be born at any time during the year. Usually a single

calf is born, but twins do occur. An adult manatee will usually give birth to a calf every 2 to 5 years. The low reproductive rate makes the species less capable of rebounding from threats to its survival. They nurse underwater for about three minutes at a time from a nipple located behind their mother's forelimb. Born with teeth, calves begin eating plants within a few weeks but remain with their mother for up to 2 years. Manatees may live for several decades.

Manatees are herbivores that feed opportunistically on a wide variety of marine, estuarine, and freshwater plants, including submerged, floating, and emergent vegetation. Common forage plants include and are not limited to: cord grass, alga, turtle grass, shoal grass, manatee grass, eel grass, and other plant types. Manatees also require sources of freshwater, obtained from both natural and anthropogenic sources.

Distribution/Habitat: All of the studies suggest that manatees in Puerto Rico are more commonly observed in coastal areas from San Juan, eastward to the east coast, (and including Culebra and Vieques Islands) and then south and west, past Jobos Bay, to the west coast, and then about as far to the northwest as Rincon. Manatees are concentrated in several "hot spots" including Ceiba, Vieques Island, Jobos Bay and Boquerón Bay, and are less abundant along the north coast, between Rincón and Dorado.

3.6 Humpback Whale (*Megaptera novaeangliae*)

Description: Humpback whales are well known for their long "pectoral" fins, which can be up to 15 feet (4.6 m) in length. Their scientific name, *Megaptera novaeangliae,* means "big-winged New Englander" as the New England population was the one best known to Europeans. These long fins give them increased maneuverability; they can be used to slow down or even go backwards.

Figure 9. Humpback Whale
Source: http://www.nmfs.noaa.gov/pr/images/cetaceans/humpbackwhale_noaa_large.jpg

Similar to all baleen whales, adult females are larger than adult males, reaching lengths of up to 60 feet (18 m). Their body coloration is primarily dark grey, but individuals have a variable amount of white on their pectoral fins and belly. This variation is so distinctive that the pigmentation pattern on the undersides of their "flukes" is used to identify individual whales, similar to a humans fingerprint (**Figure 9**).

In June 1970, humpback whales were designated as "endangered" under the Endangered Species Conservation Act (ESCA). In 1973, the ESA replaced the ESCA, and continued to list humpbacks as endangered.

Behavior, Development and Diet: Humpback whales travel great distances during their seasonal migration, the farthest migration of any mammal. The longest recorded migration was 5,160 miles (8,300 km). This trek from Costa Rica to Antarctica was completed by seven animals, including a calf. One of the more closely studied routes is between Alaska and Hawaii, where humpbacks have been observed making the 3,000 mile (4,830 km) trip in as few as 36 days.

During the summer months, humpbacks spend the majority of their time feeding and building up fat stores (blubber) that they will live off of during the winter. Humpbacks filter feed on tiny crustaceans (mostly krill), plankton, and small fish and can consume up to 3,000 pounds (1360 kg) of food per day. Several hunting methods involve using air bubbles to herd, corral, or disorient fish. One highly complex variant, called "bubble netting," is unique to humpbacks. This technique is often performed in groups with defined roles for distracting, scaring, and herding before whales lunge at prey corralled near the surface.

In their wintering grounds, humpback whales congregate and engage in mating activities. Humpbacks are generally "polygynous" with males exhibiting competitive behavior on wintering grounds. Aggressive and antagonistic behaviors include chasing, vocal and bubble displays, horizontal tail thrashing, and rear body thrashing. Males within these groups also make physical contact; striking or surfacing on top of one another. These bouts can cause injuries ranging from bloody scrapes to, in one recorded instance, death. Also on wintering grounds, males sing complex songs that can last up to 20 minutes and be heard 20 miles (30 km) away. A male may sing for hours, repeating the song several times. All males in a population sing the same song, but that song continually evolves over time.

Gestation lasts for about 11 months. Newborns are 13 to 16 ft (4 to 5 m) long and grow quickly from the highly nutritious milk of their mothers. Weaning occurs between 6 and 10 months after birth. Mothers are protective and affectionate towards their calves, swimming close and frequently touching them with their flippers. Males do not provide parental support for calves. Breeding usually occurs once every two years, but sometimes occurs twice in three years.

Distribution/Habitat: Humpback whales live in all major oceans from the equator to sub-polar latitudes. In the western North Atlantic ocean, humpback whales feed during spring, summer, and fall over a range that encompasses the eastern coast of the U.S. (including the Gulf of Maine), the Gulf of St. Lawrence, Newfoundland/Labrador, and western Greenland. In winter, whales from the Gulf of Maine mate and calve primarily in the West Indies. Not all

whales migrate to the West Indies every winter, and significant numbers of animals are found in mid- and high-latitude regions at this time.

During migration, humpbacks stay near the surface of the ocean. While feeding and calving, humpbacks prefer shallow waters. During calving, humpbacks are usually found in the warmest waters available at that latitude. Calving grounds are commonly near offshore reef systems, islands, or continental shores. Humpback feeding grounds are in cold, productive coastal waters (**Figure 14**).

3.7 Fin or Finback Whale (*Balaenoptera physalus*)

Description: Fin or finback whales are the second-largest species of whale, with a maximum length of about 75 ft (22 m) in the Northern Hemisphere, and 85 ft (26 m) in the Southern Hemisphere. Fin whales show mild sexual "dimorphism", with females measuring longer than males by 5-10%. Adults can weigh between 80,000-160,000 lbs (40-80 tons).

Figure 10. Fin or Finback Whale
Source: http://www.cetaceanalliance.org/cetaceans/Bp_home.htm
Photos © Tethys Research Institute.

Fin whales have a sleek, streamlined body with a V-shaped head. They have a tall, "falcate" dorsal fin, located about two-thirds of the way back on the body, that rises at a shallow angle from the animal's back. The species has a distinctive coloration pattern: the back and sides of the body are black or dark brownish-gray, and the ventral surface is white. The unique, asymmetrical head color is dark on the left side of the lower jaw, and white on the right side. Many individuals have several light-gray, V-shaped "chevrons" behind their head, and the underside of the tail flukes is white with a gray border (**Figure 10**).

Within the U.S., the fin whale is listed as endangered throughout its range under the ESA and is listed as "depleted" throughout its range under the Marine Mammal Protection Act of 1972.

Behavior, Development and Diet: Fin whales can be found in social groups of 2-7 whales and in the North Atlantic are often seen feeding in large groups that include humpback whales, minke whales, and Atlantic white-sided dolphins. Fin whales are large, fast swimmers and the killer whale (*Orcinus orca*) is their only non-human predator.

During the summer, fin whales feed on krill, small schooling fish (e.g., herring, capelin, and sand lance), and squid by lunging into schools of prey with their mouth open, using their 50-100 accordion-like throat pleats to gulp large amounts of food and water. They then filter the food particles from the water using the 260-480 "baleen" plates on each side of the mouth. Fin whales fast in the winter while they migrate to warmer waters.

Little is known about the social and mating systems of fin whales. Similar to other baleen whales, long-term bonds between individuals are rare. Males become sexually mature at 6-10 years of age; females at 7-12 years of age. Physical maturity is attained at approximately 25 years for both sexes. After 11-12 months of gestation, females give birth to a single calf in tropical and subtropical areas during midwinter. Newborn calves are approximately 18 ft (6 m) long, and weigh 4,000-6,000 lb (2 tons). Fin whales can live 80-90 years.

Distribution/Habitat: Fin whales are found in deep, offshore waters of all major oceans, primarily in temperate to polar latitudes, and less commonly in the tropics. They occur year-round in a wide range of latitudes and longitudes, but the density of individuals in any one area changes seasonally (**Figure 14**).

3.8 Sei Whale (*Balaenoptera borealis*)

Description: Sei whales are members of the baleen whale family and are considered one of the "great whales" or rorquals. Two subspecies of sei whales are recognized, *B. b. borealis* in the Northern Hemisphere and *B. B. schlegellii* in the Southern Hemisphere.

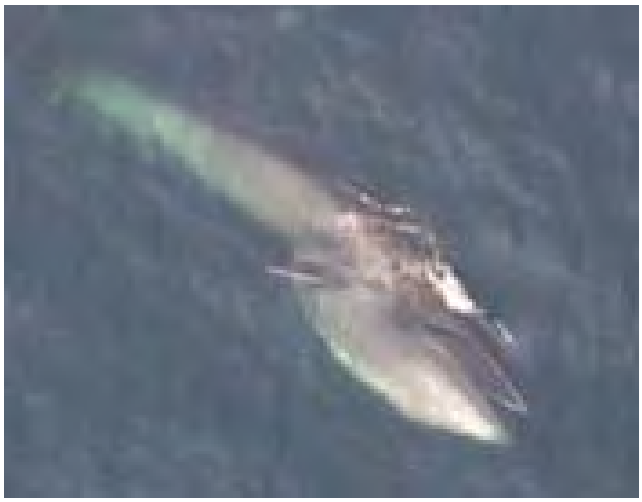

Figure 11. Sei Whale
Source: http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/seiwhale.htm#more

These large animals can reach lengths of about 40-60 ft (12-18 m) and weigh 100,000 lbs (45,000 kg). Females may be slightly longer than males. Sei whales have a long, sleek body that is dark bluish-gray to black in color and pale underneath. The body is often covered in oval-shaped scars (probably caused from cookie-cutter shark and lamprey bites) and sometimes has subtle "mottling". This species has an erect "falcate", "dorsal" fin located far down (about two-thirds) the animals back. They often look similar in appearance to Bryde's whales, but can be distinguished by the presence of a single ridge located on the animal's "rostrum". Bryde's whales, unlike other rorquals, have three distinct prominent longitudinal ridges on

their rostrum. They have 219-410 baleen plates that are dark in color with gray/white fine inner fringes in their enormous mouths. They also have 30-65 relatively short ventral pleats that extend from below the mouth to the naval area. The number of throat grooves and baleen plates may differ depending on geographic population (**Figure 11**).

When at the water's surface, sei whales can be sighted by a columnar or bushy blow that is about 10-13 feet (3-4 m) in height. The dorsal fin usually appears at the same time as the blowhole, when the animal surfaces to breathe. This species usually does not arch its back or raise its flukes when diving.

This species was listed under the ESA as endangered in 1970.

Behavior, Development and Diet: They are usually observed singly or in small groups of 2-5 animals, but are occasionally found in larger (30-50) loose aggregations. Sei whales are capable of diving 5-20 minutes to opportunistically feed on plankton (e.g., copepods and krill), small schooling fish, and cephalopods (e.g., squid) by both gulping and skimming. They prefer to feed at dawn and may exhibit unpredictable behavior while foraging and feeding on prey. Sometimes seabirds are associated with the feeding frenzies of these and other large whales.

Sei whales become sexually mature at 6-12 years of age when they reach about 45 ft (13 m) in length, and generally mate and give birth during the winter in lower latitudes. Females breed every 2-3 years, with a gestation period of 11-13 months. Females give birth to a single calf that is about 15 ft (4.6 m) long and weighs about 1,500 lbs (680 kg). Calves are usually nursed for 6-9 months before being weaned on the preferred feeding grounds. Sei whales have an estimated lifespan of 50-70 years.

Distribution/Habitat: Sei whales have a cosmopolitan distribution and occur in subtropical, temperate, and subpolar waters around the world. They prefer temperate waters in the mid-latitudes, and can be found in the Atlantic, Indian, and Pacific Oceans. During the summer, they are commonly found in the Gulf of Maine, and on Georges Bank and Stellwagen Bank in the western North Atlantic. The entire distribution and movement patterns of this species is not well known. This species may unpredictably and randomly occur in a specific area, sometimes in large numbers. These events may occur suddenly and then not occur again for long periods of time. Populations of sei whales, like other rorquals, may seasonally migrate toward the lower latitudes during the winter and higher latitudes during the summer. They prefer subtropical to subpolar waters on the continental shelf edge and slope worldwide and they are usually observed in deeper waters of oceanic areas far from the coastline (**Figure 14**).

3.9 Sperm Whale (*Physeter macrocephalus*)

Description: Sperm whales are the largest of the odontocetes (toothed whales) and the most sexually dimorphic cetaceans, with males considerably larger than females. Adult females may grow to lengths of 36 feet (11 m) and weigh 15 tons (13607 kg). Adult males, however, reach about 52 feet (16 m) and may weigh as much as 45 tons (40823 kg). It is distinguished by its extremely large head, which takes up to 25 to 35% of its total body length. It is the only living cetacean that has a single blowhole asymmetrically situated on the left side of the head near the tip. Sperm whales have the largest brain of any animal (on average 17 pounds (7.8 kg) in mature males), however, compared to their large body size, the brain is not exceptional in size.

Figure 12. Sperm Whale
Source: http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/spermwhale.htm

There are between 20-26 large conical teeth in each side of the lower jaw. The teeth in the upper jaw rarely erupt and are often considered to be vestigial. It appears that teeth may not be necessary for feeding, since they do not break through the gums until puberty, if at all, and healthy sperm whales have been caught that have no teeth.

Sperm whales are mostly dark gray, but oftentimes the interior of the mouth is bright white, and some whales have white patches on the belly. Their flippers are paddle-shaped and small compared to the size of the body, and their flukes are very triangular in shape. They have small dorsal fins that are low, thick, and usually rounded (**Figure 12**).

This species was listed under the ESA as endangered in 1970.

Behavior, Development and Diet: Because sperm whales spend most of their time in deep waters, their diet consists of many larger organisms that also occupy deep waters of the ocean. Their principle prey are large squid weighing between 3.5 ounces and 22 pounds (0.1 kg and 10 kg), but they will also eat large demersal and mesopelagic sharks, skates, and fishes. The average dive lasts about 35 minutes and is usually down 1,312 feet (400 m), however dives may last over an hour and reach depths over 3280 feet (1000 m).

Female sperm whales reach sexual maturity around 9 years of age when they are roughly 29 feet (9 m) long. At this point, growth slows and they produce a calf approximately once every five years. After a 14-16 month gestation period, a single calf about 13 feet (4 m) long is born. Although calves will eat solid food before one year of age, they continue to suckle for several years. Females are physically mature around 30 years and 35 feet (10.6 m) long, at which time they stop growing. For about the first 10 years of life, males are only slightly larger than females, but males continue to exhibit substantial growth until they are well into their 30s. Males reach physical maturity around 50 years and when they are 52 feet (16 m) long. Unlike females, puberty in males is prolonged, and may last between ages 10 to 20 years old. Even though males are sexually mature at this time, they often do not actively participate in breeding until their late twenties.

Most females will form lasting bonds with other females of their family, and on average 12 females and their young will form a family unit. While females generally stay with the same unit all their lives in and around tropical waters, young males will leave when they are between 4 and 21 years old and can be found in "bachelor schools", comprising of other males that are about the same age and size. As males get older and larger, they begin to migrate to higher latitudes (toward the poles) and slowly bachelor schools become smaller, until the largest males end up alone. Large, sexually mature males that are in their late 20s or older, will occasionally return to the tropical breeding areas to mate.

Distribution/Habitat: They inhabit all oceans of the world. They can be seen close to the edge of pack ice in both hemispheres and are also common along the equator, especially in the Pacific. Sperm whales are found throughout the world's oceans in deep waters between about 60° N and 60° S latitudes. Their distribution is dependent on their food source and suitable conditions for breeding, and varies with the sex and age composition of the group. It migrations are not as predictable or well understood as migrations of most baleen whales. In some mid-latitudes, there seems to be a general trend to migrate north and south depending on the seasons (whales move poleward in the summer). However, in tropical and temperate areas, there appears to be no obvious seasonal migration.

Sperm whales tend to inhabit areas with a water depth of 1968 feet (600 m) or more, and are uncommon in waters less than 984 feet (300 m) deep. Female sperm whales are generally found in deep waters (at least 3280 feet, or 1000 m) of low latitudes (less than 40°, except in the North Pacific where they are found as high as 50°). These conditions generally correspond to sea surface temperatures greater than 15°C, and while female sperm whales are sometimes seen near oceanic islands, they are typically far from land (**Figure 14**).

Immature males will stay with female sperm whales in tropical and subtropical waters until they begin to slowly migrate towards the poles, anywhere between ages 4 and 21 years old. Older, larger males are generally found near the edge of pack ice in both hemispheres. On

occasion, however, these males will return to the warm water breeding area. No critical habitat has been designated for this species.

3.10 Blue Whale (*Balaenoptera musculus*)

Figure 13. Blue Whale
Source: http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/bluewhale.htm

Description: The blue whale is a cosmopolitan species of baleen whale. In the Northern Hemisphere, they are generally smaller than those in the Southern Ocean. Maximum body length in the North Atlantic was about 88.5 feet (27 m) and the largest blue whale reported from the North Pacific was about 88 feet (26.8 m). Adults in the Antarctic can reach a maximum body length of about 108 feet (33 m) and can weigh more than 330,000 pounds (150,000 kg). As is true of other baleen whale species, female blue whales are somewhat larger than males. Blue whales are identified by the following characteristics: a long-body and comparatively slender shape; a broad, flat "rostrum" when viewed from above; a proportionately smaller dorsal fin than other baleen whales; and a mottled gray color pattern that appears light blue when seen through the water (**Figure 13**).

This species was listed under the ESA as endangered in 1970.

Behavior, Development and Diet: Scientists have yet to discern many details regarding the life history of the blue whale. The best available science suggests the gestation period is approximately 10-12 months and that blue whale calves are nursed for about 6-7 months. Most reproductive activity, including births and mating, takes place during the winter. Weaning probably occurs on, or en route to, summer feeding areas. The average calving interval is probably two to three years. The age of sexual maturity is thought to be 5-15 years. There are no known differences in the reproductive biology of blue whales in the North Pacific and North Atlantic oceans.

The primary and preferred diet of blue whales is krill (euphausiids). In the North Atlantic, blue whales feed on two main euphausiid species: *Thysanoëssa inermis*and and *Meganyctiphanes norvegica*. In addition, *T. raschii*and and *M. norvegica* have been recorded as important food sources of blue whales in the Gulf of St. Lawrence. In the North Pacific, blue whales prey mainly on *Euphausia pacifica*and secondarily on *T. spinifera*. While other

prey species, including fish and copepods, have been mentioned in the scientific literature, these are not likely to contribute significantly to the diet of blue whales.

Distribution/Habitat: They are found in oceans worldwide and are separated into populations by ocean basin in the North Atlantic, North Pacific, and Southern Hemisphere. They follow a seasonal migration pattern between summering and wintering areas, but some evidence suggests that individuals remain in certain areas year-round. The extent of knowledge concerning distribution and movement varies with area and migratory routes are not well known but, in general, distribution is driven largely by food requirements.

Blue whales inhabit sub-polar to sub-tropical latitudes. Poleward movements in spring allow the whales to take advantage of high zooplankton production in summer. Movement towards the subtropics in the fall allows blue whales to reduce their energy expenditure while fasting, avoid ice entrapment in some areas, and engage in reproductive activities in warmer waters of lower latitudes. Although the species is often found in coastal waters, blue whales are thought to occur generally more offshore than humpback whales, for example (**Figure 14**).

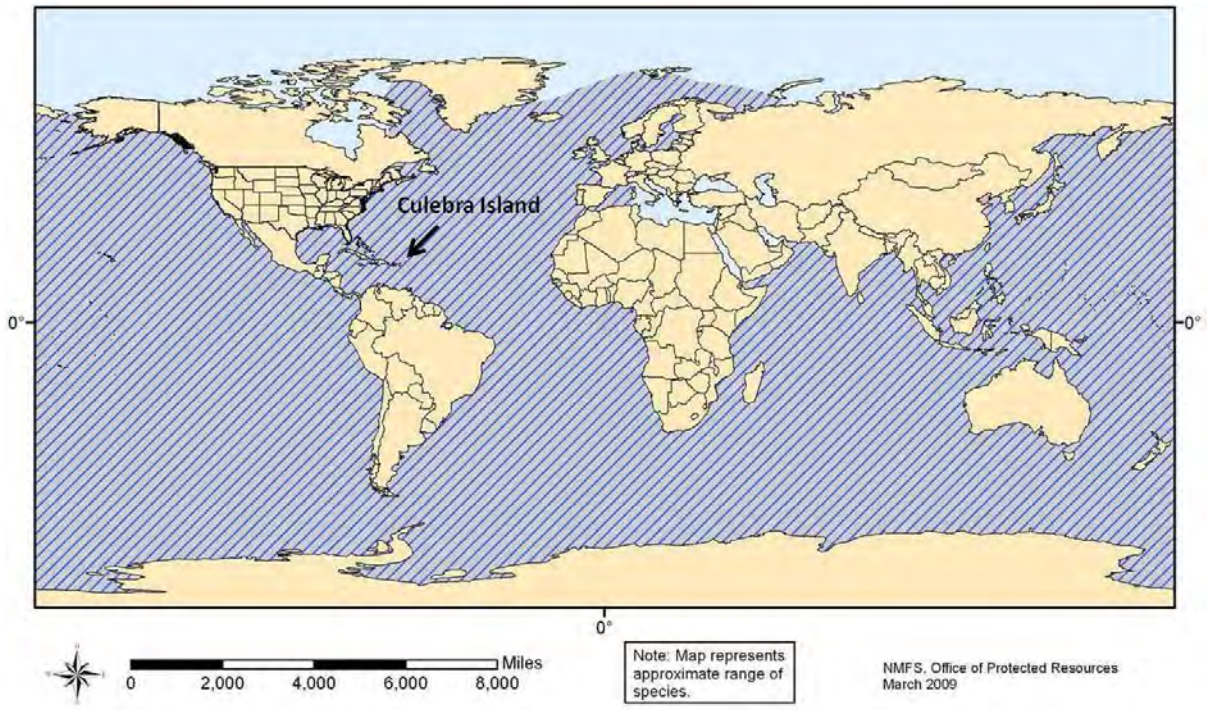

Figure 14. Approximate range map for Humpback, Sei, Sperm and Blue whales.

3.11 Elkhorn coral (*Acropora palmata*)

Description: It is a large, branching coral with thick and sturdy antler-like branches (**Figure 15**) and is found in shallow reefs, typically in water depths from 0-35 feet, as these corals prefer areas where wave action causes constant water movement. Colonies are fast growing: branches increase in length by 2-4 inches (5-10 cm) per year, with colonies reaching their maximum size in approximately 10-12 years. Over the last 10,000 years, elkhorn coral has been one of the three most important Caribbean corals contributing to reef growth and development and providing essential fish habitat. This species was listed under the ESA as endangered on May 4, 2006.

Figure 15. Elkhorn Coral
Source: http://www.nmfs.noaa.gov/pr/species/invertebrates/elkhorncoral.htm

Color: Living colonies are yellow, brown or golden with light rims.

Habitat: Elkhorn coral was formerly the dominant species in shallow water (3 ft-16 ft [1-5 m] deep) throughout the Caribbean and on the Florida Reef Tract, forming extensive, densely aggregated thickets (stands) in areas of heavy surf. Coral colonies prefer exposed reef crest and fore reef environments in depths of less than 20 feet (6 m), although isolated corals may occur to 65 feet (20 m).

Distribution/Reproduction: Elkhorn coral is found on coral reefs in southern Florida, the Bahamas, and throughout the Caribbean.

The dominant mode of reproduction for elkhorn coral is asexual, with new colonies forming when branches break off of a colony and reattach to the substrate. Sexual reproduction occurs via broadcast spawning of gametes into the water column once each year in August or September. Individual colonies are both male and female (simultaneous hermaphrodites) and will typically release millions of "gametes". The coral larvae (planula) live in the plankton for several days until finding a suitable area to settle, but very few larvae survive to settle and metamorphose into new colonies. The preponderance of asexual reproduction in this species raises the possibility that genetic diversity may be very low in the remnant populations.

3.12 Staghorn coral (*Acropora cervicornis*)

Description: It is a branching coral with cylindrical branches ranging from a few centimeters to over 6.5 feet (2 m) in length (**Figure 16**). This coral exhibits the fastest growth of all known western Atlantic corals, with branches increasing in length by 4-8 inches (10-20 cm) per year. This species was listed under the ESA as endangered on May 4, 2006.

Figure 16. Staghorn Coral
Source: http://www.nmfs.noaa.gov/pr/species/invertebrates/staghorncoral.htm

Color: Living colonies are light, grayish to yellowish-brown.

Habitat: Staghorn coral occur in back reef and fore reef environments from 0-100 feet (0 to 30 m) deep. The upper limit is defined by wave forces, and the lower limit is controlled by suspended sediments and light availability. Fore reef zones at intermediate depths of 15-80 feet (5-25 m) were formerly dominated by extensive single species stands of staghorn coral until the mid 1980s.

Distribution/Reproduction: Staghorn coral is found in the Atlantic Ocean, Caribbean Sea, and western Gulf of Mexico. Specifically, staghorn coral is found throughout the Florida Keys, the Bahamas, the Caribbean islands, and Venezuela. The northern limit of staghorn coral is around Boca Raton, FL.

The dominant mode of reproduction for staghorn coral is asexual fragmentation, with new colonies forming when branches break off a colony and reattach to the substrate. Sexual reproduction occurs via broadcast spawning of gametes into the water column once each year in August or September. Individual colonies are both male and female (simultaneous hermaphrodites) and will release millions of "gametes". The coral larvae (planula) live in the plankton for several days until finding a suitable area to settle, but very few larvae survive to settle and metamorphose into new colonies. The preponderance of asexual reproduction in this species raises the possibility that genetic diversity is very low in the remnant populations

The NMFS has designated critical habitat for elkhorn and staghorn corals in four areas: Florida, Puerto Rico, St. John/St. Thomas, and St. Croix. **Figure 17** shows the designated areas for Puerto Rico. In addition, a 4(d) rule (50 CFR Part 223) establishing “take” prohibitions for elkhorn and staghorn corals went into effect on November 28, 2008. Take

includes collect, bother, harm, harassment, damage to, death, or other actions that affect health and survival of listed species.

Figure 17. Elkhorn and Staghorn Corals Critical Habitat.

3.13 Species of Corals Proposed for Listing under the ESA

On 20 October 2009, the National Marine Fisheries Service (NMFS) received a petition from the Center for Biological Diversity to list 83 species of corals as threatened or endangered under the Endangered Species Act (ESA) and to designate critical habitat for these corals. NMFS reviewed the petition and determined that the requested listing actions may be warranted for 82 of the 83 coral species. All of the Atlantic coral species have the potential to be found in waters around Culebra. These species are: Lamarck's Sheet Coral (*Agaricia lamarcki*), Boulder Star Coral (*Montastraea annularis*), Mountainous Star Coral (*Montastrae faveolata*), *Montastraea franksi*, Pillar Coral (*Dendrogyra cylindrus*), Elliptical Star Coral or Pineapple Coral (*Dichocoenia stokesii*) and Rough Cactus Coral (*Mycetophyllia ferox*). As of the day of this document, no final decision on whether to list these species has been made by NMFS. **Figure 18** shows a range map for the seven species of coral proposed for listing under ESA.

Figure 18. Range map for the seven species of coral proposed for listing under ESA.

3.13.1 Lamarck's Sheet Coral (*Agaricia lamarcki*)

Description: Colonies form large, mostly thick plates, broad, rounded or acute, often overlapping each other. The upper surface bears concentric rows of ridges with relatively wide, straight or reticulate, valleys. The white, star-like, polyps are in the valleys' center. The septa alternate in height and thickness. Generally, the taller and thicker primary septa extend close to the columella before dropping sharply into the corallite pit, while the thinner secondary septa appear shorter, because they slope

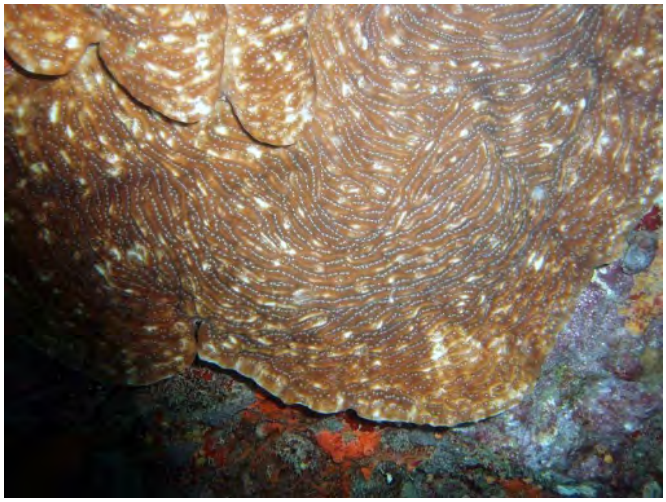

Figure 19. Lamarck's Sheet Coral
Source: http://coralpedia.bio.warwick.ac.uk/en/corals/agaricia_lamarcki.html

gradually into the corallite pit. The underside of the colony is smooth, without polyps (**Figure 19**).

Color: Yellow-brown to golden-brown to brown, sometimes with bluish or grayish tints, with contrasting white polyps (**Figure 19**).

Habitat: On sloping reefs and along walls, between 16-165 feet (5-50 m), but most common between 65-115 feet (20 and 35 m).

Distribution: Occasional in Florida and the Bahamas, common in the Caribbean (**Figure 18**).

3.13.2 *Montastraea* Complex

3.13.2.1 Boulder Star Coral (*Montastraea annularis*)

Description: The colonies grow in several morphotypes that were originally described as separate species. The species occurs as long, thick columns with enlarged, dome-like tops; large, massive mounds; sheets with skirt-like edges; irregularly bumpy mounds and plates or as smooth plates. Colonies up to 10 feet (3 m) in diameter. The surface is covered with distinctive, often somewhat raised, corallites (**Figure 20**).

Figure 20. Boulder Star Coral
Source: http://coralpedia.bio.warwick.ac.uk/images/Montastraea%20annularis01.JPG

Color: Shades of green to brown, yellow-brown and gray.

Habitat: Inhabit most reef environments and the species is often the predominant coral between 22-82 feet (7-25 m). The flattened plates are most common at deeper reefs, down to 165 feet (50 m).

Distribution: Common to abundant Florida, Bahamas and Caribbean (**Figure 18**).

3.13.2.2 Mountainous Star Coral (*Montastraea faveolata*)

Description: This species has been called the "dominant reef-building coral of the Atlantic". *Montastraea faveolata* buds extratentacularly to form head or sheet colonies with corallites that are uniformly distributed and closely packed, but sometimes unevenly exsert. Septa are highly

exsert, with septocostae arranged in a variably conspicuous fan system, and the skeleton is generally far less dense than those of its sibling species. Active growth is typically found at the edges of colonies, forming a smooth outline with many small polyps (**Figure 21**).

Figure 21. Mountainous Star Coral
Source: http://coralpedia.bio.warwick.ac.uk/images/Montastraea%20faveolata01.JPG

Color: It is usually pale brown but may be bright, fluorescent green over the dark brown.

Habitat: *M. faveolata* is found from 3-100 feet (1-30 m) in backreef and fore-reef habitats, and is often the most abundant coral between 30-65 feet (10-20 m) in fore-reef environments.

Distribution: This species occurs in the Caribbean, the Gulf of Mexico, Florida, and the Bahamas. May also be present in Bermuda, but this requires confirmation (**Figure 18**).

3.13.2.3 *Montastraea franksi*

Description: This species builds massive, encrusting plate or subcolumnar colonies via extratentacular budding. The characteristically bumpy appearance of this species is caused by relatively large, unevenly exsert, and irregularly distributed corallites. *M. franksi* is distinguished from its sibling *Montastraea* species by this irregular or bumpy appearance; a relatively dense, heavy, and hard skeleton (corallum); thicker septo-costae with a conspicuous septocostal midline row of lacerate teeth; and a greater degree of interspecies aggression (**Figure 22**).

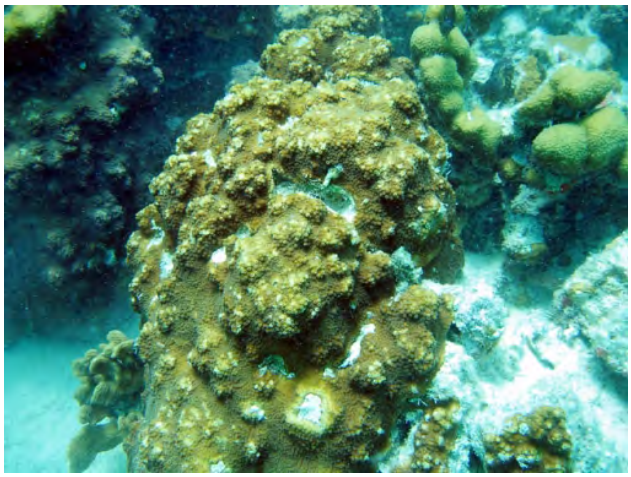

Figure 22. *Monstastraea franki*
Source: http://coralpedia.bio.warwick.ac.uk/images/Montastraea%20franksi01.JPG

Color: It is basically orange-brown with many pale patches on the lumpy surface, but may be grey or greenish-brown (**Figure 22**).

Habitat: This species mostly grows in the open like other species of this genus but smaller, encrusting colonies are common in shaded overhangs. It is uncommon in very shallow water, but becomes common deeper.

Distribution: This species occurs in the Caribbean, the Gulf of Mexico, Florida, and the Bahamas (**Figure 18**).

3.13.3 Pillar Coral (*Dendrogyra cylindrus*)

Description: Colonies form numerous, heavy, cylindrical spires, that grow upwards from an encrusting base mass. The colonies can attain a height of 10 feet (3 m), with a pillar diameter of more than 4 inches (10 cm). Polyps are normally extended during the day, giving the colony a fuzzy appearance and obscuring the long, meandroid, corallite series (**Figure 23**).

Figure 23. Pillar Coral
Source: http://coralpedia.bio.warwick.ac.uk/en/corals/dendrogyra_cylindrus.html

Color: Light tan to golden brown and chocolate brown.

Habitat: Colonies are typically found on flat gently sloping back reef and fore reef environment in depths of 3-82 feet (1-25 m). The species does not occur in extremely exposed locations.

Distribution: This species occurs in the Caribbean, the southern Gulf of Mexico, Florida, and the Bahamas (**Figure 18)**.

3.13.4 Elliptical Star Coral or Pineapple Coral (*Dichocoenia stokesii*)

Description: Colonies form rounded heads, domes or flattened plates. The distinctive character of this species is the oval corallites which protrude conspicuously above the surface between the corallites (coenesteum). Corallites are markedly oval and become elongated, almost meandroid, before dividing. Corallites are well separated from each other, and the surface between them is granular (**Figure 24**).

Color: Though sometimes green, they are usually orange-brown with white septo-costae.

Habitat: It is uncommon but has been found in most reef environments within its range, including both back and fore reef environments, rocky reefs, lagoons, spur and groove formations, channels, and occasionally at the base of reefs. This species occurs in depths from 6-236 feet (2-72 m); when found in exposed reefs at depths less than 65 feet (20 m), its hemispherical heads are more abundant than usual.

Figure 24. Elliptical/Pineapple Coral
Source: http://coralpedia.bio.warwick.ac.uk/en/corals/dichocoenia_stokesii.html

Distribution: This species occurs in the Caribbean, the Gulf of Mexico, Florida (including the Florida Middle Grounds), the Bahamas, and Bermuda (**Figure 18**).

3.13.5 Rough Cactus Coral (*Mycetophyllia ferox*)

Description: Colonies consist of flat plates with radiating valleys. It is a widely recognized valid species with colonies comprised of thin, weakly attached plates with interconnecting, slightly sinuous, narrow valleys. Tentacles are generally absent and corallite centers tend to form single rows. The walls of the valleys commonly join to form closed valleys, a feature not seen in other members of *Mycetophyllia*. The ridges are usually small and square, with a groove on top. The ridges, or walls between valleys, are commonly quite thin, and are irregular, and valleys are narrower (**Figure 25**).

Figure 25. Rough Cactus Coral
Source: http://coralpedia.bio.warwick.ac.uk/en/corals/mycetophyllia_ferox.html

Color: Valleys and walls are contrasting shades of grays and browns.

Habitat: This species is most common in fore reef environments from 5-30 meters (but is more abundant from 10-20 meters), but also occurs at low abundance in certain deeper back reef habitats and deep lagoons.

Distribution: This species occurs in the Caribbean, southern Gulf of Mexico, Florida, and the Bahamas (**Figure 18**).

4.0 MEASURES TO AVOID OR MINIMIZE POSSIBLE IMPACTS

The following measures will be implemented to avoid or minimize impacts to threatened or endangered species and their habitat during underwater investigation activities. Because the proposed action consists of data collection, no intrusive work will be performed and munitions disposal are not considered. Adverse impacts to protected species or their habitats are not expected.

The Contractor will be required to implement these SOPs, as well as the previously developed SOPs included in the attached Appendices A and B as part of any underwater work.

4.1 General Conservation Measures

4.1.1 Date of Commencement: The Contractor will provide to the U.S. Army Corps of Engineers (USACE) with a written notification of the date of commencement of underwater investigation work and a detailed description of the work to be implemented based on the Work Plan (WP) that will be coordinated and reviewed by TPP Team. USACE will provide the date of commencement to the TPP Team at least 10 days prior to initiating fieldwork.

4.1.2 Training/Briefing: Prior to initiating work all personnel shall receive training or briefings regarding the importance of endangered species, their characteristics, how they can be identified, potential and critical habitats, types of material in which they may hide, actions to take if are sighted, and avoidance measures to be followed as detailed in these SOPs. This training or briefing shall be prepared and offered by qualified personnel (e.g. biologist, marine biologist, environmental scientist, among others). The Contractor shall submit their qualifications to the USACE for review and approval. The training or briefing will also include safety and emergency procedures.

4.1.3 Civil and Criminal Penalties: The Contractor shall instruct all personnel associated with the project of the potential presence of threatened or endangered species. All personnel shall be advised that there are civil and criminal penalties for harming, harassing, killing or otherwise altering the natural behavior or condition of threatened or endangered species protected under the ESA, the Puerto Rico Wildlife Law, and the Regulation to Govern the Endangered and Threatened Species of the Commonwealth of Puerto Rico. ESA gives both

the FWS and NMFS responsibility for enforcing its provisions. The Commonwealth regulations to protect endangered and threatened species are enforced by the Puerto Rico Department of Natural and Environmental Resources (DNER).

4.1.4 Qualified Personnel: Each team performing underwater investigation work shall be accompanied on the boat, but not necessarily in the water, by qualified and experienced personnel (e.g. biologist, marine biologist, environmental scientist, among others) in order to identify the presence or absence of threatened or endangered species. The Contractor shall submit their qualifications to the USACE. The divers can request to the designated and qualified personnel on the boat to enter in the water to identify and determine if a suspected threatened or endangered species is present in the study area.

4.1.5 Coordination: All related work will be coordinated with the TPP Team prior to initiation as described in Part 4.1.1. The Contractor will provide a preliminary schedule and the areas (including the proposed transects and grids) where investigation will be performed and all the equipment to be used. Changes to the schedule and working areas will be provided to the TPP Team. The Contractor will make any required project notifications to the appropriate USACE personnel, who will in turn notify the regulators and resource agencies.

4.1.6 Reports: The Contractor shall maintain a log detailing endangered or threatened species sightings in terrestrial and marine habitats. The log shall include, but not limited to, the following information: date and time, location coordinates using a Global Positioning System (GPS) unit, species, one or more photographs, if possible, and any actions taken (e.g. species identification and distance from working area, reasons to cease operation, reasons to determine that operation may be resumed, among others) during the work period. All data shall be provided to USACE to be shared with the TPP.

4.1.7 Detonation Activities: Because the proposed action consists of data collection and characterization of benthic habitats, intrusive investigation or munitions detonations will not be conducted under this phase. If MECs are indentified during underwater work, they will be left in place and GPS coordinates of the MEC's location will be obtained for further investigations. MEC location will be shared with the TPP as "Privilege and Confidential." Due to public safety concerns, the MEC location shall not be released to the public. Based on the EBS results, additional SOPs or other conservation measures will be closely developed and coordinated with the TPP for further investigation phases and disposal activities.

4.1.8 If the UIT determines that weather conditions are unsafe (e.g. heavy rain, strong wind and rough seas), underwater investigation will not be conducted in order to minimize the potential for accidental groundings.

4.1.9 Underwater investigation activities will be conducted during day time hours (7:00am-5:00pm) only.

4.1.10 If during underwater activities the Contractor observes items that may have historic or archeological value, the Contractor will obtain GPS coordinates of the items' locations and notify the USACE of the observation. In consultation with the State Historic Preservation Officer, the USACE will use this information to assess the significance of the items in compliance with the National Historic Preservation Act.

4.2 Staging Area and Sea Turtle Nesting Monitoring

4.2.1 Contractor shall identify any onshore staging areas needed for execution of these investigations so that sea turtle nest monitoring can be conducted prior to initiating mobilization to ensure no impacts occur to this species.

4.2.2 The sea turtle nests monitoring will be limited to the areas used by the Contractor personnel. The beach monitoring efforts will consist of nests sighting and identification. The Contractor will avoid any sea turtle nests that are encountered. Any nest encountered shall be clearly marked (e.g. using flagging). The Contractor personnel shall stay at least 26 feet (8 meters) away from the marked area to avoid impacts to the nest(s). All nest sightings and actions taken shall be documented as described in Part 4.1.6. Additional conservation measures are provided in Appendices A and B.

4.2.3 Staging areas shall not require any removal of coastal vegetation. These areas shall consist of temporary tents or similar structures that can be easily removed.

4.2.4 Any areas proposed for use as staging area that form part of the Culebra National Wildlife Refuge shall be closely coordinated with the refuge manager. Points of contact are provided in Part 5.0.

4.2.5 The smaller offshore cays should not be used as staging areas; only cays that can be safely accessed by boats should be identified for use. Temporary mooring buoys should be employed to access staging areas to avoid repeated anchoring and impacts to marine bottom as per previous SOPs (refer to Parts 4.3 - 4.4 and Appendix A for more information).

4.2.6 Monitoring shall be conducted daily by qualified personnel (e.g. biologist, marine biologist, environmental scientist, among others) to identify the potential presence of new nests or sea turtle tracks during the activity period (refer to Appendix A for detailed information).

4.2.7 If sea turtle nests are found, the Contractor personnel will notify USACE, who will notify the FWS Boquerón Endangered Species Specialist, NMFS Boquerón Office and DNER

POC. If agreed the nest locations will be clearly marked and the staging area will be relocated. This information shall be documented as described in Part 4.1.6.

4.3 Coral and Seagrass Avoidance Measures

4.3.1 Prior to initiation of field activities the UIT shall receive a boating safety briefing and information regarding location and identification of coral reefs, colonized hardbottom and seagrass (refer to Part 4.1.2 for more information). Also, the information contained in these SOPs and its Appendices, and the types of actions that constitute a violation to the 4(d) rule (50 CFR Part 223) shall be discussed.

4.3.2 Vessel operator shall carry and consult appropriate NOAA nautical charts, NOAA benthic habitat maps and aerial photographs to locate potential coral reefs, colonized hardbottom and seagrass areas. Combining information from aerial photographs with hydrographic data will help to ensure that nautical charts are accurate.

4.3.3 Real-time data (e.g. GPS with nautical chart and depth finder on boat) will be continuously observed to verify water depths and vessel location. For additional information, please refer to Parts 4.3.5 and 4.4.3.

4.3.4 Vessel operator and UIT shall maintain a vigilant watch for coral reefs, colonized hardbottom and seagrass areas to avoid running aground or striking protected species. As part of the WP for conducting the underwater investigations and EBS, the Contractor shall provide and specify the type of equipment to be used and their recommended safety depths to avoid impacts to endangered and threatened species.

4.3.5 From the water's surface, some coral areas appear golden-brown. These areas should be avoided to keep from running aground. The operator shall stay at a minimum of 4 feet from the bottom of the vessel to the top of coral areas.

4.3.6 If no moorings are available, the vessel will be anchor in unvegetated sandy areas away from corals and seagrasses, so the anchor, chain and line do not contact or damage coral or seagrass areas.

4.3.7 Vessels shall be maintained away from areas with corals and seagrasses (see Part 4.3.5). Operations shall be conducted in such manner that bottom scour or prop dredging will be avoided when corals or seagrasses are present.

4.3.8 The following actions are prohibited:

a. Walk on, sit on or stand on coral
b. Collect coral (dead or alive)
c. Anchoring on coral/seagrass
d. Touch coral with hands or equipment
e. Discharge any pollutant or contaminant
f. Dump trash

4.3.9 If during the underwater investigation work any coral is injured, whatever activity causing the damage will be stopped, the injured coral will be left in place and the U.S. Coast Guard (USCG), NMFS Boquerón Office and DNER should be immediately notified. If listed corals are injured, the Contractor shall also contract the NOAA Office of Law Enforcement at 1-800-853-1964. The following information must be provided:

a. The time, date, and location (latitude/longitude) of the incident.
b. The name and type of the vessel involved.
c. The vessel's speed during the incident.
d. A description of the incident.
e. Water depth.
f. Environmental conditions (e.g. wind speed and direction, sea state, cloud cover, and visibility).
g. The type of coral or description, if possible.
h. A description of the damage caused to any coral, if possible.

4.3.10 If the vessel runs aground, the operator shall perform the following:

a. Turn of the engine.
b. Do not try to use the engine to power off the reef, hardbottom or seagrass.
c. Raise the propeller, and allow the boat to drift free.
d. Radio the Coast Guard, Marine Patrol or VHF Channel 16 for assistance.
e. If any coral or seagrass is injured the Contractor shall follow the procedures described in Part 4.3.9.

4.4 Marine Mammals and Sea Turtles Avoidance Measures

4.4.1 Vessel strike avoidance measures were also provided in Appendix A, page 12, items 1-6. These measures have been updated and for the purpose of underwater investigation activities, the Contractor shall follow and implement the avoidance measures provided under this section.

4.4.2 The Contractor shall instruct all personnel associated with the underwater investigation work of the potential presence of marine mammals (e.g. manatees and whales) and sea turtles and the need to avoid collisions with these species. The Contractor shall be held responsible

for any marine mammal and sea turtle harmed, harassed, or killed as a result of underwater activities (including vessel operations supporting these activities) and general boating activities needed to go to and from the study areas. All appropriate precautions shall be followed and the operator will avoid excessive speed as described in Parts 4.4.7 and 4.4.8.

4.4.3 All vessels associated with the underwater investigations shall operate at "no wake/idle" speeds at all times while in waters where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will preferentially follow deep-water routes whenever possible. Boats used to transport personnel shall be shallow-draft vessels, preferably of the light-displacement category, where navigational safety permits.

4.4.4 Mooring bumpers shall be placed on all vessels wherever and whenever there is a potential for marine mammal or sea turtle to be crushed between two moored vessels. The bumpers shall provide a minimum stand-off distance of four feet.

4.4.5 Vessel operator and UIT should maintain a vigilant watch for marine mammals and sea turtles to avoid striking sighted protected species.

4.4.6 If a marine mammal or sea turtle is sighted within 300 feet (100 yards) of the project area, all appropriate precautions shall be implemented by the Contractor to ensure protection of these species. These precautions shall include the operation of all moving equipment no closer than 150 feet (50 yards) of a marine mammal or sea turtle. If a marine mammal or sea turtle is closer than 150 feet (50 yards) to moving equipment or the study area, the equipment shall be shut down and all activities shall cease to ensure protection of the species. Underwater activities shall not resume until the marine mammal(s) or sea turtle(s) have left the study area naturally. Animals must not be herded away or harassed into leaving.

4.4.7 When marine mammals or sea turtles are sighted while a vessels is underway, the operator will remain parallel to the animal's course. Vessel operator will avoid excessive speed or abrupt changes in direction until the animal has left the area.

4.4.8 Vessel operator will reduce vessel speed to 10 knots or less when mother/calf pairs, groups, or large assemblages of marine mammals are observed near an underway vessel, when safety permits. A single marine mammal at the surface may indicate the presence of submerged animals in the vicinity; therefore, prudent precautionary measures will be exercised. The vessel should attempt to route around the animals, maintaining a minimum distance of 300 feet whenever possible.

4.4.9 Marine mammals and sea turtles may surface in unpredictable locations or approach slowly moving vessels. When an animal is sighted in the vessel's path or in close proximity to a moving vessel and when safety permits, the vessel operator will reduce speed and shift the

engine to neutral. Vessel operator will not engage the engines until the animals are clear of the area.

4.4.10 Monitoring: The UIT shall monitor for the presence of marine mammals and sea turtles.

4.4.11 All sightings and actions taken shall be reported as described in Part 4.1.6.

4.4.12 Injured or Dead Protected Species Reporting: Any collisions or sighting of any injured or incapacitated marine mammals or sea turtles shall be reported immediately to the USACE, FWS, NMFS, and DNER and information listed in Part 4.3.9 must be provided. For additional contact information, please refer to Section 5.0.

- Report stranded marine mammals to Southeast U.S. Stranding Hotline: (305) 862-2850
- Report stranded sea turtles to the NMFS Southeast Regional Office: (727) 824-5312
- NMFS Boquerón Office: (787) 851-3700
- FWS Boquerón Office: (787) 851-7297
- FWS Culebra NWR Office: (787) 742-0115
- DNER: (787) 645-5593

4.5 Diving Operations and Equipment

4.5.1 All underwater investigation work will be conducted by qualified and trained divers and will be planned in a manner that avoids direct impacts to threatened or endangered species and sensitive habitats within the project area. Anchoring practices described in Part 4.3 shall be implemented.

4.5.2 Prior to initiation of daily operations the UIT will check the weather conditions, inspect the vessel and verify that all the required equipment is available, in good condition, working correctly, and calibrated. The Contractor will maintain a log detailing equipment inspections.

4.5.3 The UIT will make sure that underwater conditions (e.g. visibility, current speeds) and weather are suitable for diving to ensure safety for divers and for sensitive underwater habitats.

4.5.4 Based on dive site conditions, the amount of divers in the water will be determined by the Contractor.

4.5.5 The following general "best diving practices" will be followed:

a. The point of entry and exit will be carefully selected to avoid coral or underwater sensitive areas.
b. Divers will make sure that all equipment is well secured before entering in the water.
c. Divers will make sure that they are neutrally buoyant at all times.
d. Safe distance from coral areas to be provided in the WP shall be maintained.
e. Good finning practice and body control will be followed to avoid accidental contact with coral or stirring up the sediment.
f. Divers will stay off the bottom and will never stand or rest on corals or other sessile benthic invertebrates.

4.5.6 To support or supplement the underwater investigation activities the following equipment, but not limited to, will be used: remotely operated vehicle (ROV), side scan sonar towfish, underwater metal detectors, benthic/diver sleds, towing cables and lifting lines, underwater cameras, marking buoys and floats, and GPS. The Contractor shall provide and specify the type of equipment to be used and their recommended safety depths to avoid impacts to endangered and threatened species (see Parts 4.1.1 and 4.1.5).

4.5.7 All equipment will be used in a manner to avoid physical contact or harassment of any protected species and it shall not interfere with diving operations. Hand-held equipment that would be carried by divers shall not contact corals or disturb the bottom or seagrasses in the area.

4.5.8 Site conditions, marine structures present, real-time information and existing water depth will be constantly monitored by trained operators to determine the appropriate use of equipment needed to minimize the risk of physical contact with protected species and sensitive habitats.

4.5.9 Any unintentional injury to protected species during diving operations will be reported immediately as described in Parts 4.3.9 and 4.4.12.

4.6 Supplemental Information

The July 2008 SOPs developed for Culebra DERP-FUDS and its April 2011 Addendum remain in effect. Copies of these documents are included in the attached Appendices A and B. The SOPs in the current document are meant to supplement, not replace, previous SOPs and are directed toward underwater investigation activities. The SOPs in the current document also provide the most up-to-date information regarding listed corals.

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LIST OF APPENDICES

A. SOPs for Endangered Species Conservation and their Habitat (July 2008)

B. Addendum to the 2008 SOPs (April 2011)

APPENDIX A

SOPs for Endangered Species Conservation and their Habitat (July 2008)

Standard Operating Procedures For Endangered Species Conservation And their Habitat on DERP-FUDS Project No. I02PR006802. Culebra, Puerto Rico

US Army Corps of Engineers
Jacksonville District

Standard Operating Procedures
For Endangered Species Conservation and their Habitat on
DERP-FUDS Project No. I02PR006802. Culebra, Puerto Rico

PURPOSE

The intent of this document is to develop a series of standard operating procedures (SOPs) to avoid or minimize impacts to threatened and endangered species listed pursuant to the Endangered Species Act (ESA) during the DERP-FUDS work at locations designated for cleanup on Culebra and adjacent cays and in surrounding waters that serve as habitat for these species. Species include the endangered hawksbill (*Eretmochelys imbricata*) and leatherback (*Dermochelys coriacea*) sea turtles, the threatened green sea turtle (*Chelonia mydas*) and its designated critical habitat 3 nautical miles around Culebra and its surrounding islands and cays, the threatened elkhorn (*Acropora palmata*) and staghorn corals (*Acropora cervicornis*), the West Indian manatee (*Trichechus manatus*), and avian species. These SOPs are in accordance with on-going communication with staff from the U.S. Fish and Wildlife Service (FWS), the National Marine Fisheries Service (NMFS) and the Puerto Rico Department of Natural and Environmental Resources (DNER), as well as pursuant to the Interim Guidelines provided by FWS to work on lands of Culebra National Wildlife Refuge, with the U.S. Army Corps of Engineers (USACE) Regulations and Environmental Operating Principles. These SOPs were prepared to supplement existing and future USACE contracts for work on Culebra and surrounding islands and cays under the DERP/FUDS Program and to satisfy the substantive requirements of Section 7 of the Endangered Species Act. These SOPs do not address requirements related to access approvals from FWS on lands that are within the Culebra National Wildlife Refuge.

SEA TURTLES

Culebra has some of the most important sea turtle nesting beaches in the US Caribbean. Three species of sea turtles utilize these beaches throughout the year. The endangered leatherback and hawksbill sea turtles are the most common nesters, and the threatened green sea turtle also nests on beaches in the project area. The beaches on Culebrita, Cayo Norte, and Playa Larga, Brava and Resaca on Culebra were designated as critical habitat under the Endangered Species Act by FWS in recognition of their vital importance to the future of these species (50 CFR 17.95). Similarly, waters surrounding the island of Culebra (50 CFR 226.208) from the mean high water line seaward to 3 nautical miles (5.6 km) are designated as critical habitat for the green sea turtle. These waters include Culebra's outlying Keys including Cayo Norte, Cayo Ballena, Cayos Geniquí, Isla

Culebrita, Arrecife Culebrita, Cayo de Luis Peña, Las Hermanas, El Mono, Cayo Lobo, Cayo Lobito, Cayo Botijuela, Alcarraza, Los Gemelos, and Piedra Steven where cleanup efforts are anticipated. Sea grass beds within these waters are foraging habitat for the species. In addition, the benthic habitat, including seagrass beds, coral reefs, and colonized hardbottom, around Culebra and its surrounding islands and cays provides foraging and refuge habitat for sea turtles.

Nesting Seasons

The following nesting season information was obtained from the USFWS sea turtle fact sheets and local agencies.

Green Sea Turtle: The nesting season varies with the locality. In Puerto Rico, it is roughly June through October. Nesting occurs nocturnally at 2, 3, or 4-year intervals. Only occasionally do females produce clutches in successive years. A female may lay as a many as nine clutches within a nesting season (overall average is about 3.3 nests per season) at about 13-day intervals. Clutch size varies from 75 to 200 eggs, with an average clutch size of 136 eggs reported for Florida. Incubation ranges from about 45 to 75 days, depending on incubation temperatures. Hatchlings generally emerge at night. Age at sexual maturity is believed to be 20 to 50 years. Nesting data for Puerto Rico, specifically for Culebra beaches shall be obtained from the FWS. However, the DNER indicated that nesting of green turtles in Culebra beaches is infrequent and not as common as the other species.

Green Sea Turtle

Hawksbill Turtle: The nesting season varies with locality, in Culebra, as per DNER, nesting occurs all year long with the peak between August to November. Hawksbills nest at night and, on average, about 4.5 times per season at intervals of approximately 14 days. In Florida and the U.S. Caribbean, clutch size is approximately 140 eggs, although several records exist of over 200 eggs per nest. They nest under the vegetation on the high beach and nests have been observed having the last eggs of the clutch as close as 3 inches from the sand's surface. Remigration intervals of 2 to 3 years predominate. The

incubation period averages 60 days. Hawksbills recruit into the reef environment at about 35 cm in length and are believed to begin breeding about 30 years later. However, the time required to reach 35 cm in length is unknown and growth rates vary geographically. As a result, actual age at sexual maturity is not known.

Hawksbill Sea Turtle

Leatherback Turtle: On Culebra nesting occurs from about February to August with the peak occurring around April to May. Female leatherbacks nest an average of 5 to 7 times within a nesting season, with an observed maximum of 11 nests. The average internesting interval is about 9 to 10 days. The nests are constructed at night in clutches of about 70 to 80 yolked eggs. The white spherical eggs are approximately 2 inches in diameter. Typically incubation takes from 55 to 75 days, and emergence of the hatchlings occurs at night. Most leatherbacks return to their nesting beaches at 2 to 3-year intervals. Leatherbacks are believed to reach sexual maturity in 6 to 10 years. Culebra beaches most used by the species are Flamenco, Brava and Resaca.

Leatherback Sea Turtle

Acroporid Corals

Since the preparation of some of the Culebra Project work plans, two coral species have been listed as threatened by the National Marine Fisheries Service effective May 8, 2006. Elkhorn coral (*Acropora palmata*) and staghorn coral (*Acropora cervicornis*) belong to the most abundant group of corals in the world and once represented the most dominant reef building species throughout Florida and the Caribbean. Elkhorn corals are found in shallow reefs, typically in water depths from 0-35 feet, as these corals prefer areas where wave action causes constant water movement. Staghorn corals are found in water depths ranging from 1-160 feet, although they are most common in depths from 10-60 feet. In addition to growing on reefs, staghorn corals often form colonies on bare sand. Acroporid corals have relatively high growth rates (5-6 inches per year) for corals and exhibit branching morphologies that provide important habitat for other reef organisms. The abundance of these corals has been declining for several decades due in part to hurricane damage and disease.

Acropora cervicornis

Acropora palmata

Measures to Avoid or Minimize Possible Impacts Resulting from Munitions Clearance and Detonation Activities

Vegetation Removal:

A standard 70 meter setback (from mean high water) is usually designated to avoid impacts to hawksbill sea turtle nesting habitat during nesting season. Based on the characteristics of the nesting habitat in Culebra and the surrounding cays, an appropriate setback will have to be established for beaches that are part of the cleanup project. For instance, hawksbill sea turtle nesting habitat might be designated from the line of woody vegetation instead of from the high water line. Measuring and flagging the setback on project beaches might be easier if measured landward from the edge of the existing woody vegetation since the high water line may change daily.

Beach Monitoring

To the maximum extent practicable detonation activities shall be realized when it is not sea turtle nesting season and when hatchlings are not present on beaches. To the maximum extent practicable, ground intrusive activities, including detonation, will not occur during the peak nesting seasons from March to November.

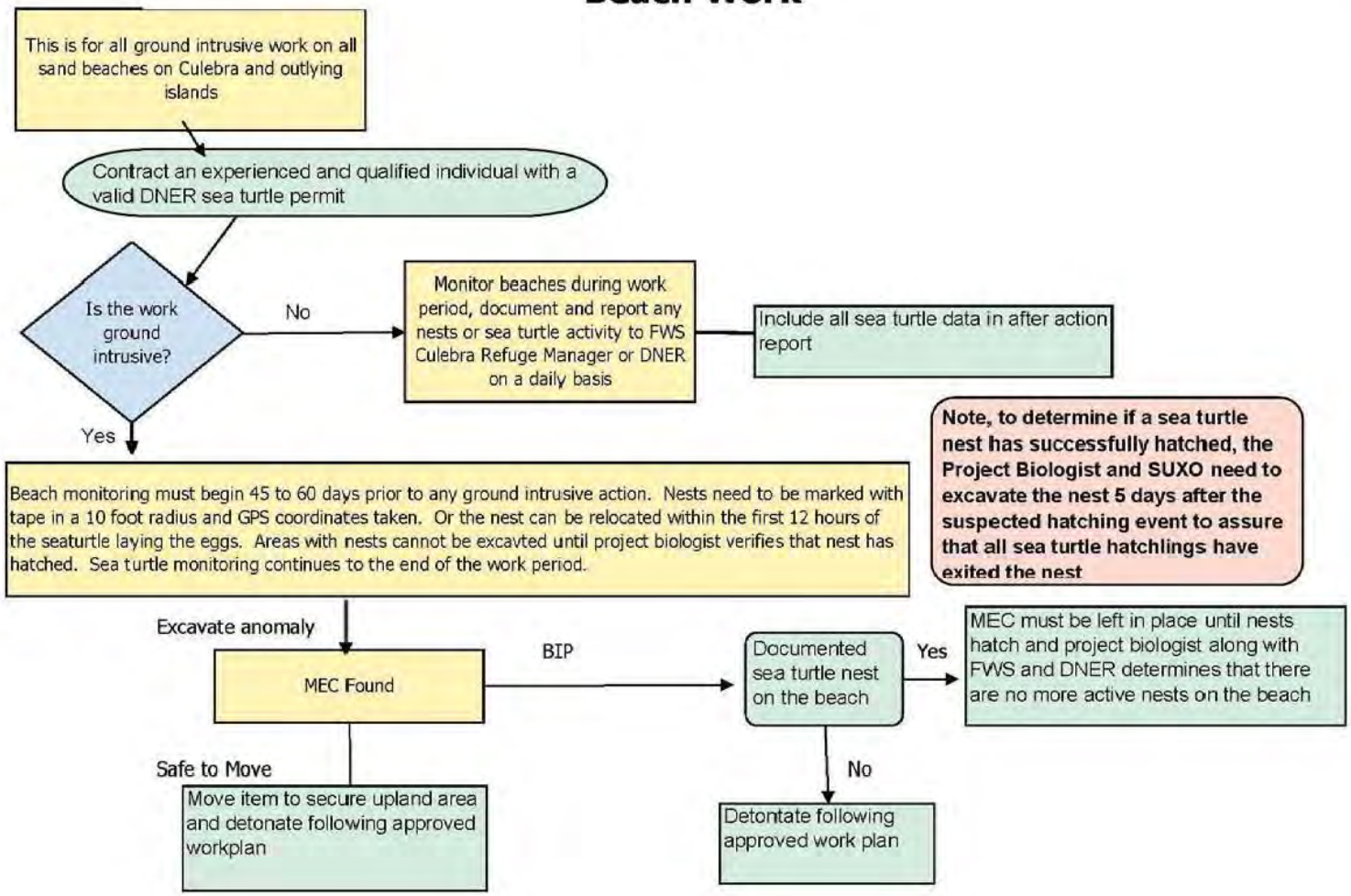
Prior to commencement of clearance activities, including vegetation removal and removal of unexploded ordnance, on Culebra, Culebrita, Cayo Norte and Cayo Luis Peña the contractor shall appoint a Project Biologist whose qualifications shall be submitted for the approval of the contracting officer and the FWS. All beach clearance activities, including vegetation removal and removal of unexploded ordnance, will be closely coordinated with FWS. In lieu of an independent Project Biologist, a USACE biologist could assist the contractor in this effort provided the USACE biologist has the appropriate training for conducting beach surveys. The Project Biologist shall perform morning beach patrols to identify the potential presence of new nests prior to and during the nesting season. When it is not nesting season, the Project Biologist or appropriately trained personnel shall conduct morning beach surveys prior to crews commencing daily activities to determine whether sea turtle nesting has occurred and to ensure that activities may be accommodated in a window of time when no nests are present.

If sea turtle nests are found on beaches being cleared of unexploded ordnance, the Project Biologist, the UXO supervisor, and/or monitoring personnel will communicate daily with the FWS Boqueron Endangered Species Specialist and the Culebra Islands NWR Refuge Manager as to whether new nests have been located, and their locations within the work area. If agreed upon by FWS, nest locations will be clearly marked to ensure clearance personnel avoid nests and no clearance activities will take place in the area until the hatchlings emerge and vacate the nest. Otherwise, nests will be relocated to a safe beach within 6-12 hours following nesting. The relocation program will be carried out by the Project Biologist and experienced personnel with the required DNER endangered species permits. This approach has been utilized by DNER personnel on Vieques from 1990-2000 to protect sea turtle nests from military operations with a hatching success of relocated nests of over 80%.

The Project Biologist shall also be responsible for training beach clearance crews prior to the initiation of clearance activities regarding the importance of endangered species, in particular the status of sea turtles at this location; the potential penalties associated with violations of the ESA; measures for crawl and nest identification; and sea turtle biology.

As an additional tool for sea turtle conservation, the following decision tree was prepared by the FWS to provide guidance on the sequence of events during ground-intrusive beach work. Project biologist shall work closely with UXO personnel to ensure these steps are followed.

Sea Turtle Conservation Measures for Ground Intrusive Beach Work



Designation of Beach Zones for Vegetation Removal and Munitions Detonation:

The information contained in this section was provided by the USFWS based on zones established during clearing activities for a Navy-led project in Vieques. The designation of zones based on number of nests, restrictions within the zones, etc. must be developed in coordination with the FWS to be specific to Culebra. The Corps shall require UXO contractors through the Project Biologist, to establish three work zones, based on sea turtle nesting data, and site inspections to ensure sea turtle nest protection during vegetation removal and munitions detonation activities. It shall be the Project Biologists responsibility to obtain specific nesting data for the beach area where the contractors will be working. This data can be obtained from the FWS Ecological Services Office in Cabo Rojo or the DNER office on Culebra or Fajardo.

The work zones proposed are:

Zone 1. No restrictions because sea turtle nesting is not expected within the area (rocky shore, no sand, etc).

Zone 2. Minor restrictions because of low historical sea turtle nesting events (fewer that 4 nests per year have occurred within the zone). Zone 2, beaches will be surveyed twice a week, 75 days prior to the activity by experienced and qualified personnel. Surveys should cover both the open sand and the area below the vegetation. No driving on the beach will occur. If no nests are found, cutting of trees smaller than 3 inches in diameter may occur. Manual cutting using machetes is the preferred alternative to allow for re-growth. If power tools such as chain saws are required, the FWS recommended pruning low branches instead of removing the trees (except for mesquite trees). Both techniques would allow for re-growth of suitable habitat. Mechanized removal of vegetation using mowers of vehicles should not be used near beach areas. When nests are found, a protection or exclusion zone of 8m should be designated around the nest and marked with flagging tape. Vegetation removal outside of the exclusion zone may occur if conducted manually. Vegetation removal within the nest area should be postponed until 5 days after hatching is documented, unless UXO is found in the vicinity of the nest.

Vegetation removal within the hawksbill sea turtle nesting habitat should not occur from June to mid December (peak of the nesting season). Hawksbill sea turtle nesting habitat varies from 10 m to 25m from the edge of the woody vegetation.

Zone 3. Major restrictions because 4 or more historical sea turtle nesting events have occurred within the zone. Zone 3, beaches will be surveyed every morning by a qualified biologist utilizing pedestrian surveys beginning 75 days prior to the scheduled start date of the project and until ordnance or vegetation removal actions are completed. Minimizing the amount of woody vegetation such as sea grape cleared would help minimize impacts to nesting hawksbill sea turtles. The rest of the conditions are the same as Zone 2.

When no nests are found on Zone 3 beaches, vegetation cutting may be conducted outside of the peak nesting season of the hawksbill sea turtle. A protection zone of 10 meters (measured landward from the edge of the woody vegetation) should be established to protect leatherback and green sea turtle nesting habitat. If leatherback and/or green sea turtle nests are left in situ (in place), vegetation removal activities should not occur within 10 meters of the landward edge of the nest track. The preferred alternative for cutting the vegetation, if nests are in situ, is hand cutting using machetes or power tools.

Vehicular Traffic

It should be noted that driving on sand beaches as a means of site access should be regarded as a measure of last resort after all other site access options have been explored. A designated entrance and an exit at the beach area, and monitoring of nesting events by qualified and experienced personnel is needed for vehicular beach access. If vehicular access is needed, we recommend the vehicular access be limited to the intertidal zone (below mean high water). Driving above the intertidal zone should not be allowed. All known nests should be marked by stake and survey tape or string in an area at least 20 feet (6 meters) in any direction from the center of the nest. No activities should enter in this area. Other alternative routes should be explored to avoid driving on sea turtle nesting beaches.

Vessel Traffic

For beach access from the ocean, should landing a vessel on the beach be necessary, the landing site shall be coordinated with the FWS Culebra National Wildlife Refuge personnel and the DNER. The route of the vessel shall be coordinated with NMFS to ensure that impacts to designated critical habitat and listed coral species are avoided. However, landing vessels on beaches should be regarded as a measure of last resort.

Beach activities on Culebrita, need to be coordinated with NMFS and FWS, the following vessel access SOPs will be implemented to minimize impacts to sea turtle refuge and foraging habitat, designated critical habitat, and listed coral species:

1. Culebrita will be accessed by entering Bahia Tortuga, the bay north of Beach E (as identified in the Engineering Evaluation/Cost Analysis for the cleanup of beaches on Culebrita and Flamenco Beach on Culebra). Contractors will tie boats to existing mooring buoys or, if the draft of vessels is shallow, anchor in the unvegetated, sandy zone between the seagrass beds and the beach.

2. No additional access points to beaches A, B, C, or D will be established as the contractor will bring all equipment and supplies to Beach E for offloading and transport overland or will offload personnel and equipment from an unanchored vessel into a inflatable craft that will then transit to access point previously established in coordination with NMFS and FWS. These access points do not currently exist and would have to be agreed upon.

In meetings with USACE, FWS, DNER, EQB and NMFS, it was agreed that the following cays will not be part of the cleanup project as they are inaccessible. The cays are:

1. Cayo Tiburón
2. Whale Rock
3. El Mono
4. Cayo Mono
5. Alcarazza/Fungi Bowl
6. The Washer

It was further agreed that access to the some of the cays that will be part of the cleanup project will be as follows:

1. Cayo Botella – contractors will use the Culebrita Island access in the bay northwest of the largest beach (Beach E) or anchor boats in the sandy bottom area south of the cay and use a inflatable craft, kayak, or swim to access the cay from the southeast where there is a small sand channel between areas of coral reefs.

2. Cayo Norte – boats will anchor in sand bottom in the small bay off the beach on the southeast of the island.

3. Pajarito Cay – from anchorage or mooring in Culebrita or Cayo Norte, access will be by inflatable craft entering the south side of the cay.

4. Cross Cay/Cayo Lobo – boats can anchor in unvegetated sandy bottom in the bay on the southeast side of the cay and anchors will not be dropped in areas containing coral colonies or seagrass beds.

The Corps, in coordination with the FWS, NMFS and DNER personnel have agreed that, in order to avoid impacts to listed coral species and designated critical habitat, the installation of mooring buoys to access Palada Cay/Cayo Geniqui, Cayo de Agua, Cayo Yerba and Cayo Ratón (also called Los Gemelos/Twin Rocks) will be completed if the clean-up activities will take place on these cays for more than two weeks. Prior to installation of mooring buoys at any given location in Culebra waters, the proposed locations shall be assessed for presence/absence of unexploded ordnance and to select final locations in unvegetated, sandy bottom. If the mooring buoys are not installed, the contractor will use a transit vessel to transport personnel to a site near each cay. The transit vessel will not weigh anchor and personnel will access the cays via an inflatable craft.

The following areas were identified using aerial photography, nautical charts and area maps and are proposed for installation of mooring buoys:

1. Cayo Geniquí/Palada Cay: Mooring buoy in 20-30 feet of water in the hardbottom area south of the cay to moor the transport boat. Access to the cay will be via inflatable craft.

2. Cayo del Agua: Mooring buoy in 20-30 feet of water on the south side of the cay to moor the transport boat. Access to the cay will be via inflatable craft.

3. Los Gemelos/Twin Rocks (Cayos Ratón and Yerba): Transit vessel will moor to the buoy serving Cayo del Agua and a inflatable craft will be used to access the cays.

These mooring buoy locations shall be coordinated with the United States Coast Guard.

In addition to establishment of access points, the following protocols shall be followed to minimize impacts to sea turtle refuge and foraging habitat, designated critical habitat, and listed coral species:

1. Access to the cays that have not been determined to be inaccessible and therefore form part of cleanup efforts will be dependent on wind, wave, and current conditions. During periods of rough seas, cays will not be accessed in order to minimize the potential for accidental groundings.

2. The transport boat utilized to provide access to the smaller cays will remain offshore and will not weigh anchor

Clearance crews and equipment will be ferried to the cays with an inflatable-type craft and the landing point for this craft will be determined in coordination with NMFS and FWS.

NMFS Protected Species Vessel Strike Avoidance Measures and Reporting

Background
The National Marine Fisheries Service (NMFS) has determined that collisions with vessels can injure or kill protected species (e.g., endangered and threatened species, and marine mammals). The following standard measures should be implemented to reduce the risk associated with vessel strikes or disturbance of these protected species to discountable levels. NMFS should be contacted to identify any additional conservation and recovery issues of concern, and to assist in the development of measures that may be necessary.

Protected Species Identification Training
Vessel crews should use an Atlantic and Gulf of Mexico reference guide that helps identify protected species that might be encountered in U.S. waters of the Atlantic Ocean, including the Caribbean Sea, and Gulf of Mexico. Additional training should be provided regarding information and resources available regarding federal laws and regulations for protected

species, ship strike information, critical habitat, migratory routes and seasonal abundance, and recent sightings of protected species.

Vessel Strike Avoidance
In order to avoid causing injury or death to marine mammals and sea turtles the following measures should be taken when consistent with safe navigation:

1. Vessel operators and crews should maintain a vigilant watch for marine mammals and sea turtles to avoid striking sighted protected species.

2. When whales are sighted, maintain a distance of 100 yards or greater between the whale and the vessel.

3. When sea turtles or small cetaceans are sighted, attempt to maintain a distance of 50 yards or greater between the animal and the vessel whenever possible.

4. When small cetaceans are sighted while a vessel is underway (e.g., bow-riding), attempt to remain parallel to the animal's course. Avoid excessive speed or abrupt changes in direction until the cetacean has left the area.

5. Reduce vessel speed to 10 knots or less when mother/calf pairs, groups, or large assemblages of cetaceans are observed near an underway vessel, when safety permits. A single cetacean at the surface may indicate the presence of submerged animals in the vicinity; therefore, prudent precautionary measures should always be exercised. The vessel should attempt to route around the animals, maintaining a minimum distance of 100 yards whenever possible.

6. Whales may surface in unpredictable locations or approach slowly moving vessels. When an animal is sighted in the vessel's path or in close proximity to a moving vessel and when safety permits, reduce speed and shift the engine to neutral. Do not engage the engines until the animals are clear of the area.

Additional Requirements for the North Atlantic Right Whale
The NMFS guidance includes additional requirements for the North Atlantic right whale, but these do not apply for the Culebra activities.

Injured or Dead Protected Species Reporting
Vessel crews should report sightings of any injured or dead protected species immediately, regardless of whether the injury or death is caused by your vessel.
Report marine mammals to the Southeast U.S. Stranding Hotline: 877-433-8299
Report sea turtles to the NMFS Southeast Regional Office: 727-824-5312
If the injury or death of a marine mammal was caused by a collision with your vessel, responsible parties should remain available to assist the respective salvage and stranding network as needed. NMFS' Southeast Regional Office should be immediately notified of the strike by email (takereport.nmfsser@noaa.gov) using the attached vessel strike reporting form.

For additional information, please contact the Protected Resources Division at:
NOAA Fisheries Service
Southeast Regional Office
263 13th Avenue South
St. Petersburg, FL 33701
Tel: (727) 824-5312
Or visit their website at: http://sero.nmfs.noaa.gov

Considerations for Other Species

The Corps and its contractors shall avoid contact with any bird or reptile found injured or otherwise in the way of the cleanup activities, until adequate coordination is done with the resource agencies. Detonation of UXO on cays should be conducted outside of the seabird nesting season. Some seabirds nest year round, in the event an item needs to be detonated near nests, the birds should be captured and held prior to the blow in place. This should be coordinated with the Project Biologist, FWS and DNER. In the event of manatee sighting in the vicinity of a work area, the work will stop until the animal(s) are at a safe distance.

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APPENDIX B
Addendum to the 2008 SOPs (April 2011)

FINAL

Addendum to the Standard Operating Procedures for Endangered Species Conservation and their Habitat

DERP-FUDS Project No. I02PR006802

Culebra, Puerto Rico

US Army Corps of Engineers
Jacksonville District

April 2011

US Army Corps of Engineers
Jacksonville District

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Final Addendum to the Standard Operation Procedures for Endangered Species Conservation and their Habitat on DERP-FUDS Project No. I02PR006802, Culebra, Puerto Rico

1.0 INTRODUCTION

In 2008, the U.S. Army Corps of Engineers (USACE) in coordination with the National Marine Fisheries Services (NMFS) Protected Resources Division and the U.S. Fish and Wildlife Services (FWS) developed a series of standard operating procedures (SOPs) to avoid or minimize impacts to listed species and their critical habitats pursuant to the Endangered Species Act (ESA) during Formerly Used Defense Site (FUDS) work at locations designated for investigation and cleanup on Culebra Island, its adjacent cays and in surrounding waters that serves as habitat for these species.

In recent communications, the FWS recommended to the USACE to modify the existing SOPs in order to include terrestrial listed species that have the potential to occur in the project areas and were not covered under the July 2008 SOPs. Based on FWS recommendations and on-going communications with their staff this addendum has been prepared.

The intent of this document is to 1) supplement the 2008 SOPs 2) serve as guidance for the USACE and its contractors in order to avoid or minimize impacts to terrestrial listed species and their designated critical habitat, and 3) satisfy the substantive requirements of the ESA.

2.0 TERRESTRIAL LISTED THREATENED OR ENDANGERED SPECIES

The purpose of this section is to provide a detailed description of the threatened and endangered terrestrial species and their habitat to be found in Culebra Island and its adjacent cays. Species include the Culebra giant Anole (*Anolis roosevelti*), Virgin Islands tree boa (*Epicrates monensis granti*), Wheeler's perperomia (*Peperomia wheeleri*) and *Leptocereus grantianus* (no common name).

The information used to describe the listed species and their habitat was obtained from state/federal agencies fact sheets, recovery and management plans, the Federal Register and internet search, among other sources.

2.1 Culebra Giant Anole (*Anolis roosevelti*)

2.1.1 General Description: The Culebra Island Giant Anole (*Anolis roosevelti*) is an extremely rare or possibly extinct lizard of the *Anolis* genus. It is native to Culebra Island, Puerto Rico. It is a rather large lizard reaching a length of approximately 160 mm snout-vent length. The color in life is brownish-grey with two lines on each side. One line begins around

Figures 1 and 2. Culebra Giant Anole. Source: http://eolspecies.lifedesks.org/node/1797

the ear and extends posteriorly to the groin; the other begins in the shoulder region and extends posteriorly into the groin. There is a distinct light spot on the temple, and the eyelids are yellow. The throat fan is grey except for the lower rear quarter which is light yellow. The tail is yellowish-brown and the underside of the belly is whitish. The tail is deeply scalloped and supports a large fin along most of its length. This fin is high: the third from the distal most ray is twice as long as the depth of the tail, and the fourth proximal ray is as long as the depth of the tail (**Figure 1 and 2**). The edge of the tail fin is scalloped between rays in *A. roosevelti*, as opposed to straight in *A. cuvieri*. *Anolis roosevelti* is additionally distinguished from *Anolis cuvieri* by being grey, not green or brown; by lacking postanal scales in males (present in *A. cuvieri*); by smooth scales under the base of the tail (keeled in *A. cuvieri*), and by its large size **Figure 3** shows *A. cuvieri* for comparison purposes.

2.1.2 Breeding Season and Behavior: Reproduction behavior is unknown. The only information available on its food and foraging behavior is that the species was sighted feeding on the fruits of Ficus trees. There are no information on population number and trends. There have been no confirmed observations of the species since 1932.

Figure 3. *Anolis cuvieri*. Source: http://www.drna.gobierno.pr/biblioteca/banco-de-fotos/Slide9.JPG/view fotos/Slide9.JPG/view

2.1.3 Habitat and Distribution: This lizard is presumably arboreal and restricted to the large Ficus and gumbo-limbo trees. There is no other information on its ecology on the island. In 1977, FWS determined that the *Anolis roosevelti* is an endangered species under

the provisions of the ESA and declared most of the remaining forest in Culebra Island as critical habitat. The critical habitat area comprises Monte Resaca, Punta Flamenco, Playa Resaca, and Playa Brava. **Figure 4** shows the designated critical habitat areas for the Culebra Island Giant Anole.

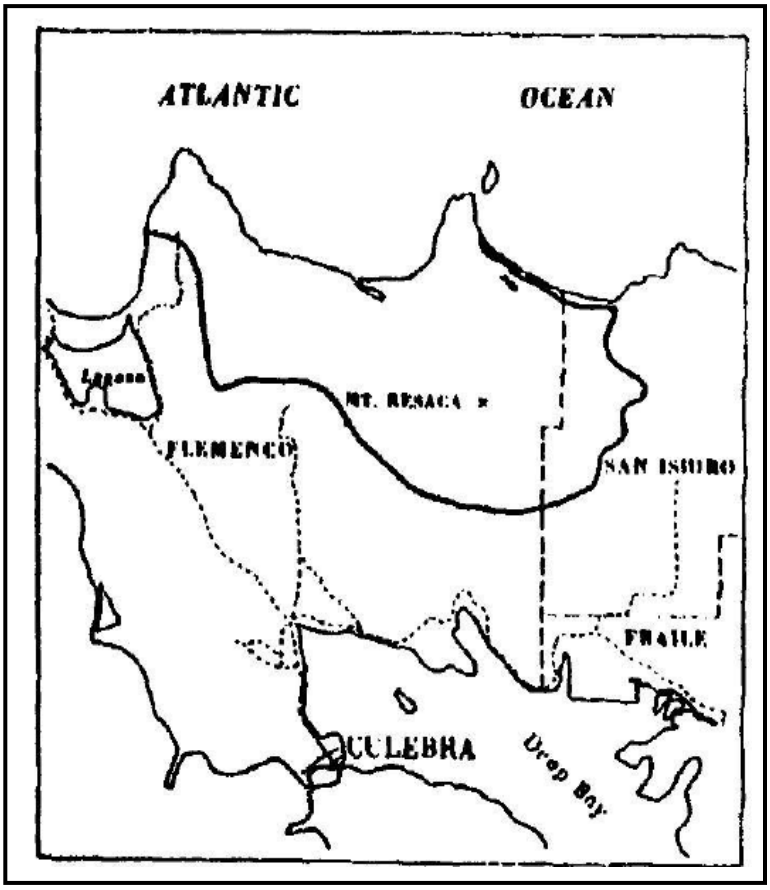

Figure 4. Boundaries of the critical habitat designated for the Culebra Island Giant Anole. Source: Critical Habitat Designations for PR and USVI (FWS 2007).

2.2 Virgin Islands Tree Boa (*Epicrates monensis granti*)

2.2.1 General Description: The adult body color is light plumbeous brown with darker blotches partially edged with black. The ventral surface is greyish-brown speckled with darker spots. This snake grows to slightly less than a meter snout-vent length (**Figure 5**). The Virgin Island (VI) boa was listed as an endangered species in 1979. Critical habitat has not been designated for this species.

2.2.2 Behavior: The VI boa is considered a nocturnal or crepuscular (active at twilight or sunrise) species, but can be active during daylight hours. Little is know of their food habits.

Figure 5. Virgin Island Tree Boa. Source: http://www.flickr.com/photos/deep-blue/2588456233/

2.2.3 Habitat and Distribution: The VI boa is considered endemic to Puerto Rico and the VI. The historical distribution of the VI boa suggests that this species was widely distributed throughout Puerto Rico and the VI, including the northeastern side of Puerto Rico, the offshore cay of Cayo Diablo, Culebra Island, and St. Thomas in USVI; Tortola, and Virgin Gorda in British Virgin Islands (BVI). Although the number of individuals at Culebra Island has not been determined, individuals have been sighted.

The VI boa's habitat has been described from two forest associations: subtropical dry forest and subtropical moist forest. The subtropical dry forest zone is the driest life zone found in VI, Vieques, southwestern Puerto Rico, plus all of Mona Island, Culebra Island and Desecheo. The dry forest habitat is characterized by small (<5m/ 15 ft) deciduous trees with small, coriaceous or succulent leaves and thorns, spines, and secondary defensive compounds, with high density of inter-digitating branches and vines greater than 1 cm (0.4 in) in diameter connecting adjacent tree canopies, and with a rainfall less than 750 mm (30 in) per year.

The species has also been sighted in mangrove forests including Button wood *(Conocarpus erectus)* and red mangrove, *(Rhizophora mangle)* on Culebra Island and Cayo Ratones. It was also found the VI boa in disturbed lower vegetation and artificial structures. Foraging boas are not restricted to trees, as they also use salt-tolerant shrub lands just above the high tide line.

2.3 Wheeler's Peperomia (*Peperomia wheeleri*)

2.3.1 General Description: *Peperomia wheeleri* is an evergreen, glabrous, erect herb which may reach 1 meter in height. The stems root only at the base and may be up to 1 centimeter in diameter. The opposite leaves are entire, fleshy, elliptic to elliptic-obovate, with 3 or 5 main veins ascending from the base. The lower side of the leaf is inconspicuously black punctate. Inflorescenses are spikes, 10 to 16 centimeters long and 5 millimeters in diameter, which are borne solitary and opposite the leaves or at the leaf axils. Flowers are minute, approximately 0.5 millimeter in diameter (**Figure 6**).

2.3.2 Habitat and Distribution: The species is known to occur in Culebra Island and has been documented in the municipalities of Isabela and Quebradillas.

Culebra Island has an irregular topography and occurs on volcanic and intrusive rocks. The vegetation of this island is classified as belonging to subtropical dry forests. *P. wheeleri* is found in a more mesic environment, the semi-evergreen seasonal forest that consists of two strata, a tree canopy and herbaceous layer. The canopy reaches approximately 16 feet in height. Mature trees are approximately 7 to 15 feet apart (3 to 5 meters), separate by large granodiorite boulders. Roots form an entangled mass. *P. wheeleri* is a component of the understory of this semi-evergreen seasonal forest. This small herb grows on the humus which accumulates on these granodiorite boulders. Removal of the forest canopy alters the microclimatic conditions within this forest, resulting in the elimination of the humus substrate necessary for the survival of the species.

Figure 6. Wheeler's Peperonia. Source: http://www.fws.gov/caribbean/es/Images/Endangered/Peperomia_wheeleri.JPG

P. wheeleri is associated with the following canopy species: *Clusea rosea, Bursera simaruba* and *Ficus citrifolia*. It is also associated with other species growing in the herbaceous strata: several species of *Tillandsia, Anthurium acaule, Whittmackia lingulata* and *Epidendrum cochleatum*.

2.4 *Leptocereus grantianus* (No Common Name)

2.4.1 General Description: *Leptocereus grantianus* is a sprawling or suberect, nearly spineless cactus, which may reach up to 2 meters in height and 3 to 5 centimeters in diameter. The elongated stems have 3 to 5 prominent ribs with broadly scalloped edges. Ribs of young joints are thin, and the small areoles or spine-bearing areas may bear from one to three minute, nearly black spines which disappear as the joints grow older and the ribs become thicker. The flowers are solitary at terminal areoles, from 3 to 6 centimeters long, and nocturnal. The ovary and flower tube bear distinct areoles. The outer perianth segments are linear, green, and tipped by an areole like those of the tube and ovary. The inner perianth segments are numerous, cream-colored, oblong-obvate, obtuse, and about 8 millimeters long. Stamens are many and have yellow anthers. The stigma lobes are several and short. The fruit is subglobose to ellipsoid and about 4 centimeters in diameter (**Figure 7**).

This species is similar to another endemic species, *L. quadricostatus*, known from southern and southwestern Puerto Rico. These species differ primarily in flower morphology and in the characteristic areoles.

2.4.2 Habitat and Distribution: It is endemic to Culebra Island, and island located just off the northeastern corner of Puerto Rico. The species is found in the subtropical dry forest life zone in

dry thickets which grow on a crumbling rock substrate on a steep bank just above the shoreline. Associated species include the sea grape (*Coccoloba uvifera*) and almacigo (*Bursera simaruba*). This species is currently known to occur in Punta Melones, Villas de Mi Terruño at Sardineras Ward, and Punta Soldado. In addition, the species has been introduced in a private property located at Fraile Ward, and at the Observation Point located within the Culebra National Wildlife Refuge in Punta Flamenco.

Figure 7. *Leptocereus grantianus*. Source: http://www.fws.gov/caribbean/ES/Images/Leptocereus_grantianus.jpg

L. grantianus was determined to be an endangered species in 1993 pursuant to ESA. Critical habitat has not been designated for this species.

3.0 MEASURES TO AVOID OR MINIMIZE POSSIBLE IMPACTS

The following measures will be implemented to avoid or minimize impacts to terrestrial threatened or endangered species and their habitat during investigation and cleanup work on Culebra Island and its adjacent cays.

3.1 General Procedures

3.1.1 Protected Species Identification Training/Briefing: Prior to initiate work all personnel shall receive training or briefings regarding the importance of endangered species, their characteristics, how they can be identified, potential habitats, types of material in which their may hide, actions to take if are sighted and avoidance measures to be followed. This training or briefing shall be prepared and offered by qualified personnel (e.g. biologist, environmental scientist, botanist, among others).

3.1.2 Civil and Criminal Penalties: The Contractor shall instruct all personnel associated with the project of the potential presence of threatened or endangered species. All personnel shall be advised that there are civil and criminal penalties for harming, harassing or killing threatened or endangered species protected under the ESA and Commonwealth of Puerto Rico Endangered Species Regulation.

3.1.3 Qualified Personnel: Each team performing vegetation clearance/removal (e.g. pruning, trimming, and cutting) shall be accompanied by qualified and experienced personnel in order to identify the presence or absence of threatened or endangered species. The Contractor shall submit their qualifications to the USACE and the FWS.

3.1.4 Coordination: All related work will be coordinated with the resource agencies (FWS, DNER and NMFS) prior initiation. The Contractor will provide a preliminary schedule and the areas (including the proposed transects and grids) where investigation or cleanup activities will be performed. Changes to the schedule and working areas will be provided to the resource agencies. Any access and work on the adjacent cays will be closely coordinated with FWS and DNER. Seabirds breeding season (May-August) shall be considered during the cays access coordination.

3.1.5 Reports: The Contractor shall maintain a log detailing sightings. The log shall include, but not limited to, the following information: date and time, location, species, and any actions taken during the work period. All data shall be forwarded to USACE Environmental Branch.

3.1.6 Detonation Activities: If determined that detonation activities are required, the related work and its conservation measures will be closely coordinated with the resource agencies.

3.2 Culebra Giant Anole Avoidance and Monitoring

3.2.1 In order to avoid impacts to this species transects/grids monitoring surveys will be conducted by qualified personnel to determine its presence or absence. The areas where the vegetation will be cleared shall be inspected prior to proceed with vegetation clearance.

3.2.2 According to the obtained information, this species is presumably active in daytime. For that reason, if it is sighted the vegetation clearance work shall cease to ensure the protection of the species. The activities will not be resumed until the animal has moved, at least, 100 feet outside the transect/grid limits or is at a safe distance.

3.2.3 The vegetation where the species was sighted shall not be cleared, until coordination with FWS has been completed.

3.2.4 The capture or collection of this species is prohibited. This species is protected under ESA.

3.2.5 It should be noted that this species has not been sighted since 1932. If this species is identified during investigation or cleanup work, the USACE Environmental Branch and FWS personnel must be notified immediately. It location shall be documented and provide it to FWS in order to facilitate additional field investigations. The USACE and FWS points-of-contact (POC) are included in Section 4.0.

3.3 Virgin Islands Tree Boa

3.3.1 Boa Monitoring: Boas have the potential to occur within the work area limits, in trees or bushes, under stored materials or inactive equipment stored in shady locations. Qualified personnel shall conduct the boa monitoring. Boas are active mostly during the night. Therefore, a daily search around and in machinery shall be completed at the beginning of each working day, prior to start-up of engines of quarry machinery, bulldozers, trucks, etc. Particular attention

should be paid to motors and other warm areas that may be entered at night by the animals in an attempt to warm themselves.

3.3.2 If search of machinery does not discover any specimens, areas that are about to be cleared of vegetation shall be inspected next, especially piles of brush, leaf litter and rotting vegetation. These areas may be prodded gently with a blunt stick.

3.3.3 Relocation Actions: If a boa is discovered, all work shall stop within a 50 foot radius of the boa's location. One person shall keep watch on the boa while another contacts the designated boa monitor. If it is sighted within the transect limits, the boa shall be allowed to leave the site naturally. If the boa does not show any intention of leaving the area naturally, it will be relocated off the transect limits to an area with similar characteristic (e.g. vegetation cover) in order to resume the activities. If relocation is required 1) the boa monitor shall contact the USACE, FWS, and DNER POCs 2) shall provide the proposed relocation site location and its description, and 3) then will perform the capture, and relocation of the boa. The FWS and/or DNER POCs shall agree with the relocation site prior its relocation. The captured animal must be maintained in a cool, shady place (not inside a parked car) until relocation is completed.

3.3.4 The areas where boas have been relocated shall be clearly marked, documented, and provided to the USACE, FWS and DNER POCs.

3.3.5 Capture and Relocation Supplies and Equipment: At least three items should be provided by the contractor to the boa monitor, and maintained available on-site to handle and carry snakes if they are spotted: These are: a blunt snake hook, netting or burlap bags with closing ties, and a 6 x 6 or 8 x 8 foot tarpaulin.

3.4 Listed Vegetation Avoidance Measures

3.4.1 Cutting or pruning of any of these species (*Peperomia wheeleri* and *Leptocereus grantianus*) is prohibited. These species are listed as endangered and are protected under ESA.

3.4.2 Prior to the beginning of any vegetation clearance, the Contractor's qualified personnel shall identify if any of the listed species described in Section 2 are present or absence within the work area. The Contractor shall contact the FWS in order to obtain additional information (e.g. GIS shapefiles, location maps, etc.) on the locations and populations of these species. This information will be used to determine the transects/grids dimensions and their final locations. During the investigation activities qualified personnel shall conduct visual surveys to ensure the presence or absence of these species and to avoid or minimize possible impacts.

3.4.3 Vegetation clearance in areas where specimens of Wheeler's Peperomia are found shall be closely coordinated with FWS and DNER. Removal of the forest canopy could alter the microclimatic conditions within the forest, resulting in the elimination of humus substrate necessary for the survival of the species. This species is associated with the following canopy species: *Clusea rosea*, *Bursera simaruba* and *Ficus citrifolia*. It is also associated with other species growing in the herbaceous strata: several species of *Tillandsia*, *Anthurium acaule*,

Whittmackia lingulata and *Epidendrum cochleatum*. Particular attention should be paid to these areas.

3.4.4 Cutting or pruning vegetation within Wheeler' Peperomia habitat, including forested areas with boulders that are densely covered by bromeliads, orchids or anthuriums, shall be avoided to the maximum extend possible in order to maintain the microclimate conditions that contribute to the suitability of this endangered species.

3.4.5 Cutting or pruning of any species of cacti shall be avoided in order to prevent impacts to *Leptocereus grantinanus* species.

3.4.6 If any of these species (*Peperomia wheeleri* and *Leptocereus grantianus*) is found within the proposed transect/grid, the route will be realigned. The species shall be clearly marked in order to ensure its protection.

4.0 POINT OF CONTACT FOR SOP COORDINATION

U.S. Army Corps of Engineers, Jacksonville District:

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Appendix B: Culebra RAB Projects Briefing Report to Congress – NW Peninsula Study

OFFICE OF THE UNDER SECRETARY OF DEFENSE
3000 DEFENSE PENTAGON
WASHINGTON, DC 20301-3000

ACQUISITION,
TECHNOLOGY
AND LOGISTICS

MAY 2 2 2012

The Honorable Luis G. Fortuno
Governor of Puerto Rico
La Fortaleza
P.O. Box 9020082
San Juan, Puerto Rico 00902-0082

Dear Governor Fortuno:

Enclosed is the study you requested in your April 25, 2011, letter to the Secretary of Defense regarding the presence of unexploded ordnance in a portion of the former Naval bombardment area at Culebra Island, Puerto Rico. I am responding on his behalf.

The Army conducted the study using existing site information and data the U.S. Army Corps of Engineers collected during its field investigations. The Corps of Engineers staff worked with the Puerto Rico Environmental Quality Board, which provided draft information outlining one potential future use of the study area, but the Board has not yet finalized its plans. The Corps of Engineers based its estimate on the use of the area as a park and other recreational area. The enclosed study estimates the cost at $49M for the removal of unexploded ordnance from the study area's entire 408 acres. The estimated costs associated with making the area safe could either increase or decrease based on the Commonwealth's final use determination.

Ms. Maureen Sullivan, Director of Environmental Management, is available if your staff has any questions or concerns regarding the study. She can be reached at 703-695-7957 or Maureen.Sullivan@osd.mil.

Sincerely,

Dorothy Robyn
Deputy Under Secretary of Defense
(Installations and Environment)

Enclosure:
As stated

Ike Skelton National Defense Authorization Act for Fiscal Year 2011
Public Law 111-383
111th Congress

SEC. 2815. FORMER NAVAL BOMBARDMENT AREA, CULEBRA ISLAND, PUERTO RICO.

(a) Study Required.--At the request af the Commonwealth of Puerto Rico, the Secretary of Defense shall conduct a study relating to the presence of unexploded ordnance in a portion of the former bombardment area at Culebra Island, Puerto Rico, transferred to the Commonwealth of Puerto Rico by quitclaim deed. The Secretary shall complete the study within 270 days after receiving the request from the Cammonwealth.

(b) Contents of Study.--The study shall include a specific assessment of Flamenco Beach located within the former bombardment area and shall include the following elements for each area:

(1) An estimate of the type and amount of unexploded ordnance.

(2) An estimate of the cost of removing unexploded ordnance.

(3) An examination of the impact of such removal on any endangered or threatened species and their habitat.

(4) An examination of current public access to the former bombardment area.

(5) An examination of any threats to public health or safety and the environment from unexploded ordnance.

(c) Consultation With Commonwealth.--In conducting the study, the Secretary of Defense shall consult with the Commonwealth of Puerto Rico regarding the Commonweolth's planned future uses of the former bombardment area. The Secretary shall consider the Commonwealth's planned future uses in developing any conclusions or recommendations the Secretary may include in the study.

(d) Definitions.--In this section:

(1) The term "quitclaim deed" refers to the quitclaim deed from the United States to the Commonwealth of Puerto Rico, signed by the

Secretary of the Interior on August 11, 1982, for that portion of Tract (1b) consisting of the former bombardment area on the islond af Culebra, Puerto Rico.

(2) The term "unexploded ordnance" has the meaning given that term by section 101(e)(5) af title 10, United States Code.

Department of Defense

Study Relating to the Presence of Unexploded Ordnance in a Portion of the Former Naval Bombardment Area of Culebra Island, Commonwealth of Puerto Rico

Conducted Pursuant to Section 2815 of the Ike Skelton National Defense Authorization Act for Fiscal Year 2011, Public Law 111-383

April 20, 2012

Forward

This report was prepared by the U.S. Army for the Department of Defense (DoD) in response to the Governor of Puerto Rico's April 25, 2011 request to the Secretary of Defense in accordance with section 2815 of the Ike Skelton National Defense Authorization Act for Fiscal Year 2011, Public Law 111-383. By direction of the Deputy Assistant Secretary of the Army for Environment, Safety and Occupational Health, the U.S. Army Corps of Engineers (USACE) conducted a study to develop the data needed to prepare a report responsive to the matters that section 2815 addresses. The U.S. Army developed this report based on both existing site information and data that USACE derived from its field investigations, which were limited to collecting only the data required to address section 2815.

At the Army's request, the Commonwealth of Puerto Rico provided draft information outlining its potential plans for the future use of the Southern Portion of the Northwest Peninsula (NWP), but it has not yet finalized its plans for development of this property. Consequently, this report is based on the estimated cost for removing unexploded ordnance from the study area's entire 408 acres.

It is important to understand that factors, such as the Commonwealth's decision on how the NWP will be used, compliance with the Endangered Species Act (ESA), and the desire to limit the impact of any response actions on the various valuable ecological resources present may cause the estimated costs to increase significantly.

Study Relating to the Presence of Unexploded Ordnance in a Portion of the Former Naval Bombardment Area of Culebra Island, Puerto Rico

On behalf of the Department of Defense (DoD), the U.S. Army Corps of Engineers (USACE) conducted a study between June 2011 and December 2011 to evaluate site-specific conditions relating to the presence of unexploded ordnance (UXO)[1] at the Southern Portion of the Northwest Peninsula (NWP) (the Study Area), Culebra Island, Commonwealth of Puerto Rico. The United States owned and the U.S. Navy used this property as a bombardment area for several decades. In 1982, the property was transferred by deed to the Commonwealth of Puerto Rico at the Commonwealth's request. Pursuant to authority granted in section 204 of Public Law 93-166, the deeds imposed certain conditions limiting the property's use. The island of Culebra is located approximately 17 miles east of the main island of Puerto Rico.

Section 2815 of the Ike Skelton National Defense Authorization Act for Fiscal Year 2011, Public Law 111-383 (Enclosure 1) provides that the Secretary of Defense shall conduct a study upon receiving a request from the governor of Puerto Rico. The governor made such a request by letter dated April 25, 2011.

Section 2815 requires that the Secretary of Defense:

- Conduct a study of the former bombardment area with regard to the following five elements, with a specific assessment of Flamenco Beach:
  - *(1) An estimate of the type and amount of unexploded ordnance.*
  - *(2) An estimate of the cost of removing unexploded ordnance.*
  - *(3) An examination of the impact of such removal on any endangered or threatened species and their habitat.*
  - *(4) An examination of current public access to the former bombardment area.*
  - *(5) An examination of any threats to public health or safety and the environment from unexploded ordnance.*
- Consult with the Commonwealth of Puerto Rico regarding its plans for the future uses of the former bombardment area.
- Consider the Commonwealth's plans in developing any conclusions or recommendations the Secretary may include in the study.

OVERVIEW

The Study Area (outlined in blue on Figure 1), which consists of approximately 408 acres, is the southern portion of the NWP. The Study Area includes the Carlos Rosario Beach and portions of Flamenco Beach.

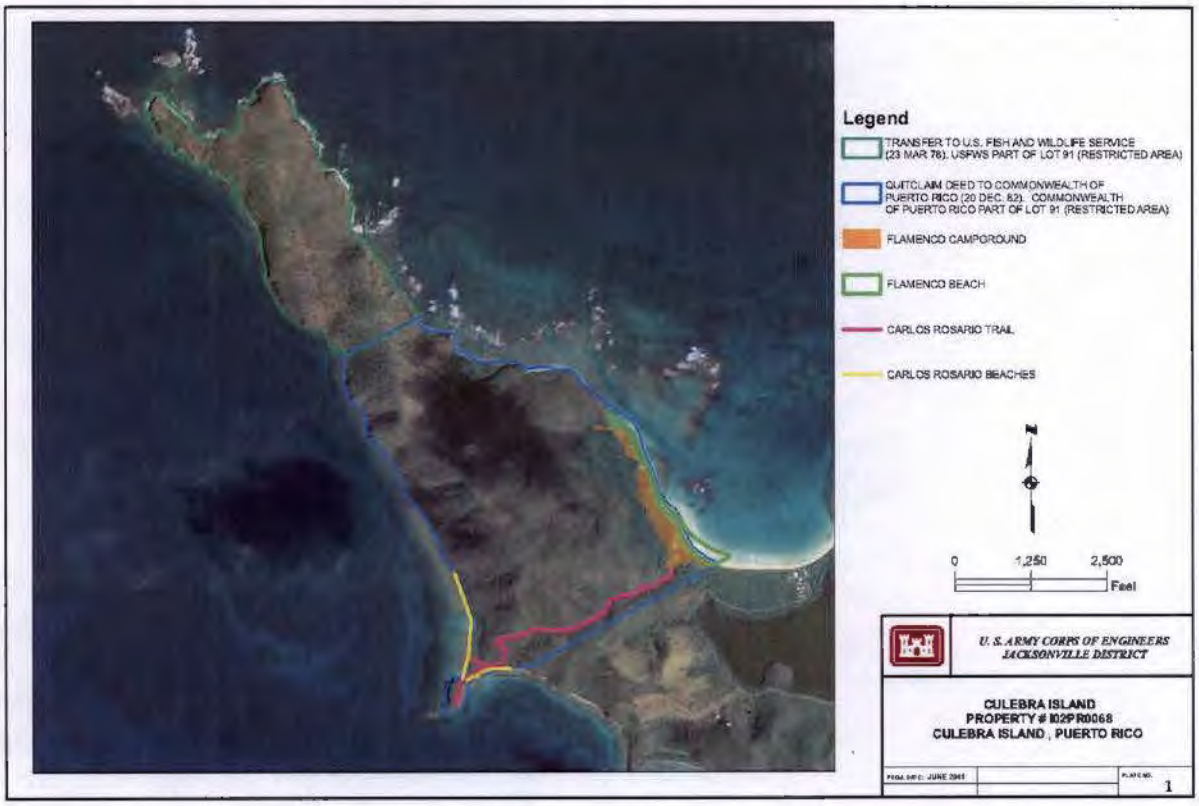


Figure 1. Map of Study Area (Quitclaim Deed Boundary)

Input to this report consisted of data collected through:

- A review of historical military records and previous investigation reports.
- A geophysical survey during which advanced metal detectors were used to detect subsurface metallic objects (referred to as anomalies) and record their location.
- The excavation of selected anomalies for which the geophysical survey data indicated the anomaly may be a UXO.
- An evaluation of the recovered item to determine whether it was a UXO.
- Sampling of soil, surface water, and sediment for munitions constituents $(MC)^2$.

STUDY APPROACH

The Army developed this study to obtain the data needed to comply with the requirements of section 2815. Throughout the study, USACE coordinated with the Puerto Rico Environmental Quality Board (EQB) to ensure consideration of the EQB's concerns and input.

USACE's field work began with selection of geophysical survey paths that were located in areas representative of the different types of terrain found within the Study Area. The areas that USACE selected were along the beach, in the campgrounds, and included both flat and steeply sloping terrain. To accommodate the survey, workers manually cleared tropical vegetation from the selected survey paths. During clearing, plant biologists helped ensure endangered plant species were avoided, and UXO-qualified personnel ensured UXO were avoided.

Once the survey paths were cleared of vegetation, UXO-qualified personnel used advanced metal detectors along the survey paths to detect subsurface anomalies that were subsequently excavated to determine whether they were UXO. In some areas, USACE widened the survey path to allow more extensive data to be obtained. During the geophysical survey, USACE:

- Used a portable global positioning system (GPS) instrument to record the location of the survey paths and any detected anomalies;
- Investigated all detected anomalies to determine whether it was UXO, munitions debris, or other debris (e.g., cultural debris, like fence wire);
- Determined the explosives safety status of any munitions debris encountered; and
- Destroyed all recovered UXO and any munitions debris determined to pose an explosive hazard either in place or at a selected location.

After the survey, USACE used specialized software to map the distribution and type of military munitions[3] (e.g., UXO) found along the survey paths. Because the survey paths only covered a portion of the Study Area, experts used the survey data to develop a model to predict the potential distribution of UXO across the entire Study Area. The resulting map (see Figure 3) divides the Study Area into distinct areas based on density of munitions (High, Medium, and Low) and steepness of the terrain. USACE then estimated the potential costs for investigation and removal of UXO for each of these areas. Significant portions of the estimated costs are for clearance of vegetation, investigation of detected anomalies, and removal of UXO. The greater the UXO density, the higher the potential costs.

As part of the investigation, USACE collected soil, surface water, and sediment samples. USACE analyzed these samples to determine whether they contained MC (metals and explosives) that could be harmful to human health or the environment.

Additional detail concerning the study approach and results are provided in the following sections.

ASSESSMENT OF THE STUDY AREA

The USACE's assessment of the Study Area, which addresses the entire 408 acres, responds to the five elements stated in section 2815(b).

(1) An Estimate of the Type and Amount of Unexploded Ordnance (UXO)

The NWP was used for live gunnery practice between 1936 and January 1, 1972. During this period, approximately 750,000 naval rounds were fired into the NWP. Of these, an estimated 80 percent (600,000) were 5 inch (")/38 caliber (cal) and 5"/54 cal projectiles and an estimated 10 percent (75,000) were 3"/50 cal, 6"/47 cal, and 8"/55 cal gun ammunition. The balance included other types of military munitions including 16"/50 cal, and munitions for both mortars and howitzers. Additionally, during 1942 to 1968, approximately 320,000 naval aviation munitions (e.g., bombs and rockets) were used (dropped or fired) within the NWP. (U.S. Navy Memorandum dated June 1973 from Commander in Chief U.S. Atlantic Fleet to Chief of Naval Operations, Subject: Time-Phased Plan for Relocation of Training Activities from the Culebra Complex to the Islands of Desecheo and Monito.)

Since 1995, 70 UXO have been encountered within approximately 19 acres of the Study Area. This total, which includes 36 UXO discovered during this study, equates to approximately 3.7 UXO per acre. The locations of the 36 UXO discovered during USACE's 2011 assessment are shown on Figure 2.

The predominant military munition encountered within the Study Area as UXO was the 5-inch High Explosive (HE) naval projectile. Other UXO encountered included the following types of military munitions: 2.75-inch rockets, 3-inch naval projectiles, 40mm projectiles, 75mm projectiles, 81mm mortars, 100-pound General Purpose (GP) bombs, a 500-pound GP bomb, and Bomb Dummy Unit (BDU)-33 practice bombs.

Figure 2. Locations of Individual or Multiple UXO

(2) An Estimate of the Cost of Removing Unexploded Ordnance (UXO)

The estimated cost-to-complete (CTC) for the removal of UXO from the entire 408 acre Study Area is approximately $49 million. This estimate includes the cost to prepare all necessary environmental documentation. USACE based this estimate on the scope of munitions response activities (e.g., investigation, removal) that it developed, pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), for property intended to be used as a public park and recreation area. The response actions USACE used to develop this estimate included a surface removal of UXO and the removal of subsurface UXO to a depth of two feet below ground surface. Similar response actions have been considered protective for property to be used as public parks and recreation areas. In response to section 2815(b), this CTC includes approximately $3 million for removal of UXO from the Flamenco Beach and Campground Area. Should the Commonwealth of Puerto Rico change the Study Area's future land use, the CTC may increase or decrease depending on the response actions needed to make the land safe from an explosives safety perspective for the intended use.

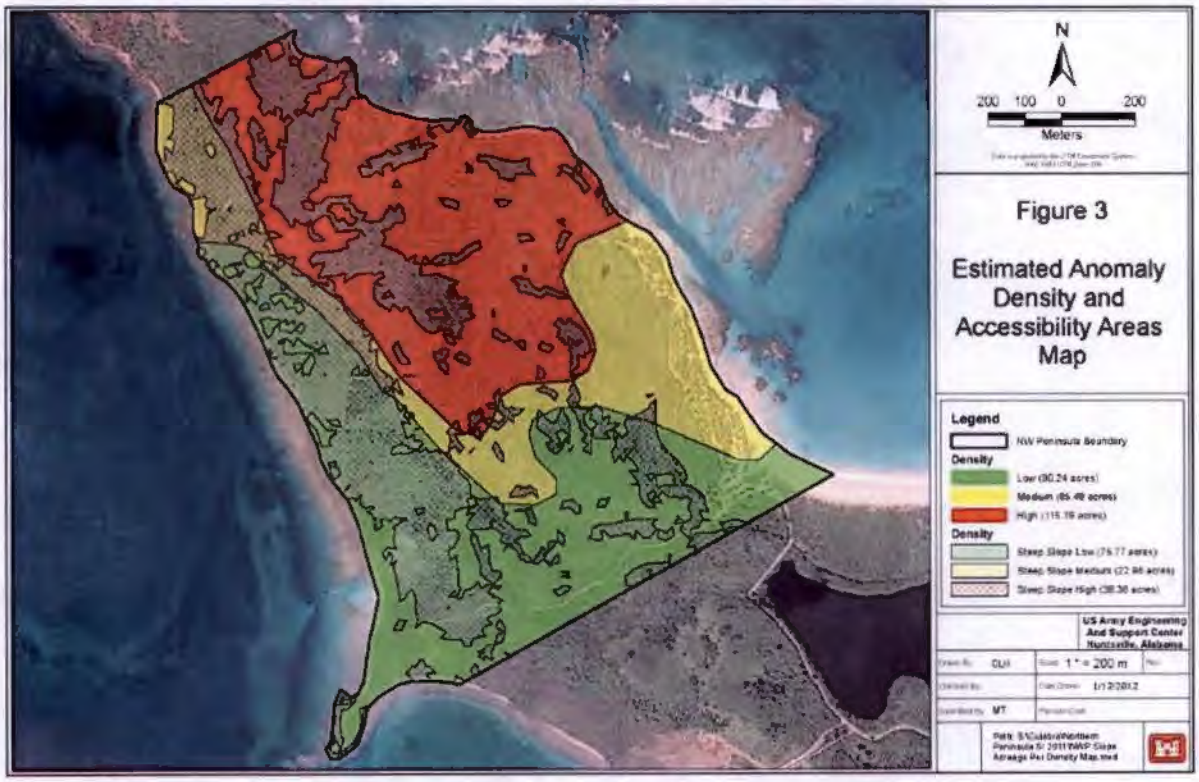


Figure 3. Estimated Anomaly Density and Accessibility Areas Map

In developing this CTC, USACE divided the Study Area into three areas based upon the number of metallic anomalies that USACE detected during the geophysical survey, USACE's estimate of the density of those metallic anomalies within each area, and the steepness of the terrain (see Figure 3). USACE based its estimate on the costs associated with digging each

anomaly and destroying any UXO encountered. The three areas reflect an estimated anomaly density of:

- Low (Green): 0 to 785 anomalies per acre
- Medium (Yellow): 786 to 1,040 anomalies per acre
- High (Red): 1,041 to 1,400 anomalies or more per acre

Additionally, the steepness of terrain can increase the cost for UXO removal. The conduct of munitions response[4] actions (e.g., investigation or removal) on terrain slopes of greater than 30 percent also poses safety concerns that must be considered. When necessary, the conduct of munitions responses on such terrain requires significantly more effort than areas with a lesser slope. To more accurately represent the UXO removal costs, USACE further subdivided the three density areas above into areas with and without steep terrain (see below). Of the 408 acres within the Study Area, USACE determined that approximately 34 percent has a slope of over 30 percent.

- High density acres (115.19 acres)
- High density acres with a steep slope (38.36 acres)
- Medium density acres (65.48 acres)
- Medium density acres with a steep slope (22.96 acres)
- Low density acres (90.24 acres)
- Low density acres with a steep slope (75.77 acres)

USACE based the CTC for the Study Area on the estimated cost of removing UXO from each of these areas. Table 1 provides the estimated costs for each of these areas and indicates the per acre cost. The per acre cost is based upon the estimated cost for:

- Removal of vegetation to gain access to the areas to conduct a geophysical survey;
- Excavation of the metallic anomalies that USACE believes have the potential to be UXO;
- Evaluation of any military munitions, munitions debris, or range-related debris encountered;
- On-site disposal of any UXO and any material determined to pose an explosive hazard;
- Collection and removal of munitions debris and range-related debris that has been evaluated and documented as safe; and
- Implementation of measures determined to be necessary to protect ESA-listed species and designated critical habitat.

The estimated cost of removing UXO from the Study Area was calculated by multiplying the cost per acre by the estimated number of acres for the corresponding density areas type.

Table 1. Estimated Cost for UXO Removal from the Study Area

Area	Estimated Cost per Acre	Estimated Acreage	Estimated Subtotal Cost by Density Area
High density	$115,211	115.19	$13,271,155
High density, with steep slope	$161,296	38.36	$6,187,315
Medium density	$104,454	65.48	$6,839,648
Medium density with steep slope	$146,236	22.96	$3,357,579
Low density	$96,366	90.24	$8,696,068
Low density, with steep slope	$134,912	75.77	$10,222,282
Estimated Cost-to-Complete (CTC) for Removal Activities		**408**	**$48,574,047***
***Additional cost of $490K required to prepare environmental documentation to implement removal activities.**			

(3) <u>An Examination of the Impact of Such Removal on Any Endangered or Threatened Species and Their Habitat</u>

The Study Area consists of diverse sensitive habitats including wetlands, a mangrove area, seabird rookeries, and sea turtle nesting sites. Various valuable ecological resources are present or are potentially present within the Study Area. Such resources include five federally listed threatened or endangered species. Because protected species and habitats are present or are potentially present within the Study Area, the Study Area is considered ecologically important. Based on the ecological resources present or potentially present, the primary ecological risk assessment management goal is to sustain the populations of any listed species that occur at the Study Area.

USACE's study included an analysis of the various types of habitat prevalent within the Study Area. Such habitat types include: beaches and shores; lagoons; rocky cliffs; open grasslands; closed forest canopy; and legume canopy and grassland understory. The following threatened or endangered species are present or are potentially present within these habitat types: hawksbill turtle; Virgin Islands tree boa; Culebra giant anole; Grant's leptocereus; and Wheeler's peperomia.

Removal of UXO may have an impact on endangered or threatened species and their habitats because vegetation clearance would be required for areas to be investigated to help ensure the safety of munitions response workers. The ESA requires that any possible impact or

harm to endangered species or their critical habitat be minimized. Therefore, any munitions response actions that may be conducted that have the potential to impact or harm endangered species or their critical habitat should be coordinated with the U.S. Fish and Wildlife Service and others, as appropriate. This coordination will be the basis for developing mitigation measures to limit such impacts or harm before proceeding with the response action. The mitigation measures developed would be employed during response action activities to help ensure threatened or endangered species and their habitats are identified and when possible, avoided.

(4) An Examination of Current Public Access to the Former Bombardment Area

There are no full-time residents within the Study Area, and its use for residential purposes is restricted by deed provisions and section 204 of Public Law 93-166. Many people visit the area throughout the year. Local workers are regularly present within the Study Area to manage recreational areas. The Flamenco Beach Campground, which consists of 11 commercial vendor structures and an expansive tent-camping area, is located within the Study Area. Additionally, other areas such as Flamenco Beach, Carlos Rosario Trail and Beach, and Tamarindo Beach are regularly visited. Access to Flamenco Beach is unrestricted; however, natural barriers, such as dense vegetation and rocky cliffs, make access to many portions of the Study Area difficult.

As shown in Figure 4, a fence was installed along the western border of the Flamenco Beach Camping Area. Another fence, which was installed during the 1970s, runs partially along the Study Area's southern boundary. This fence, which begins at the Flamenco Beach parking area, extends west and terminates short of the top of the ridgeline. Vegetation growth or visitors have compromised multiple areas along the fence line.

There are two gates in the fence that provide access to the Study Area. One is at the parking area on the south end of the campground, with the other at the campground's northern most point (see Figure 4). The southern access point is controlled by a chained and locked gate. However, visitors have been able to bypass this gate, gaining access to the trail that leads to the Carlos Rosario Beach Area. The Study Area's vegetation is very restrictive, generally deterring travel off established trails and roads. Additionally, the Study Area is accessible by sea on both the eastern and western sides along the beach areas.

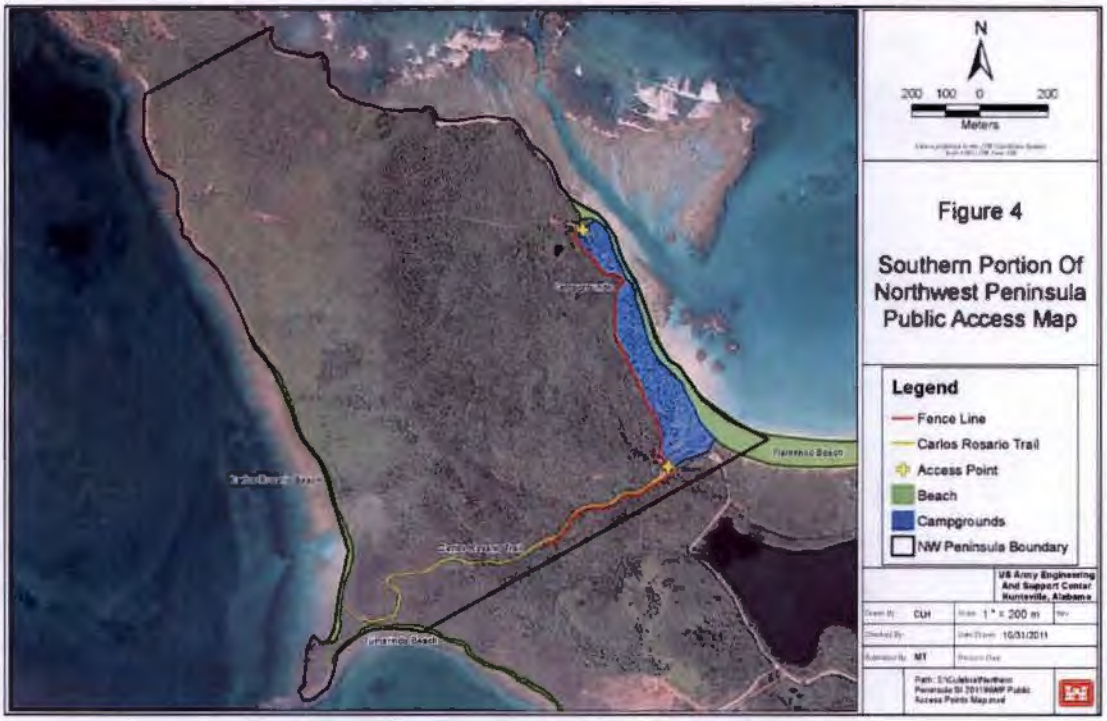


Figure 4. Public Access Map

(5) <u>An Examination of Any Threats to Public Health or Safety and the Environment from Unexploded Ordnance (UXO)</u>

(a) Threats to Public Health or Safety from UXO

USACE applied the Munitions Response Site Prioritization Protocol (MRSPP) (32 Code of Federal Regulation, Part 179) to identify the relative risks posed by UXO, discarded military munitions (DMM)[5], and MC to people (e.g., visitors, current and future workers) who might obtain access to the Study Area. The MRSPP's modules are the:

- Explosive Hazard Evaluation (EHE) Module: provides the approach for assigning a relative priority to a munitions response site (MRS) where UXO, DMM, and MC are known or suspected to be present.
- Chemical Warfare Materiel Hazard Evaluation (CHE) Module: provides the approach for assigning a relative priority to an MRS where chemical warfare materiel (CWM) (i.e., chemical munitions and chemical agents in other than a munitions configuration) hazards are known or suspected to be present.
- Health Hazard Evaluation (HHE) Module: provides the approach for evaluating the relative risk to human health and the environment where MC and any incidental non-munitions-related contaminants are known or suspected to be present.

Application of the MRSPP to the Study Areas resulted in a score of 2, on a scale of 1 to 8, with one being the highest relative priority. This ranking was based solely on the EHE module as there is no historical or physical evidence to indicate that CWM-related activities

occurred within the Study Area. In addition, data (beyond the scope of this study) would be required to fully complete the MRSPP's HHE.

A relative MRS priority of 2 is the highest relative risk ranking possible for an MRS that is known or suspected to only contain conventional military munitions.

(b) Threats to Human Health and the Environment from Munitions Constituents (MC)

USACE collected over 100 soil, surface water, and sediment samples from within the Study Area. These samples were analyzed for MC (both metals and explosives). Samples that contained MC concentrations that exceeded background (normal levels) were used in the risk assessment.

USACE used the results of the sampling and analysis and EPA's Risk Assessment Guidelines to determine that no unacceptable human health risks from MC would be expected through exposure to surface water or sediment. However, there may be an unacceptable human health risk from exposure to MC in soil. For ecological receptors, the sample analysis indicated that exposure to certain compounds in soil, surface water, and sediment may pose an unacceptable risk; however, further analysis is required to determine whether response actions may be needed to address potential human health and ecological risks.

Screening-level risk assessments were completed for both human health and ecological receptors. These risk assessments evaluated specific MC detected in the samples collected as part of this study. For soil, the MC considered in the risk assessment included metals (antimony, chromium, copper, lead and zinc) and explosives (2-amino-4,6-dinitrotolune, 4-amino-2,6-dinitrotoluene, 2,4,6-trinitrotoluene, and methyl-2,4,6-trinitrophenyl-nitramine [tetryl]). The risk assessment also considered copper in sediment and copper, lead, and zinc in surface water.

The human health screening-level risk assessment results indicate that copper and one explosive (2,4,6-trinitrotoluene) were detected in soil above their human health preliminary screening values (USEPA Regional Screening Levels, residential soil, June 2011). As such, copper and 2,4,6-trinitrotoluene may pose an unacceptable human health risk in soil at the Study Area. USACE used the results of the sampling and analysis and EPA's Risk Assessment Guidelines to determine that an unacceptable human health risk from MC would not be expected through exposure to surface water or sediment within the Study Area.

The screening-level ecological risk assessment results indicate that five metals (antimony, chromium, copper, lead, zinc) and four explosives (2-amino-4,6-dinitrotolune, 4-amino-2,6-dinitrotoluene, 2,4,6-trinitrotoluene, and methyl-2,4,6-trinitrophenylnitramine [tetryl]) were present in soil (Metals - USEPA Ecological Soil Screening Levels; Explosives – Los Alamos National Laboratory, Eco Risk Database (Release 3.0), October 2011). Additionally, one metal (copper) was detected in sediment and three metals (copper, lead, and zinc) were detected in surface water above their preliminary ecological screening values (USEPA Region 4 Ecological Screening Values, November 30, 2001). Based on these results, exposure to these compounds in soil, sediment, and surface water may pose an unacceptable risk to ecological receptors within the Study Area; however, further analysis is required before determining if response actions may be needed to address these potential risks.

CONSULTATION WITH THE COMMONWEALTH

In addition to the previously mentioned EQB involvement, DoD consulted with the Commonwealth of Puerto Rico regarding the Commonwealth's planned future use of the former bombardment area. The EQB provided DoD with the 2011 Culebra Sustainable Master Plan from the Department of Economic Development and Commerce, Government of Puerto Rico (Enclosure 3), which outlines the Commonwealth's plans for development of parks and recreational area within the Study Area.

Enclosure 1: Section 2815 of the Ike Skelton National Defense Authorization Act for Fiscal Year 2011 (Public Law 111-383)

Ike Skelton National Defense Authorization Act for Fiscal Year 2011
Public Law 111-383
111th Congress

SEC. 2815. FORMER NAVAL BOMBARDMENT AREA, CULEBRA ISLAND, PUERTO RICO.

(a) Study Required.--At the request of the Commonwealth of Puerto Rico, the Secretary of Defense shall conduct a study relating to the presence of unexploded ordnance in a portion of the former bombardment area at Culebra Island, Puerto Rico, transferred to the Commonwealth of Puerto Rico by quitclaim deed. The Secretary shall complete the study within 270 days after receiving the request from the Commonwealth.

(b) Contents of Study.--The study shall include a specific assessment of Flamenco Beach located within the former bombardment area and shall include the following elements for each area:

(1) An estimate of the type and amount of unexploded ordnance.

(2) An estimate of the cost of removing unexploded ordnance.

(3) An examination of the impact of such removal on any endangered or threatened species and their habitat.

(4) An examination of current public access to the former bombardment area.

(5) An examinatian of any threats to public health or safety and the environment fram unexploded ordnance.

(c) Consultation With Commonwealth.--In conducting the study, the Secretary of Defense shall consult with the Commonwealth of Puerto Rico regarding the Commonwealth's planned future uses of the former bombordment area. The Secretary shall consider the Commonwealth's planned future uses in developing any conclusions or recommendations the Secretary may include in the study.

(d) Definitions.--In this section:

(1) The term "quitclaim deed" refers to the quitclaim deed from the United States to the Commonwealth of Puerto Rico, signed by the

Secretary of the Interior on August 11, 1982, for that portion of Tract (1b) consisting of the former bombardment area on the island of Culebra, Puerto Rico.

(2) The term "unexploded ordnance" has the meaning given that term by section 101(e)(5) of title 10, United States Code.

Enclosure 2: Letter from the Governor of Puerto Rico dated April 25, 2011

GOVERNMENT OF PUERTO RICO

LUIS G. FORTUÑO
GOVERNOR

April 25, 2011

Hon. Robert Gates
Secretary of Defense
U.S. Department of Defense
1000 Defense Pentagon, Room 3E880
Washington, DC 20301-1000

Deor Secretary Gates:

Pursuant to Section 2815(a) of the Ike Skelton National Defense Authorization Act for Fiscal Yeor 2011 (PL 111-383), I hereby request thot the Deportment of Defense conduct a study relating to the presence of unexploded ordnance in a portion of the former Naval bombardment area at Culebra Island, Puerto Rico.

In conducting this study, it is important for the DOD to take into consideration that certoin portions of land in the former bombardment area, including (1) the area thot serves as the camping grounds at Flamenco Beach, (2) the path across the neck of the Northwest Peninsulo from Flamenco Beach to Carlos Rosario Beach, and (3) the area at Flamenco Beach that is immediately off the shore and where bathers stand when wading in the water, may require special attention (Special Attention Areas). Flamenco Beach is a world renowned recreational area and these areas experience a high volume of tourist and local traffic, attracting many thousands of visitors each year, including families and children.

Accordingly, I request that in conducting the study, DOD estimate the cleanup casts for the Special Attention Areas and endeavor to provide the estimate for the Special Attention Area within 120 days of commencing the study. The goal is to ensure that safety is provided as soon as possible to the general public who are intensively using the Special Attention Areas while recognizing thot the study will also address the other portions af the former bombardment area.

L FORTALEZA, SAN JUAN, PR 00901 * PO BOX 9020082, SAN JUAN, PR 00902-0082
TEL: (787) 721-7000 * FAX: (787) 722-4300

For any assistance or coordination that the DOD may need in conducting this study, pleose contact Mr. Pedro J. Nieves Miranda, Chairmon of the Puerto Rico Environmental Quality Boord, which is the lead agency overseeing the cleanup of the former defense sites in Puerto Rico. Thank you for your considerotion of this request.

Sincerely,

Luis G. Fortuño

c: Dr. Dorothy Robyn, Deputy Under Secretary of Defense, Installations & Environment

Enclosure 3: Letter from the Department of Economic Development and Commerce, Government of Puerto Rico dated October 7, 2011, regarding 2011 Culebra Sustainable Master Plan

DEPARTMENT OF ECONOMIC DEVELOPMENT AND COMMERCE
DEDC
GOVERNMENT OF PUERTO RICO

October 7, 2011

Lcdo. Pedro J. Nieves Miranda
President
Puerto Rico Environmental Quality Board
PO box 366147
San Juan, PR 00936

RE: 2011 Culebra Sustainable Master Plan

Dear Mr.Nieves,

The Puerto Rico Department of Economic Development and Commerce ("DDEC") has commissioned the revision of the Culebra Sustainable Master Plan. For the past months DDEC and its team have completed the first draft of the above mentioned plan. A world renowned eco-Architect, eco-Landscape Architect and Environmental Planner has been hired to assists in such plan. From our several visits and studies in Culebra, Flamenco Peninsula is the area that we have designated ideal for an eco-tent concept. Exhibit 1 includes an excerpt from our planners report depicting the concept we envision for Flamenco Peninsula.

As DDEC intends to explore Culebra's touristic attributes, the Flamenco Peninsula is an important part of such development. The proposed eco-tents would be located on the western tip of Flamenco, beyond the current campsite. An access road to the tents would be created inland in an attempt to increase the eco arrival experience. Exhibit 2 delineates the areas we plan to develop. It is to my understanding that your team is working with these parcels and we would like to make sure our plans are aligned.

We look forward to working with you in the sustainable development of Culebra. Please contact Joao Proenca or Riccardo Lopez Cepero at 787-765-2900 or joao.proenca@ddec.pr.gov if you need assistance or have questions with respect to our plans for both islands.

Sincerely,

Jaime A.López Díaz
Chief Development Officer
Department of Economic Development and Commerce
Government of Puerto Rico

Exhibit 1

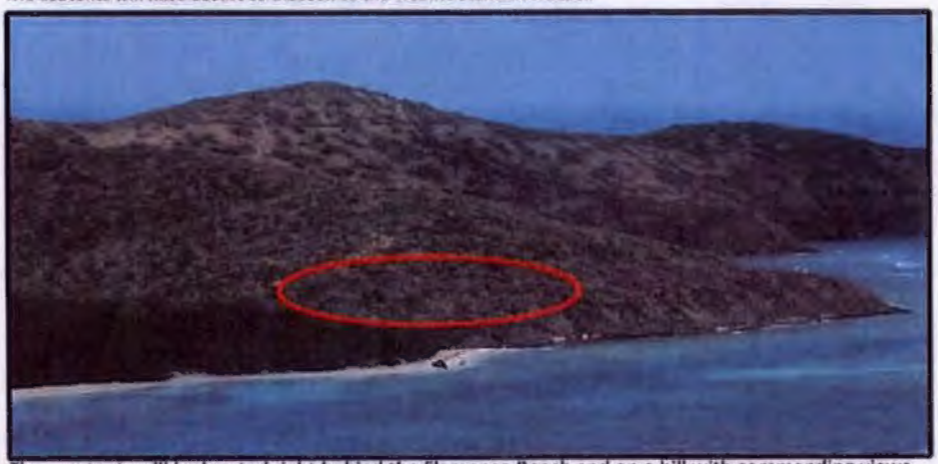
Proposed Project 1– Flamenco Beach Eco-tents by DNR and Private developer

The Flamenco Beach/Lagoon is one of the most beautiful sites in the whole of Puerto Rico and it will be here that the **Flamenco Beach Eco-tents** will be located. The Eco-tents will be sited in the western edge of the Flamenco beach and in an area which has a secluded beach. This area would be the ideal location for eco-tents as it has views of the Beach and Ocean. For a truly unique ecotourism experience and in order to create an accommodation facility that is an exemplary case study the eco-tents need to be located beyond the existing camping site and in total seclusion.

Visitors here would have easy access to the beautiful coral reef system, beaches and dry forest. Activities related to these experiences would include kayaking, trail walking/jogging, canoeing, birdwatching, swimming, snorkeling, diving and mountain biking.

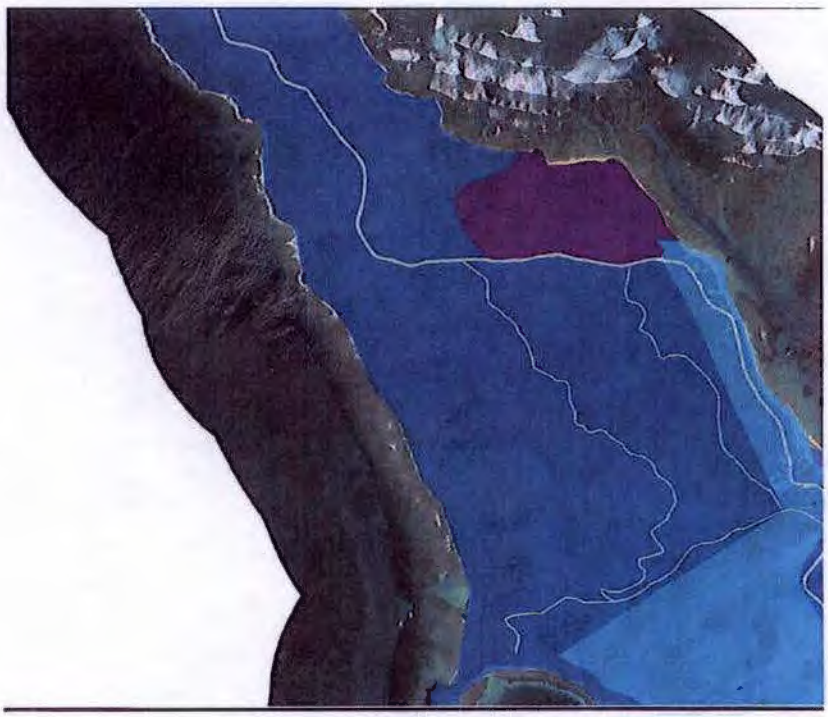
The existing Camping Sites and Retail Kiosks are a mass tourism destination especially during weekends and public holidays when many tourists take the ferry from Fajardo and this area needs to be converted into a sustainable higher-scale destination.

The ecotents will have access to a beach to the west of Flamenco Beach



The eco-tents will be located right behind the Flamenco Beach and on a hill with commanding views

Exhibit 2



ENDNOTES:

[1] Unexploded ordnance (UXO). Military munitions that (A) have been primed, fuzed, armed, or otherwise prepared for action; (B) have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installations, personnel, or material; and (C) remain unexploded either by malfunction, design, or any other cause.

[2] Munitions Constituents (MC). Any materials originating from unexploded ordnance (UXO), discarded military munitions (DMM), or other military munitions, including explosive and non-explosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions.

[3] Military munitions. All ammunition products and components produced or used by or for the U.S. Department of Defense or the U.S. Armed Services for national defense and security, including military munitions under the control of the Department of Defense, the U.S. Coast Guard, the U.S. Department of Energy, and National Guard personnel. The term:

Includes: confined gaseous, liquid, and solid propellants, explosives, pyrotechnics, chemical and riot control agents, smokes, and incendiaries used by DoD Components, including bulk explosives and chemical warfare agents, chemical munitions, rockets, guided and ballistic missiles, bombs, warheads, mortar rounds, artillery ammunitions, small arms ammunitions, grenades, mines, torpedoes, depth charges, cluster munitions and dispensers, demolition charges, and devices and components thereof.

Does not include: wholly inert items, IEDs (improvised explosive devices), and nuclear weapons, devices, and components thereof. (However, it does include non-nuclear components of nuclear devices, managed under the Department of Energy's nuclear weapons program after all required sanitization operations under the Atomic Energy Act of 1954, as amended, have been completed.)

[4] Munitions response. Response actions, including investigation, removal actions, and remedial actions, to address the explosives safety, human health, or environmental risks presented by unexploded ordnance (UXO), discarded military munitions (DMM), or munitions constituents (MC), or to support a determination that no removal or remedial action is required.

[5] Discarded military munitions (DMM). Military munitions that have been abandoned without proper disposal or removed from storage in a military magazine or other storage area for the purpose of disposal. The term does not include unexploded ordnance, military munitions that are being held for future use or planned disposal, or military munitions that have been properly disposed of consistent with applicable environmental laws and regulations.