FINAL

MRS 07 CULEBRITA ARTILLERY IMPACT AREA WATER ACREAGE AND ALL CAYOS OF MRS 2 CULEBRA, PUERTO RICO FUDS PROJECT NO: I02PR0068

PHASE 2 REMEDIAL INVESTIGATION/FEASIBILITY STUDY WORK PLAN

prepared for:

U.S. ARMY CORPS OF ENGINEERS, JACKSONVILLE DISTRICT
and
U.S. ARMY ENGINEERING AND SUPPORT CENTER, HUNTSVILLE

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prepared by:

PARSONS
3577 Parkway Lane, Suite 100
Norcross, GA 30092

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Revision: 0

Jae Yun
QC Reviewer: _____ 05/07/15
(Signature) **(Date)**

Patricia T. Berry
Project Manager: _____ 05/07/15
(Signature) **(Date)**

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ACRONYMS AND ABBREVIATIONS

AHA	Activity Hazard Analysis
APP	Accident Prevention Plan
ARARS	Applicable or Relevant and Appropriate Requirements
ASI	Aqua Survey, Inc.
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CESAJ	Corps of Engineers, South Atlantic Division, Jacksonville District
CFR	Code of Federal Regulation
CHE	Chemical Warfare Material Hazard Evaluation
CMS	Caribbean Marine Services
COPC	Contaminant of Potential Concern
CSM	Conceptual Site Model
°F	degree Fahrenheit
DA	Department of the Army
DD	Decision Document
DDC	District Diving Coordinator
DDESB	Department of Defense Explosives Safety Board
DFW	Definable Feature of Work
DGM	Digital Geophysical Mapping
DGPS	Differential GPS
DID	Data Item Description
DNER	Department of Natural and Environmental Resources
DoD	Department of Defense
DQO	Data Quality Objective
EBS	Environmental Baseline Survey
EHE	Explosive Hazard Evaluation
EM	Electromagnetic
EM	Engineer Manual
EOD	Explosive Ordnance Disposal
EQB	Environmental Quality Board
ESA	Endangered Species Act
FS	Feasibility Study
FUDS	Formerly Used Defense Site
GIS	Geographic Information System
GPS	Global Positioning System
GSV	Geophysical System Verification
HA	Hazard Assessment
HHE	Health Hazard Evaluation
HTRW	Hazardous, Toxic, and Radioactive Waste
IAW	In Accordance With
IVS	Instrument Verification Strip

ISO	Industry Standard Object
LLP	Lessons Learned Program
MBS	Multibeam Bathymetry Survey
MC	Munitions Constituents
MD	Munitions Debris
MEC	Munitions and Explosives of Concern
MPPEH	Material Potentially Presenting an Explosive Hazard
MQO	Measurement Quality Objective
MRS	Munitions Response Site
MRSPP	Munitions Response Sites Prioritization Protocol
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NWR	National Wildlife Refuge
OESS	Ordnance and Explosives Safety Specialist
OSHA	Occupational Safety and Health Administration
PDA	Personal Digital Assistant
PDT	Project Delivery Team
PLS	Professional Licensed Surveyor
PM	Project Manager
PPE	Personal Protective Equipment
PR	Puerto Rico
PWS	Performance Work Statement
QA	Quality Assurance
QC	Quality Control
QCP	Quality Control Plan
RAGS	Risk Assessment Guidance
RI	Remedial Investigation
ROE	Rights of Entry
ROV	Remotely Operated Vehicle
RTK-DGPS	Real-time Kinematic Differential GPS
SARA	Superfund Amendments and Reauthorization Act
SCUBA	Self-Contained Underwater Breathing Apparatus
SDSFIE	Spatial Data Standards for Facilities, Infrastructure and Environment
SLRA	Screening Level Risk Assessment
SM	Site Manager
SOP	Standard Operating Procedure
SSHP	Site Safety and Health Plan
SSS	Side Scan Sonar
SUXOS	Senior UXO Supervisor
TIFF	Tagged Image File Format
TM	Technical Manager
TP	Technical Paper

TPP	Technical Project Planning
U/W	Underwater
USA	USA Environmental, Incorporated
USACE	U.S. Army Corps of Engineers
USAESCH	U.S. Army Engineering and Support Center, Huntsville
USBL	Ultra Short Base Line
USCG	United States Coast Guard
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
UXO	Unexploded Ordnance
UXOQCS	Unexploded Ordnance Quality Control Specialist
UXOSO	Unexploded Ordnance Safety Officer
UXO Technician III	Unexploded Ordnance Technician III
VSP	Visual Sample Plan
WP	Work Plan

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1.0 INTRODUCTION

This Work Plan (WP) describes Phase 2 field activities planned for the Remedial Investigation (RI) of the underwater (U/W) areas surrounding Munitions Response Site (MRS) 07 Culebrita Artillery Impact Area Water Acreage and all Cayos of MRS 02, on the island of Culebra, Puerto Rico (PR) (see Figure 1-1). The RI consists of U/W surface and subsurface investigation of transects, to determine the extent of hazards posed by Munitions and Explosives of Concern (MEC) and Munitions Constituents (MC).

1.1 PROJECT AUTHORIZATION

Parsons Government Services Inc. (Parsons) has prepared this Geophysical Survey (Phase 2) WP for MRS 07 Culebrita Artillery Impact Area Water Acreage and all Cayos of MRS 02, Culebra, PR (Formerly Used Defense Site [FUDS] Project Number I02PR0068) under Contract No: W912DY-09-D-0062, Task Order No. 0010, from the U.S. Army Engineering and Support Center, Huntsville (USAESCH).

1.2 PURPOSE AND SCOPE

This RI is being performed under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and is part of the overall Remedial Action process. The primary purpose and scope is to perform an U/W RI. The U/W investigation is to determine the nature and extent of possible contamination of Material Potentially Presenting an Explosive Hazard (MPPEH)/ MC located both on and below the surface of the seafloor resulting from Department of Defense (DoD) use. The end goal is to gain acceptance of a Decision Document (DD) for the areas investigated.

The U/W operations at each site will commence at the shoreline, and extend seaward to the MRS boundary within the MRS 02 and MRS 07 water areas. This WP outlines the following U/W operations within the MRS 02 and 07 boundaries which will be completed during three phases of work:

1. Phase 1: Environmental Baseline Survey (EBS) with EBS Report. Phase 1 fieldwork EBS Report was completed in October 2013. Phase 1 was separated into two different tasks and mobilizations which are referred to as Phase 1A and Phase 1B.
2. Phase 2: U/W Investigation (Geophysical Survey)
3. Phase 3: U/W Intrusive Investigations of geophysical anomalies identified during Phase 2 and marine sediment sampling to determine the nature and the extent of MEC/MC contamination within the MRS's.

All activities involving work in areas potentially containing MEC hazards will be conducted in full compliance with USAESCH, U.S. Army Corps of Engineers (USACE), Department of the Army (DA), DoD requirements regarding personnel, equipment, and procedures, and with Occupational Safety and Health Administration (OSHA) Standard 29 Code of Federal Regulation (CFR) Part 1910. In addition, all activities will be conducted in accordance with "*Final Supplemental Standard Operating Procedures for Endangered Species Conservation and their Critical Habitat (Addendum 1), DERP-FUDS Property No. I02PR0068, Culebra, Puerto Rico* (CESAJ, February 2015)", found in Appendix K.

1.3 WORK PLAN ORGANIZATION

1.3.1 GUIDANCE DOCUMENTS

This WP follows the directions of Engineer Manual (EM) 200-1-15 and the Data Item Descriptions (DIDs) listed in Table 1-1.

1.3.2 WP ORGANIZATION

This WP has been divided into Chapters 1 through 10 with associated documents provided either as appendices herein or as standalone documents. Together, the WP and associated documents present

the project history, work elements, and requirements in an organized manner. Table 1-2 describes the general structure and organization of this WP. References are frequently made between various sections in the WP and the associated documents.

Table 1-1: Data Item Descriptions

DID	DID Title
WERS-001.01	Work Plans
WERS-004.01	Geophysics
WERS-005.01	Accident Prevention Plan
WERS-007.01	Geospatial Information and Electronic Submittals
WERS-011.01	Accident / Incident Reports
WERS-012.01	Personnel Qualifications Certification Letter
WERS-014.01	Reports / Minutes, Record of Meeting
WERS-015.01	Telephone Conversations / Correspondence Records
WERS-016.02	Periodic Status Report

Table 1-2: Work Plan Structure

Chapter Number	Descriptor	Information
1	Introduction	A statement of the project objectives, project authorization, purpose and scope; summary of work plan organization, project location, and site descriptions.
2	Technical Management Plan	Summary of project objectives, project organization, communication and reporting, project deliverables, project schedule, public relations support, subcontractor management, and management of field operations.
3	Field Investigation Plan	Describes the approach and procedures that will be followed in performing the geophysical survey of transects and reporting activities, and includes discussion of project goals, data quality objectives.
4	Quality Control Plan	Describes the standard processes that will be used to monitor, inspect, and control daily field activities to ensure quality performance, processes to correct quality issues, quality control of contract deliverables, and QC reporting requirements.
5	Explosives Management Plan	This chapter is not used. The Explosives Management Plan will be completed for Phase 3, Intrusive Investigation.
6	Environmental Protection Plan	Describes the approach, methods and operational procedures that will be employed during onsite activities to protect the natural environment.
7	Property Management Plan	This chapter is not used. The Property Management Plan is not required for this Firm Fixed Price task.
8	Interim Holding Facility Siting Plan for Recovered Chemical Warfare Materiel	This chapter is not used. The Interim Holding Facility Siting Plan for Recovered Chemical Warfare Materiel is not required for this Task Order.
9	Physical Security Plan for Recovered Chemical Warfare Sites	This chapter is not used. The Physical Security Plan for Recovered Chemical Warfare Sites is not required for this Task Order.
10	References	Citation of documents referenced within this Work Plan

1.4 PROJECT LOCATION

The project location is the U/W areas surrounding MRS 07 (Cayo Culebrita) and MRS 02 (Cayo Lobo, Cayo Lobito, El Mono, Cayo del Agua, Cayo Yerba, Cayo Raton, Cayo Alcarraza, Cayo Los Gemelos, Cayo Piedra Stevens, Cayo Tiburon, Cayos Geniqui, and Cayo Sombrerito), all located approximately three-quarter miles off the northern, western and eastern coasts of Culebra Island.

1.5 SITE DESCRIPTION

1.5.1 LOCATION

The site location is described in Section 1.4 and shown in Figure 1-1.

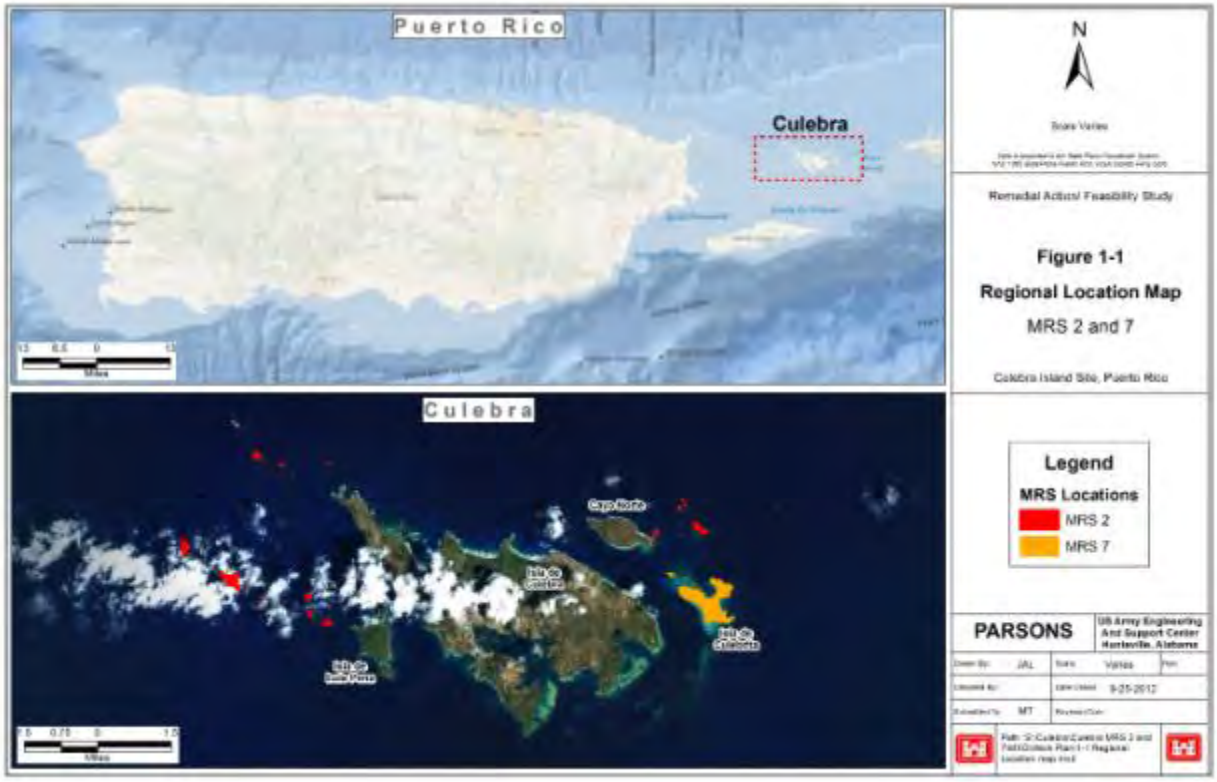

Figure 1-1: Location Map of MRSs 07 and 02 Boundaries

1.5.2 TOPOGRAPHY

The Culebran Islands are underlain by both intrusive and extrusive volcanic rock of Upper Cretaceous age. The volcanic rock exhibits little or no porosity because of compaction and filling of the pores with quartz and calcite.

Cayo Culebrita (MRS 07) is comprised of sandy beaches, irregular rugged coastlines and steep hills.

Most of the MRS 02 Cayos are smaller islands comprised of solid volcanic rock.

1.5.3 CLIMATE

The weather on Culebra Island is generally warm year round due to its tropical marine climate. Yearly average rainfall is approximately 36 in. The months of August through November are considered the wet season; the driest months are January through April. The average daily temperature is 80 degrees Fahrenheit (°F); the average maximum is 86 °F with an average low of 74 °F. Winds are generally from

the east-northeast during November through January and from the east during February through October. Yearly average wind speed is 8 knots. Hurricane season is June through November; severe hurricanes hit Culebra every 10 to 20 years. The yearly average rainfall for Culebra is provided in Table 1-3 (source: www.weather.com).

Sea state is often the limiting factor for marine operations. During the Phase 1A fieldwork, conducted during the month of June of 2013, the combination of wave swells and waves generated by winds did not impact the field work as the winds averaged 10 to 14 knots. However, for Phase 1B (August 2013) the winds averaged 15 to 20 knots, creating small craft warnings for the duration of the project. To take full advantage of the weather conditions, the field teams worked on the lee of the islands when the sea state was high, and when the sea state was light or moderate, the field teams concentrated their efforts on the windward side of the MRSs. This same approach will be used during the Phase 2 field work.

Table 1-3: Average Rainfall, Culebra Island

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
mm	**48.6**	**34.6**	**37.7**	**51.7**	**91.2**	**80.9**	**78.5**	**98.2**	**119.1**	**122.6**	**104.2**	**62.8**	**931.1**
inches	1.9	1.4	1.5	2.0	3.6	3.2	3.1	3.9	4.7	4.8	4.1	2.5	36

1.5.4 SENSITIVE ENVIRONMENTS

1.5.4.1 Threatened and Endangered Species

The main island of PR and its associated islands support 82 federally listed threatened and endangered species consisting of 33 animals and 49 plants. Among this diverse group of fauna and flora are multiple species that are known to exist, potentially exist, or temporarily use areas within the Culebra Island archipelago. Of the 82 federally listed species, 16 are known, or are suspected, to occupy Culebra Island and/or the associated cayos. In addition to the federally listed species, two state-listed species are known to occupy Culebra Islands. The federally and state-listed species include both terrestrial and marine life. The federally listed species of most concern for the wildlife refuge are the green sea turtle, hawksbill sea turtle, leatherback sea turtle, and loggerhead sea turtle. Due to declining populations, pillar, elkhorn, rough cactus coral, lobed star, mountainous star, boulder star, and staghorn corals in the surrounding waters are federally listed as threatened species.

1.5.4.2 National Wildlife Refuge (NWR)

According to the NWR System, portions of Culebra Island and 22 cayos are considered NWR area. The three largest cayos are Culebrita, Cayo Norte (privately owned), and Cayo Luis Peña. These resemble Culebra in that they all have sandy beaches, rugged coastline, and gentle to steep hills. Vegetation ranges from moderate to extremely dense. The smaller cayos are primarily solid rock with sparse or no vegetation. A few of the smaller cayos have small beaches; however, most are rugged rock.

1.5.4.3 Conservation Priority Areas

The following are Department of Natural and Environmental Resources (DNER) prioritized areas of conservation:

- Designated Critical Habitat
- All of the lagoons on Culebra
- All beaches around Culebra
- Flamenco Peninsula
- Punta Soldado
- Ensenada del Cementerio
- The Canal Luis Peña Marine Reserve.

1.6 SITE HISTORY

Spain ceded all of PR to the United States in 1898 following the Spanish American War. The public lands in the Culebra Island Archipelago were placed under the control of the U.S. Department of Navy in 1901. The Culebra Island Archipelago was used for training purposes by the U.S. Navy and U.S. Marines, and was later used by the North Atlantic Treaty Organization. The U.S. Marines used portions of Culebra Island as a training facility from 1902 through 1941. Culebra Island was used as a bombing and gunnery range from 1935 through 1975. To support the increased training needs during Vietnam operations, the Navy acquired additional training areas on cayos east and west of Culebra Island for use as air-to-ground ranges. Live ordnance operations reached their peak in 1969, as the fleet was training pilots for Vietnam. Aircraft bombing and strafing of the Flamenco Peninsula ended around 1970, while the use of live rounds for naval gunfire support training ended in 1971. Subsequent naval support training was conducted using quieter practice rounds until ordnance use was terminated on September 30, 1975. Between 1975 and 1982, the facilities were turned over to the General Services Administration.

During military use of the land the island was inhabited by many residents centralized around the town of Dewey on the west central portion of the island. Currently, the site includes municipal, residential, and recreational areas. Most of the main island of Culebra, as well as Cayo Norte, are privately owned, while the surrounding cayos are managed by the U.S. Fish and Wildlife Service (USFWS). The PR DNER also manages land and adjacent water areas on Culebra. The following references provide a more complete description of the U.S. military's training events and the munitions used on Culebra and the surrounding Cayos: Supplemental Archives Search Report for Culebra, Puerto Rico, Project No. I02PR0068 (USACE, 2005) and Site Inspection Report, Culebra Island Site, Puerto Rico (Parsons, 2007). Additional references can be found in Section 10. Historical findings for the project sites (MRS 02 and MRS 07) are summarized in Section 1.8.

1.7 LAND USE

1.7.1 MRS 07 CULEBRITA ARTILLERY IMPACT AREA WATER ACREAGE

The Cayo is managed by the USFWS and DNER as part of the Culebra NWR. Residential areas do not exist on Culebrita; however, many people visit by boat, the beach and water areas of the MRS. Boaters use the mooring field or anchor inside and outside of the bay. Recreational activities such as fishing, swimming, snorkeling, and Self-Contained Underwater Breathing Apparatus (SCUBA) diving are conducted within the MRS water boundaries. The Culebrita Lighthouse is the only structure on Culebrita; however, it functions as a historical attraction and is not occupied. Site conditions could change in the future with potential impact on public land use related to accessing the water acreage. Examples might include excessive soil erosion on beaches or streams.

1.7.2 MRS 02 SURROUNDING CAYOS

MRS 02 Cayos are managed by the USFWS as part of the Culebra NWR. Residential areas do not exist on any of these islands. Most of the cayos are inaccessible due to steep terrain from the water's edge. SCUBA divers frequently access the water acreage surrounding these cayos.

1.8 PREVIOUS INVESTIGATIONS OF THE SITES

The summaries below provide previous investigation information relevant to MRS 07 and MRS 02. All of the projects were land based investigations.

1.8.1 1991 INVENTORY PROJECT REPORT

An Inventory Project Report (INPR) was signed on 24 December 1991, establishing the Culebra Island site as a FUDS, defining a site boundary, and assigning FUDS Project No. I02PR006800 (USACE, 1991). The Findings and Determination of Eligibility (FDE) concluded that "the site, except for 87.5 acres still under control of the Navy, has been determined to be formerly used by the Department of Defense. It is therefore eligible for the Defense Environmental Restoration Program (DERP)."

1.8.2 1995 ARCHIVES SEARCH REPORT

The Archives Search Report (ASR) was completed by the USACE Rock Island District in February 1995 (USACE, 1995) after reviewing available records, photographs, and reports that documented the history of the site. As part of the ASR, a site visit was conducted in October 1994, during which the team identified munitions debris (MD) on Cayo Botella, Cayos Geniqui, and Cayo Del Agua.

1.8.3 1997 FINAL ENGINEERING EVALUATION / COST ANALYSIS

In April 1997, Environmental Science and Engineering, Inc. (ESE) submitted the final engineering evaluation and cost analysis (EE/CA) for the Former Culebra Island Naval Facility, Culebra Island, Puerto Rico (ESE, 1997). The EE/CA investigation included surface and subsurface sample grids on Flamenco Peninsula, Isla Culebrita, Cayo Botella, Cayo del Agua, Cayo Lobo, and Cerro Balcon. MEC were found in all areas except Cayo Lobo and Cerro Balcon, where only MD was identified.

1.8.4 2004 ARCHIVES SEARCH REPORT SUPPLEMENT

The ASR Supplement was completed by the USACE Rock Island District as an addition to the 1995 ASR (USACE, 2004a). This report provides detail of aerial training conducted by the Navy between 1935 and 1975 and identifies the following range areas applicable to this contract:

- Cayo Tiburon (MRS 02), was used as a bombing and rocket target. Suspected ordnance includes MK82 general purpose 500-pound HE bombs and 5-inch Zuni rockets. 75mm Projectiles are also documented as being used on Cayo Tiburon during FLEX #2 and FLEX #5.
- Cayo Geniqui (MRS 02), was used as a bombing and rocket target. Suspected ordnance includes MK82 general purpose 500-pound HE bombs and 5-inch Zuni rockets. Cayo Geniqui was also a target within the Culebrita Torpedo Range. Firing at this range from the water north of Culebrita targeted the sheer cliffs of Cayo Geniqui. Suspected munitions include the Navy's general torpedo. During FLEX #2 and #5, 75mm projectiles were documented as used on Cayo Geniqui and at water borne targets within Impact Area #1 (which includes Cayo Geniqui).
- Cayo Botella (MRS 07) was used as bombing and rocket target. Suspected ordnance includes MK82 general purpose 500-pound HE bombs and 5-inch Zuni rockets. During FLEX #2 and #5 75mm projectiles were documented as used on Cayo Geniqui and at water born targets within Impact Area #1 (which includes Cayo Geniqui).
- Culebrita Strafing Range (MRS 07): This strafing range target was on the north side of Culebrita and is part of MRS 07. Suspected munitions include general small arms, .50-caliber small arms, and MKI 20mm HEI.
- Culebrita Torpedo Range: Firing at this range from the water north of Culebrita targeted the sheer cliffs of Cayos Geniqui, part of MRS 02. Suspected munitions include the Navy's general torpedo.
- Los Gemelos (MRS 02), was used as targets for aerial bombs and rockets. Munitions included MK80s series general purpose bombs, 5-inch Zuni rockets, and MK8 5-inch practice rockets. During exercises and training conducted in 1922; 7-inch, 8-inch, 3-inch, 155mm, 75mm, and 37mm guns, were used targeting the cayo.
- Alcarazza (MRS 02), was used as a target for aerial bombs and rockets. Suspected munitions include MK80s series general purpose bombs and 5-inch Zuni rockets. During exercises and training conducted in 1922; 7-inch, 8-inch, 3-inch, 155mm, 75mm, and 37mm guns, were used targeting the cayo.
- Cayo Lobo (MRS 02), was used as a strafing and bombing target. Munitions included general small arms, .50-caliber small arms, MK80s series general purpose bombs, and MK I 20mm HEI.

- Agua Cay (MRS 02), was used as a target for bombing and rocket fire. Munitions include MK80s series general purpose bombs and 2.75-inch rockets. In addition during the ASR Site visit (USACE, 2004) and the EE/CA [Environmental Science & Engineering, Inc. (ESE, 1997)], SI (Parsons, 2007) MK 76 practice bomb, 76mm projectile, and evidence of aircraft flares.

1.8.5 2005 REVISED INVENTORY PROJECT REPORT

A Revised INPR was completed in June 2005 (USACE, 2005b). The Revised INPR further clarified the military use of the Island of Culebra and divided the original site, Property No I02PR0068, into 14 separate MRSs. One hazardous and toxic waste (HTW) project was identified and assigned the number 00, and 13 Military Munitions Response Program (MMRP) project areas were identified and assigned Risk Assessment Code (RAC) scores.

1.8.6 2005 SUPPLEMENTAL ARCHIVES SEARCH REPORT

The Supplemental ASR was completed by the USACE, St. Louis District in 2005 as an addition to the 1995 ASR (USACE, 2005c). The Supplemental ASR is the source of most of the historical information pertaining to site operations and identifies the key areas of focus for the SI. This document provided a detailed summary of military activities conducted on Culebra Island and the surrounding cays. The document summarizes planned and/or executed maneuvers and training conducted at the site, including specific time periods, locations, and munitions used. The terrestrial boundaries for MRS 07 coincide with the leased Impact Area #1 identified in the Supplemental ASR (USACE, 2005). Historical documents identified this portion of Culebrita as having been the main artillery impact area used by the Marine Corps during their training exercises. They also used it as a boat firing target. Additionally, the site was used as a Navy aerial strafing target. Ladrón Cay (Cayo Botella) was used by the Navy as a bombing target. Appendix B: Maps, Figure B-24, identifies the target impact areas.

1.8.7 2009 NON-TIME-CRITICAL REMOVAL ACTION (NTCRA)

Ellis Environmental Group, LC (EEG), under contract to the USAESCH, provided non-time-critical removal operations on Culebra Island and adjacent cayos in Puerto Rico. The areas included in this surface clearance included Cerro Balcon, Culebrita, and the adjacent cays, including Cayo Botella, Cayo Tiburon, Los Gemelos, Cayo del Agua, Gayos Genequi, Cayo Lobo, and Cayo Alcarraza. The activities and results of the NTCRA for Culebrita and the Cayos are summarized as follows:

- Culebrita: The field work scheduled for the site focused on 82 acres in the northwest sector of the island formerly used as a strafing range. Field work was not completed as planned for the lack of an approved explosives safety submittal in time for the field work to be started.
- Cayos: Cayo Botella, Cayo Alcarraza, Cayo Los Gemelos, Cayo Lobo, Cayo del Agua, Cayo Tiburon, and Cayo Geniqui were recommended for surface clearance. Cayo Lobo was the only Cayo to be investigated. The following MEC items were located within the search areas of the NTCRA:
    - BDU33 25-lb practice bombs, MK106 5-lb practice bombs, 5-inch 54 MK41 projectile.

1.8.8 2009 NON-TIME CRITICAL REMOVAL ACTION (NTCRA) CULEBRITA AND CULEBRA BEACHES

USAE, under contract to the USAESCH, provided non-time-critical removal operations on Culebrita and Culebra beaches. The areas included Flamenco Beach and Culebrita beaches A thru E (see Figure 1-2).

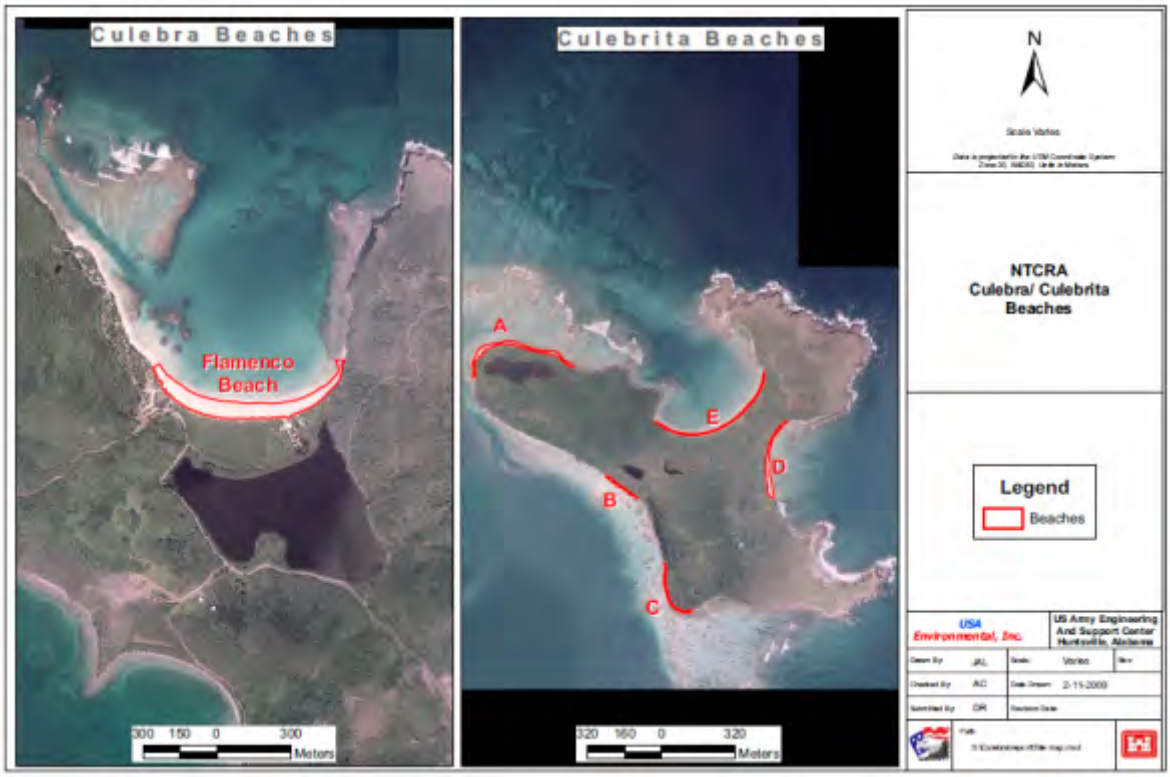

Figure 1-2: Beach areas in which the NTCRA field work was conducted.

The following table (Table 1-4) provides the MEC/MPPEH/MD results for the Culebrita beaches NTCRA:

Table 1-4: MEC/MPPEH/MD Results for the Culebrita Beaches NTCRA

Culebrita Beach A	
Identification	Quantities
20mm MD	3
75mm MD	9
20mm MEC	6
20mm MPPEH	6
Culebrita Beach B	
No MD/MEC/MPPEH discovered	
Culebrita Beach C	
No MD/MEC/MPPEH discovered	
Culebrita Beach D	
No MD/MEC/MPPEH discovered	
Culebrita Beach E	
No MD/MEC/MPPEH discovered	

1.8.9 2007 SITE INSPECTION

Parsons conducted a site inspection (SI) to determine whether the Culebra Island FUDS warranted further investigation under the MMRP (Parsons, 2007). Due to the presence of MEC and MD observed during previous investigations and during the SI field visit, 12 of the 13 MRSs at the Culebra Island FUDS were recommended to proceed to RI/FS, including MRS 02 and MRS 07. During the SI, further evaluation of MC was recommended for the MRSs (02 and 07) covered under this RI/FS.

1.8.10 2013 REMEDIAL INVESTIGATION

Explosive Ordnance Technologies, Inc. (EOTI) conducted a RI for MRS 02 - Cerro Balcon and Adjacent Cays, MRS 04 – Flamenco Lagoon Maneuver Area, MRS 05 – Mortar and Combat Range Area, MRS 07 – Culebrita Artillery Impact Area.

RI fieldwork was conducted from 11 October 2010 to 25 March 2011, in accordance with the approved Final MMRP Work Plan (EOTI, 2010) and decisions made during technical project planning (TPP) sessions. The fieldwork included geophysical investigations, during which surface and subsurface metallic anomalies were investigated along predefined transects throughout MRS 04,

No investigations were conducted in MRS 02 due to the lack of rights-of-entry (ROE) in the Cerro Balcon area and the inability of field teams to access the cays, which comprise the remainder of MRS 02. The cays are difficult to access due to steep terrain and inadequate landing areas. The field teams attempted access to the cays but were deterred by rough seas. While access to all of the cays is prohibited, Cayo Lobo and Cayo Yerba are more accessible than the other cays by recreational users (trespassers).

MRS 07. During the investigation, 49 pieces of MD were found, totaling 43 pounds. MD included items associated with mortars, 3-inch projectiles, 20mm projectiles, flares, fuzes, small arms ammunition, and unidentifiable fragments. The investigation confirmed that MD and cultural debris were located on the surface and in the subsurface of MRS 07. During the investigation, MEC associated with a MK 5 Mod 0 rocket and a Charge, Demolition, Flex Linear, MK 8 was found within MRS 07.

1.9 PREVIOUS UNDERWATER VISUAL SURVEY DATA

Phase 1: The primary purpose and scope of the EBS (EBS Report completed in April 2014) was to perform an in-depth study designed to gather the data necessary to determine the U/W habitat within MRSs 07 and 02 cayos (water areas) for use in subsequent phases of a RI/FS (Phases 2 and 3). The intent of this EBS was not to perform an in-depth biological study; rather, it was to document the conditions in the actual area where the RI activities will take place. The EBS was the first of three phases of the RI/FS being conducted within the U/W portions surrounding MRS 07 and MRS 02 Cayos. The results of the EBS were presented via the EBS Report during the Technical Project Planning (TPP) meeting held on 16 January 2014. In addition to an EBS, the Report includes any data related to MPPEH that was observed during EBS field activities. MPPEH data will be included in the overall RI evaluation and associated MEC Hazard Assessment (HA).

The following EBS field activities were conducted:

- Phase 1A: Hydrographic Surveys (Deployment of Multi-beam Bathymetry and Side Scan Sonar systems); Field work was completed in June 2013.
- Phase 1B: U/W Visual Surveys (U/W Video/still camera systems and snorkeling); Field work was completed in August 2013. Parsons located 11 suspected MPPEH items which were all located within MRS 02 underwater boundaries (MPPEH locations are not provided in this WP as a protection measure since the MPPEH items have not been fully investigated or disposed of).

All activities involving work in areas potentially containing MEC hazards were conducted in full compliance with USAESCH, USACE, DA, DoD requirements regarding personnel, equipment, and procedures, and with OSHA Standard 29 CFR Part 1910. In addition, field personnel adhered to the established *USACE Final Standard Operating Procedure for Endangered Species and Conservation and*

Their Critical Habitat During Underwater Investigations with Addendum 1, DERP-FUDS Property No. I02PR0068, Culebra Island, Puerto Rico (CESAJ, February 2015), included in Appendix K of this WP.

1.10 INITIAL SUMMARY OF RISK FROM MEC

1.10.1 MRS 07 CULEBRITA ARTILLERY IMPACT AREA WATER ACREAGE

MRS 07 includes the northern portion of Culebrita as well as Cayo Botella. 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 included 20mm projectiles, MK 44 and MK 45 flares, live and practice bombs up to 500 pounds, and 2.75-inch rockets, as well as British bombs and rockets. The surrounding waters of Cayo Botella and Culebrita were included as part of the Impact Area #1 and 75mm Impact Area in which 75mm projectiles were documented as used. Culebrita beaches are used recreationally, and many boats visit the island each year. Culebrita was part of the land designated for use by the Department of the Navy in 1900; it was reported excess in 1972. The water acreage surrounding MRS 07 experiences rough sea action which could cause changes in the bottom conditions, therefore increasing the likelihood of MEC migration.

1.10.2 MRS 02 SURROUNDING CAYOS

MRS 02 includes the surrounding islands of, Cayo Lobo, Cayo Lobito, El Mono, Cayo del Agua, Cayo Yerba, Cayo Raton, Alcarraza, Los Gemelos, Piedra Stevens, Cayo Tiburon, Cayos Geniqui, and Cayo Sombrerito, encompassing approximately 660 acres. The Navy conducted fleet maneuvers and FLEXs on MRS 02 between 1923 and 1941. During these exercises, the surrounding cayos 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 Los Gemelos and Alcarraza to most of the cays on the east and west side of Culebra. Training continued until 1975. Water acreage surrounding most of the cayos experiences rough sea action which could cause changes in the bottom conditions, thereby increasing the likelihood of MEC migration.

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2.0 TECHNICAL MANAGEMENT PLAN

2.1 OBJECTIVES

The purpose of the Technical Management Plan is to provide the approach and procedures that will be used to manage the tasks required to meet the project objectives. A detailed description of the geophysical survey field procedures are included in separate chapters and appendices of this WP. This chapter focuses on organization, personnel, communication and reporting, duties and responsibilities.

2.2 PROJECT ORGANIZATION

Close coordination and cooperation between the stakeholders, community, regulators, and technical support personnel will ensure successful project completion. Table 2-1 identifies the key project entities and the roles these organizations occupy in the project.

Table 2-1: Key Project Organizations

Organization	Responsibility Category
USAESCH	Project Management, Implementing District,
Corps of Engineers, South Atlantic Division, Jacksonville District (CESAJ)	Project Management, Geographical District
Parsons and Subcontractors	Project Management, Contractor
PR Environmental Quality Board (PREQB)	Regulator/Review and concurrence of WP and reports
NMFS	Stakeholder/Review of WP and reports
NOAA	Stakeholder/Review of WP and reports
USFWS	Stakeholder/Review of WP and reports
PR DNER	Stakeholder/Review of WP and reports
US Environmental Protection Agency (USEPA)	Stakeholder/Review of WP and reports

2.2.1 USAESCH

USAESCH, the implementing agency for execution of the project, provides technical expertise for MEC and MC activities, and serves as the Project Manager (PM) for conducting the RI and Feasibility Study (FS). USAESCH responsibilities include procurement and direction of the prime contractor and the coordination of document reviews and approvals. Huntsville is also responsible for quality assurance (QA) of the contractor's adherence to the Performance Work Statement (PWS) and controlling the budget and schedule.

2.2.2 CESAJ

CESAJ is the overall PM for the RI/FS project. CESAJ's responsibilities include the review of project plans and documents, obtaining ROE to properties in the work area, working with the news media and the public, and coordinating with federal, state, and local stakeholders on issues pertaining to implementation of this project and protection of ecological and cultural resources.

2.2.3 PARSONS

Parsons is the prime contractor to USAESCH for this project. Parsons will provide staff to perform all aspects of fieldwork and provide oversight of field activities. Parsons will assign project personnel based on management and technical experience and abilities. Parsons will subcontract to USA Environmental (USA) who will tier subcontract Aqua Survey, Inc. (ASI) to conduct geophysical surveys, and Caribbean Marine Services (CMS) for logistical and boat support for diving evolutions. Parsons will prepare and

submit data reports in accordance with (IAW) relevant USACE guidance and applicable DIDs. The Parsons PM is Ms. Patricia Berry.

2.2.4 PROJECT REGULATORS/STAKEHOLDERS

The stakeholders are the individuals and organizations directly impacted by the survey activities and the utilization of the resulting RI/FS Report data. Stakeholders include (but are not limited to):

- PR EQB (Regulator)
- PR DNER
- USFWS
- USEPA
- NMFS
- NOAA
- Culebra NWR

Those listed above participate in the TPP process.

2.3 CONTRACTOR MANAGEMENT TEAM

2.3.1 PROJECT MANAGER

The Parsons PM (Ms. Patricia Berry) is responsible for monitoring overall progress of the Task Order, preparing and submitting monthly progress reports, and ensuring that resources are available. The PM maintains close communication with USAESCH to assess USAESCH satisfaction with Parsons' performance on this Task Order.

2.3.2 PROJECT SAFETY OFFICER

The Project Safety Officer (Mr. Ed Grunwald) is responsible for reviewing and updating the Accident Prevention Plan (APP) and verifying compliance with the plan. The Project Safety Officer is the contact for regulatory agencies on matters of health and safety. The Project Safety Officer verifies compliance with the APP and Site Safety and Health Plan (SSHP) by auditing project activities and instituting corrective actions.

2.3.3 PROJECT QUALITY CONTROL MANAGER

The Project QC Manager (Mr. Robert Crownover) is responsible for reviewing and updating the Quality Control Plan (QCP) and verifying compliance with the plan. The Project QC Manager verifies compliance with the QCP by auditing project activities and instituting corrective actions.

2.3.4 USA TECHNICAL MANAGER

The TM (Mr. Tom Bourque) provides logistical support for all field activities in addition to providing technical and report writing support to ensure the technical quality of deliverables to USAESCH. The TM coordinates field activities with the U/W Investigation Team(s) and second tier subcontractors.

2.3.5 PROJECT ENGINEER

The Project Engineer (Mr. Brian Skubin) provides logistical support for all field activities, in addition to providing technical and report writing support to ensure the technical quality of deliverables to USAESCH.

2.3.6 GEOGRAPHIC INFORMATION SYSTEM (GIS) MANAGER

The Geographic Information System (GIS) Manager (Mr. Jeff Lewis) is responsible for management and control of the project GIS. The GIS Manager will direct GIS operations occurring locally and remotely, and is responsible for control of data included in and used as part of the project GIS.

2.3.7 PROJECT GEOPHYSICIST

The Project Geophysicist (Mr. Al Crandall) is responsible for the overall technical direction for Digital Geophysical Mapping (DGM) surveys, to include the following:

- Provide overall technical direction for DGM surveys.
- Supervise data processing and interpretation.
- Coordinate with the Site Geophysicist to verify the accuracy and completeness of; project DGM documentation and target lists, instrument verification strip (IVS) testing results, QC results, and related DGM project documentation.

2.4 FIELD MANAGEMENT TEAM

The Field Management Team is responsible for the efficient and safe execution of the daily site activities during Phase 2 and 3. Appendix L, Dive Operations Plan, provides additional detail regarding the qualifications of the dive team and their responsibilities, and the various field team compositions which are dependent upon the work being accomplished. The following subsections describe the Field Management Team and their responsibilities:

2.4.1 SITE MANAGER/SENIOR UXO SUPERVISOR

The Site Manager (SM) and/or Senior Unexploded Ordnance (UXO) Supervisor (SUXOS) is provided by Parsons and manages/supervises all field activities while on the work site. The SM/SUXOS ensures conformance with the RI/FS WP and all its associated plans. The SM/SUXOS will report administratively and operationally to the PM.

2.4.2 DIVING SUPERVISOR

The PM will designate the Diving Supervisor in writing. During diving operations, the Diving Supervisor has the operational authority and responsibility to conduct the dive operations per the RI/FS WP, Dive Operations Plan, and USA Dive Safe Practices Manual. The Diving Supervisor is not required to be an UXO Technician. The Diving Supervisor will report administratively and operationally to the SUXOS, or to the PM if the Diving Supervisor holds the additional responsibilities as the SUXOS.

2.4.3 UXO SAFETY OFFICER (UXOSO)

The UXOSO is provided by Parsons and has the responsibility for enforcement of the overall safety aspects of the RI fieldwork. The UXOSO will provide daily safety briefs, and will conduct safety audits of all activities in the Diving Phase of the project. The UXOSO is responsible to the Parsons Corporate Director of Safety and Quality for all safety related issues. The UXOSO will also be SCUBA Dive Qualified. The UXOSO has stop work authority in any matter related to the safety of personnel and equipment involved with the project. Specific duties include:

- Daily Safety Brief
- Daily Safety Inspections
- Weekly Safety Audit
- Conducting initial site safety orientation training
- Periodic safety training on relevant safety subjects
- Complete appropriate Accident Investigation and Accident/Incident Reports, as required

- Acting in an advisory capacity with the PM on safety related issues
- Working directly with the Dive Supervisor and SUXOS to ensure safe completion of operational tasks.

2.4.4 UXO QUALITY CONTROL SPECIALIST (UXOQCS)

The UXOQCS is provided by Parsons and is responsible for overseeing the site QCP in all field operations. The UXOSO/UXOQCS will be trained in QC techniques methodology and be qualified as a UXO Technician III (UXOIII). The UXOSO/UXOQCS coordinates with the PM for daily operations, and maintains a direct line of communication to the PM and Field Team.

- Conducts daily audits of the DGM teams, equipment and procedures
- Conduct daily audits of the UXO teams, equipment and procedures
- Perform and document random sampling (by pieces, volume or area) of all MPPEH collected from the various teams to ensure no items with explosive hazards, engine fluids, illuminating dials and other visible liquid Hazardous, Toxic, and Radioactive Waste (HTRW) materials are identified as munitions debris or range-related debris as required for completion of the Requisition and Turn-in Document, DD Form 1348-1A

2.4.5 UXO QUALITY CONTROL SPECIALIST/UXO SAFETY OFFICER (UXOQCS/UXOSO)

Parsons will be using a UXOQCS/UXOSO for this project. The duties as described under UXOSO and UXOQCS apply to the UXOQCS/UXOSO.

2.4.6 SITE GEOPHYSICIST

The Site Geophysicist is provided by ASI. Mr. Mark Padover is responsible for the following:

- Coordination and communication with Parsons PM and USA's Project Geophysicist
- Overall site geophysical support, and DGM equipment maintenance and operation
- IVS set-up and processing
- Production DGM management, collection, archiving, processing, analysis, and delivery to USA's Project Geophysicist
- Primary input to the Geophysical System Verification (GSV) report.

2.4.7 SEA TURTLE AND MARINE MAMMAL OBSERVER

Rolando Soler, local biologist, will be contracted as the lead sea turtle and marine mammal observer. Mr Soler has completed coursework requirements and is current on his marine mammal observer certification and is a qualified turtle monitor.

2.5 PROJECT COMMUNICATION AND REPORTING

Communications for this project will generally flow along the lines established by the organization depicted in Figure 2-1. All communications between Parsons and the USAESCH will primarily be directed through the respective USAESCH PM or Contracting Officer. Communication directly between Parsons and other government entities associated with this project will only occur with USAESCH concurrence.

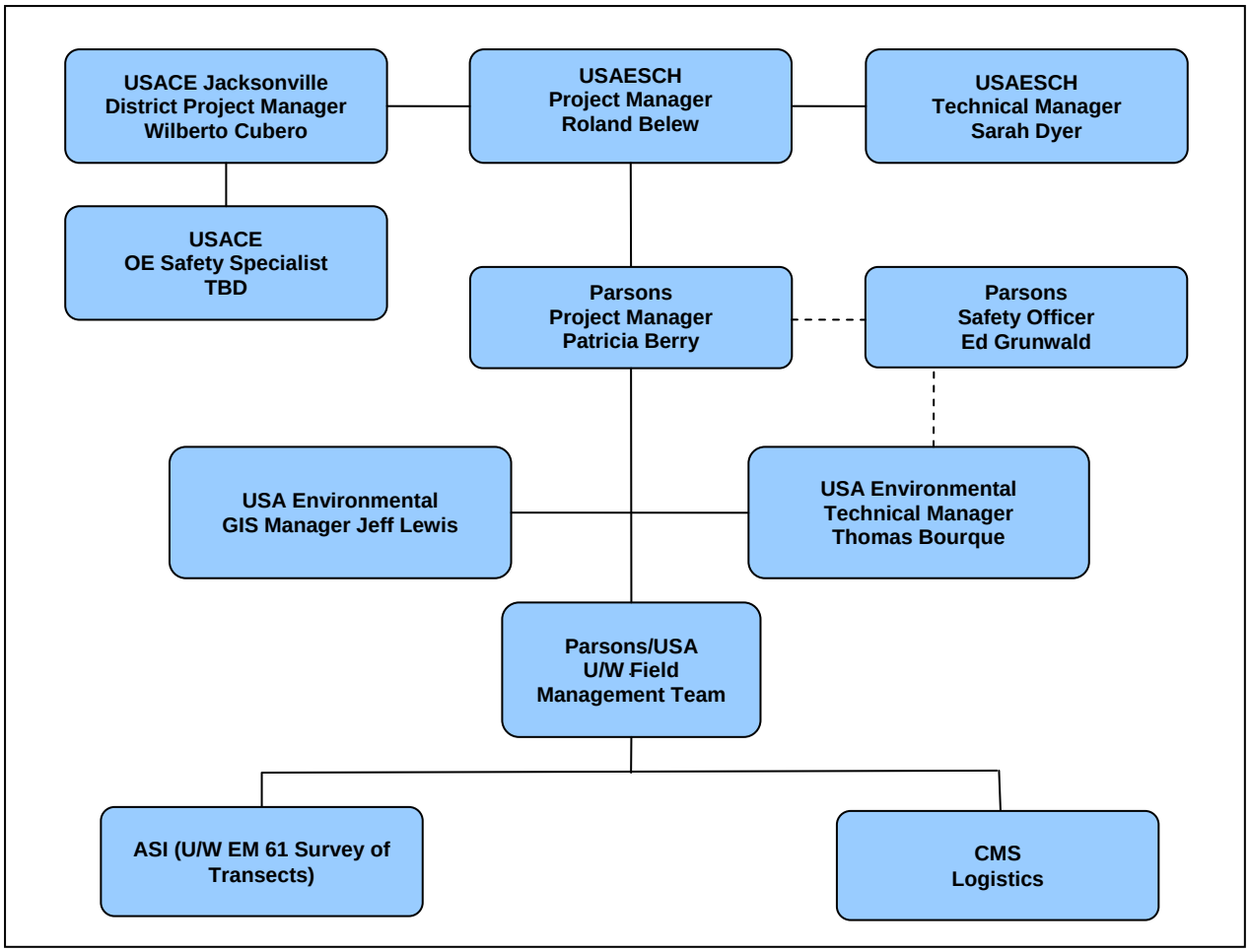

Figure 2-1: Project Management Organization

2.6 PROJECT SCHEDULE

The project schedule (see Appendix J) presents the logical sequence of tasks, deliverable due dates, and anticipated number of days to complete each task. The schedule will be updated monthly and will be included in the Monthly Progress Status Reports prepared in accordance with the applicable DID.

2.7 PERIODIC REPORTING

Project Status Reports will be prepared IAW WERS-016.02. This report will be submitted by Parsons monthly when fieldwork is not being performed, and daily when fieldwork is underway. Parsons will submit the Access Data Base weekly when fieldwork is underway. When MC sampling is being conducted, daily reports will be submitted per WERS-009.01, paragraph 1.3.2.

2.8 SAFEGUARDING DOCUMENTS AND FIELD FILES

Parsons will safeguard project files during field work phases by uploading project files onto the Parsons Corporate server on a weekly basis. If internet access is limited on Culebra the files will be backed up on a separate portable hard drive.

2.9 COSTING AND BILLING

The budget for the project was negotiated with the USAESCH pursuant to contract number W912DY-09-D-0062, Task Order No. 0010. Parsons will submit a monthly invoice to the USAESCH. The Parsons PM is responsible for submitting monthly reports to the USAESCH PM along with the invoice that documents the work performed during the corresponding billing period. Requests for payment will be based on completion of performance milestones as defined in the monthly Project Status Report.

2.10 PROJECT PUBLIC RELATIONS SUPPORT

Public relations support will include participation in public meetings to be held on Culebra. These meetings are in addition to the TPP meetings. A public meeting will be held specifically to present the Proposed Plan. Two additional meetings are proposed to be held during the period of performance of the project at times to be determined by the Project Delivery Team (PDT), Parsons will prepare and deliver briefings, graphics, maps, posters, presentations, and support of question and answer sessions. When required, Parsons will prepare invitation letters, fact sheets, and meeting notices. Parsons will obtain the meeting sites, perform public notifications and prepare any correspondence necessary to meeting the objectives of this task. To ensure the quality of public meetings, Parsons will coordinate with the USACE Public Relations Officer or other appropriate USACE representative on all matters of public relations.

2.11 SUBCONTRACT MANAGEMENT

Before subcontract work is performed at the site, Parsons will negotiate and prepare subcontracts that will detail all necessary and appropriate terms and conditions, including the statement of work. Once the subcontract is executed, Parsons will perform periodic reviews to ensure that contractual requirements and milestones are met. These reviews will cover contractual progress, technical progress, and cost and schedule status. Parsons' technical staff will review data generated by the subcontractor as part of subcontract deliverables.

Parsons will maintain supervisory responsibility for all operations. Subcontractors will work under the direction and oversight of Parsons' PM, SM and/or SUXOS when in the field, and will be monitored by Parsons' UXOQCS/SO. The SM/SUXOS will schedule all operational activities, and a strict accounting will be made of actions performed and activities completed. Throughout their operations, subcontractors will coordinate their operational schedules with Parsons' SM/SUXOS, and strictly adhere to this WP and associated APP.

2.12 MANAGEMENT OF FIELD OPERATIONS

Parsons' PM along with the USA TM and Project Engineer will coordinate field operations with the Field Management Team. The Project Safety Officer and Project Quality Control Manager will remain off-site but will be available by telephone for consultation on issues of safety or quality. The GIS Manager, who is responsible for control of data included in and used as part of the project GIS, will also be available by telephone for consultation.

2.13 INITIAL CONCEPTUAL SITE MODEL (CSM)

A Conceptual Site Model (CSM) is a description of a site and its environment that can be used to depict the nature of potential contamination, its location, and the possible human and ecological receptors' interactions with the potential contamination. The CSM summarizes which potential receptor exposure pathways for MEC and MC are (or may be) complete and which are (and are likely to remain) incomplete. Exposure pathways are considered incomplete unless *all four* of the following elements are present (USEPA 1989):

1. a source of contamination
2. an environmental transport or exposure medium
3. a point of exposure at which the contaminant can interact with a receptor
4. a receptor and a likely route of exposure at the exposure point.

If any single factor was not present, the pathway would be incomplete. An incomplete exposure pathway indicates there are no current means by which a receptor (human or ecological) can encounter MEC or MC and, therefore, no hazards or risks from exposure to MEC or MC would be expected. This information is used to focus the investigation of the site by suggesting which complete or potentially complete exposure pathways need to be evaluated. The CSM is a "living document" based on existing knowledge and, therefore, can, and is, updated throughout the course of the project as more data become available.

2.13.1 MEC AND MC EXPOSURE ANALYSIS

Historical findings and preliminary visual investigations of the U/W areas of the MRS have identified MPPEH on the surface of the seafloor, and a MEC exposure pathway for human and ecological receptors is potentially complete. The presence of sub-surface MEC is currently unknown, but due to the dynamic nature of marine sediments, its presence is likely.

MC exposure pathways for humans would be through dermal contact with the surface sediments, and ingestion of fish or other biota from the sea that has ingested the MC. Marine water is not used for human consumption on the island. Exposure pathways to ecological receptors would be through ingestion of marine water and other sea life that has ingested MC, and dermal contact with the marine sediments.

The U/W portions of the MRSs are frequented by fisherman, divers, and snorkelers who may encounter MEC on the seafloor. Beach visitors may encounter MEC along the shoreline and in the shallow waters. Sensitive ecological receptors, including sea turtles, coral, and sea grasses, have been identified in the area and could be exposed to MEC during intentional or unintentional detonation. The MC associated with the MEC that is potentially present on the seafloor would likely be undetectable once the MEC is removed. Due to the undersea environment, the groundwater migration pathway is incomplete. MC exposure and pathway is potentially complete for ecological receptors in the immediate location of the MEC item, but currents and the dynamic nature of the seafloor would likely dilute the effects.

The RI was designed to assess the presence/nature and extent of surface and subsurface MEC and identify if MC is present in and around MEC found within the U/W portion of the MRSs.

The Human Health Risk Assessment and SLRA results will be provided in the RI Report and will factor into potential removal/remediation measures during the FS phase. The MEC and MC CSMs are presented in Figures 2-2 through 2-5.

These preliminary CSMs are the initial CSMs for the RI/FS, and were developed in accordance with EM 1110-1-1200. These CSMs are presented as a summary table indicating known or suspected MEC/MC contamination sources, potential/suspected locations and distribution of contamination, related source or exposure media, current and future receptors, and potentially complete exposure pathways.

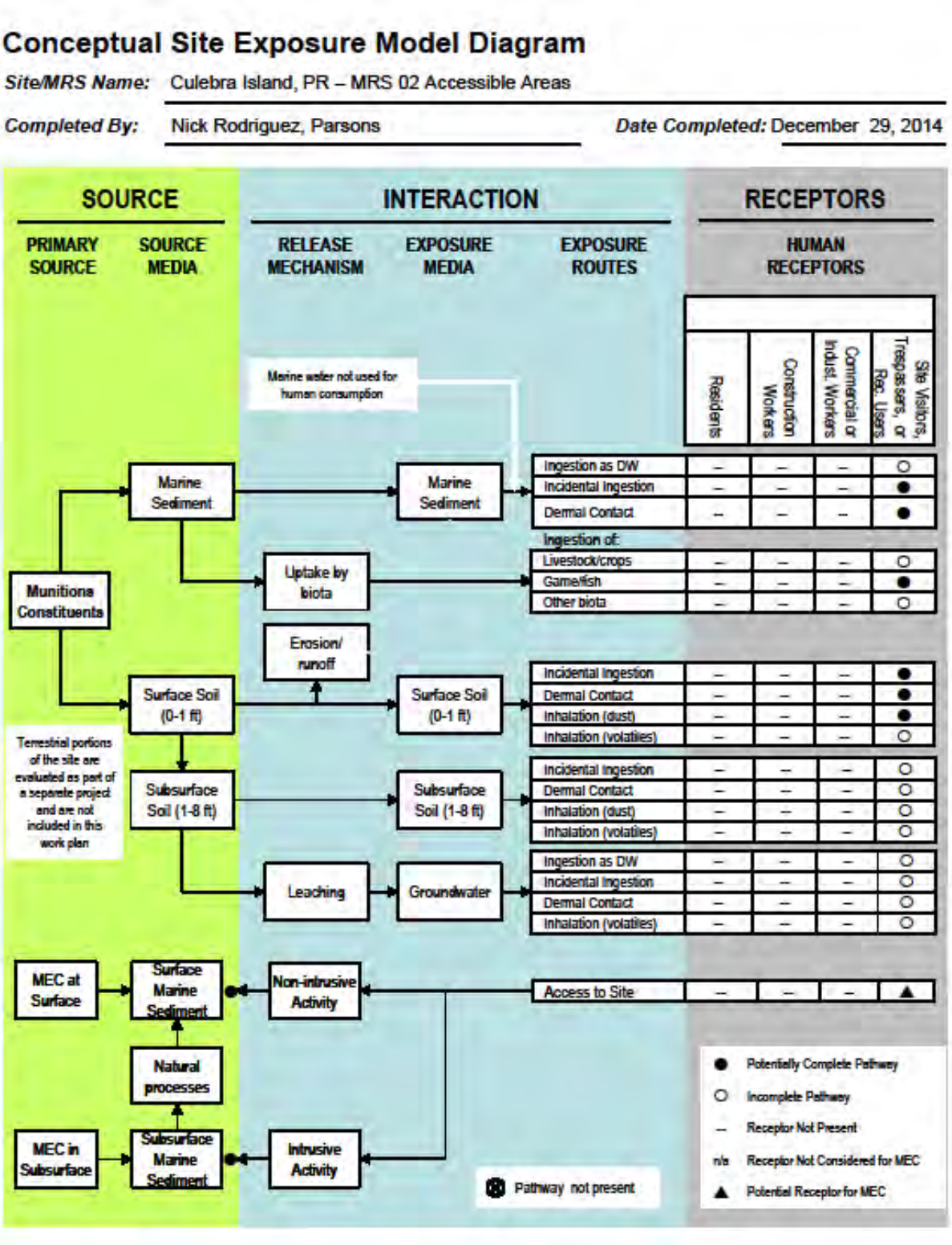

Figure 2-2a: MRS 02 MEC/MC Human CSEM – Accessible Areas

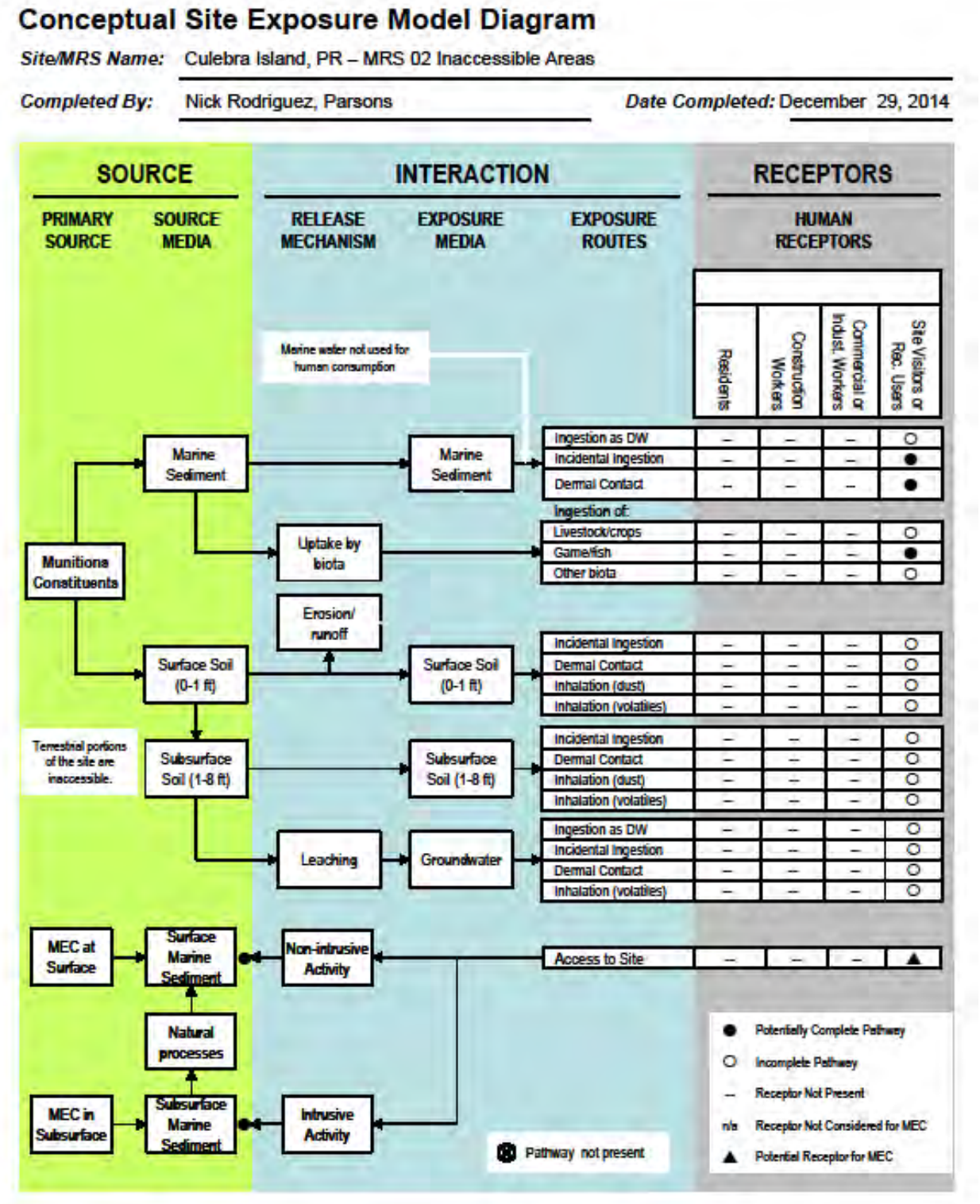

Figure 2-2b: MRS 02 MEC/MC Human CSEM – Inaccessible Areas

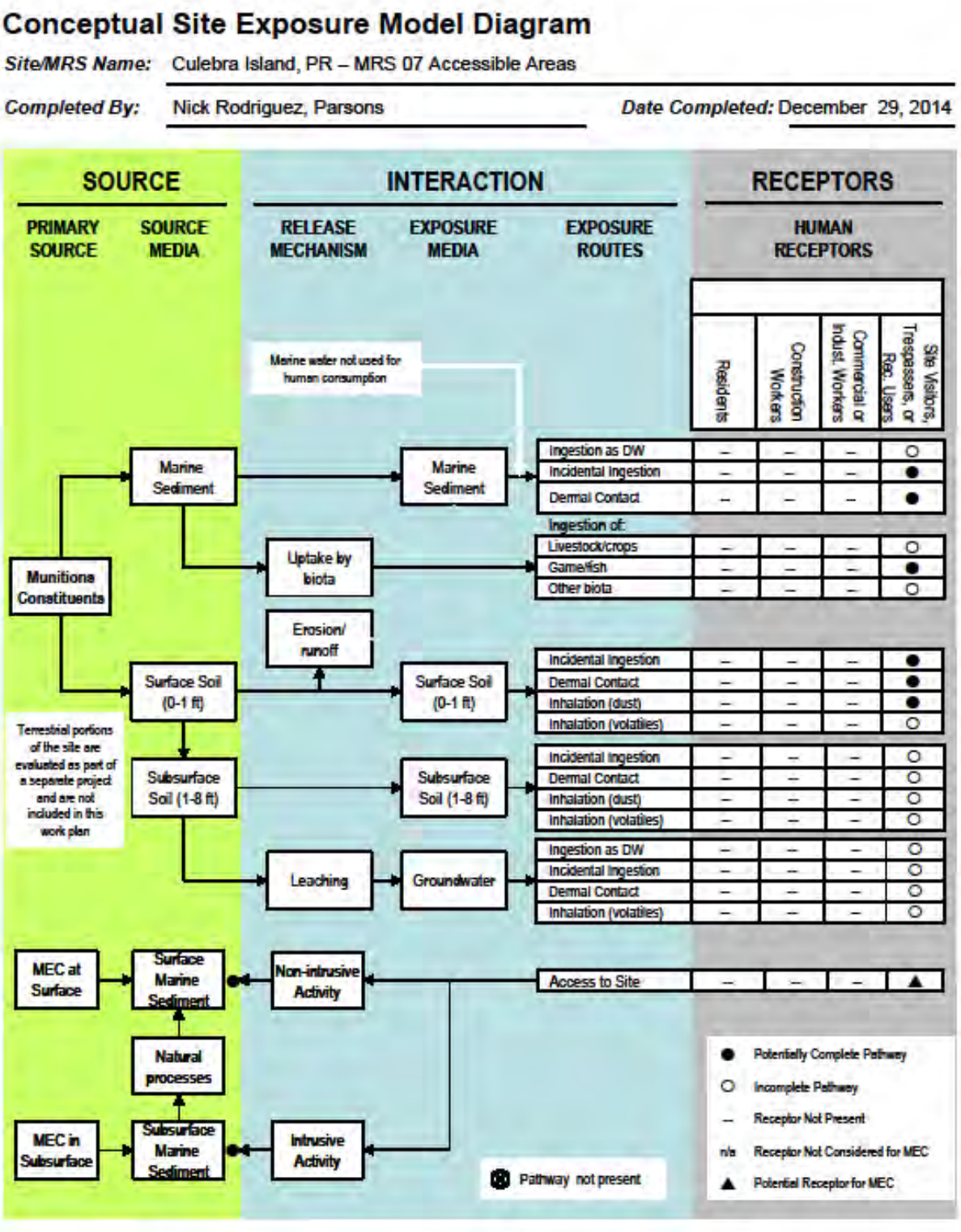

Figure 2-3a: MRS 07 MEC/MC Human CSEM – Accessible Areas

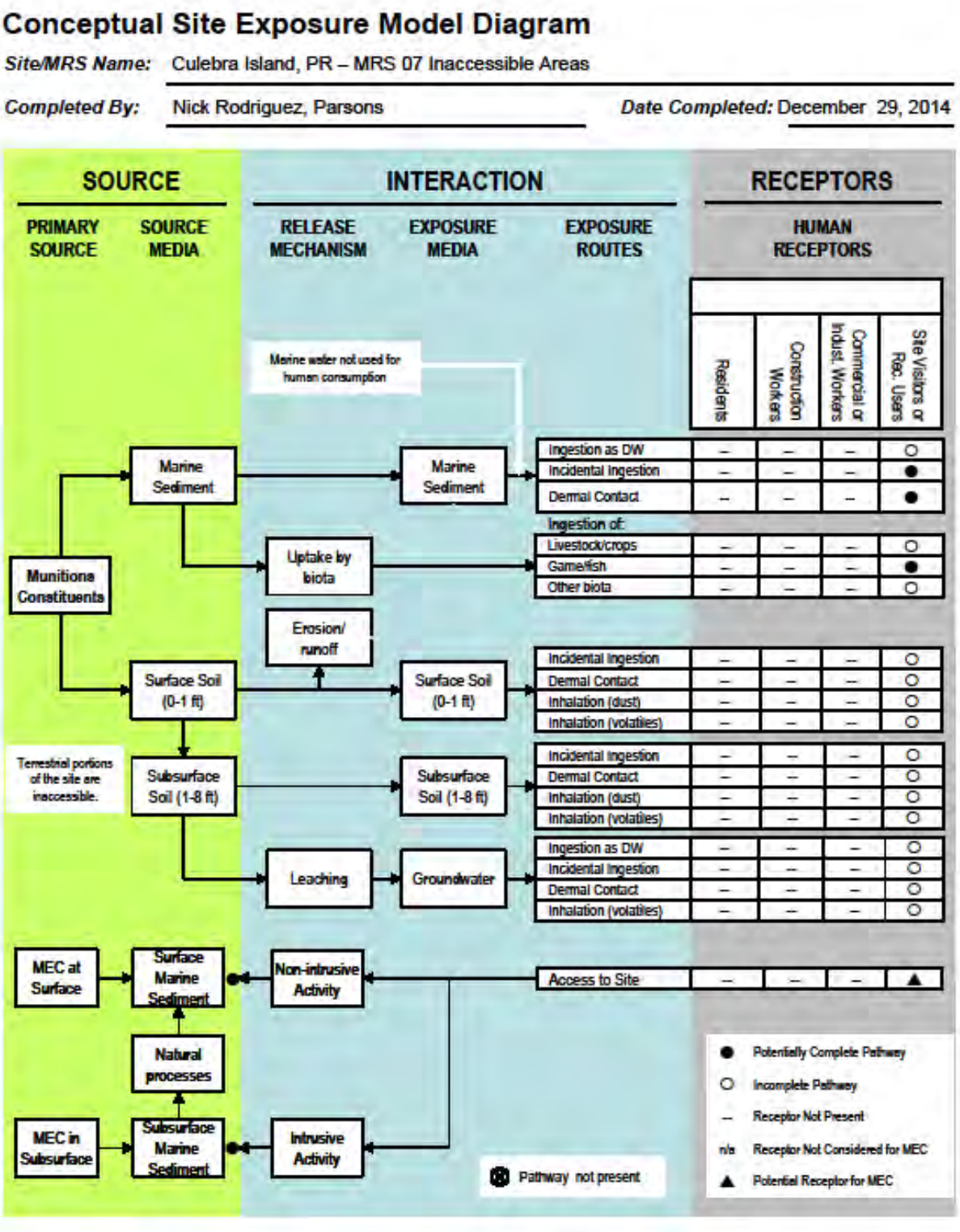

Figure 2-3b: MRS 07 MEC/MC Human CSEM – Inaccessible Areas

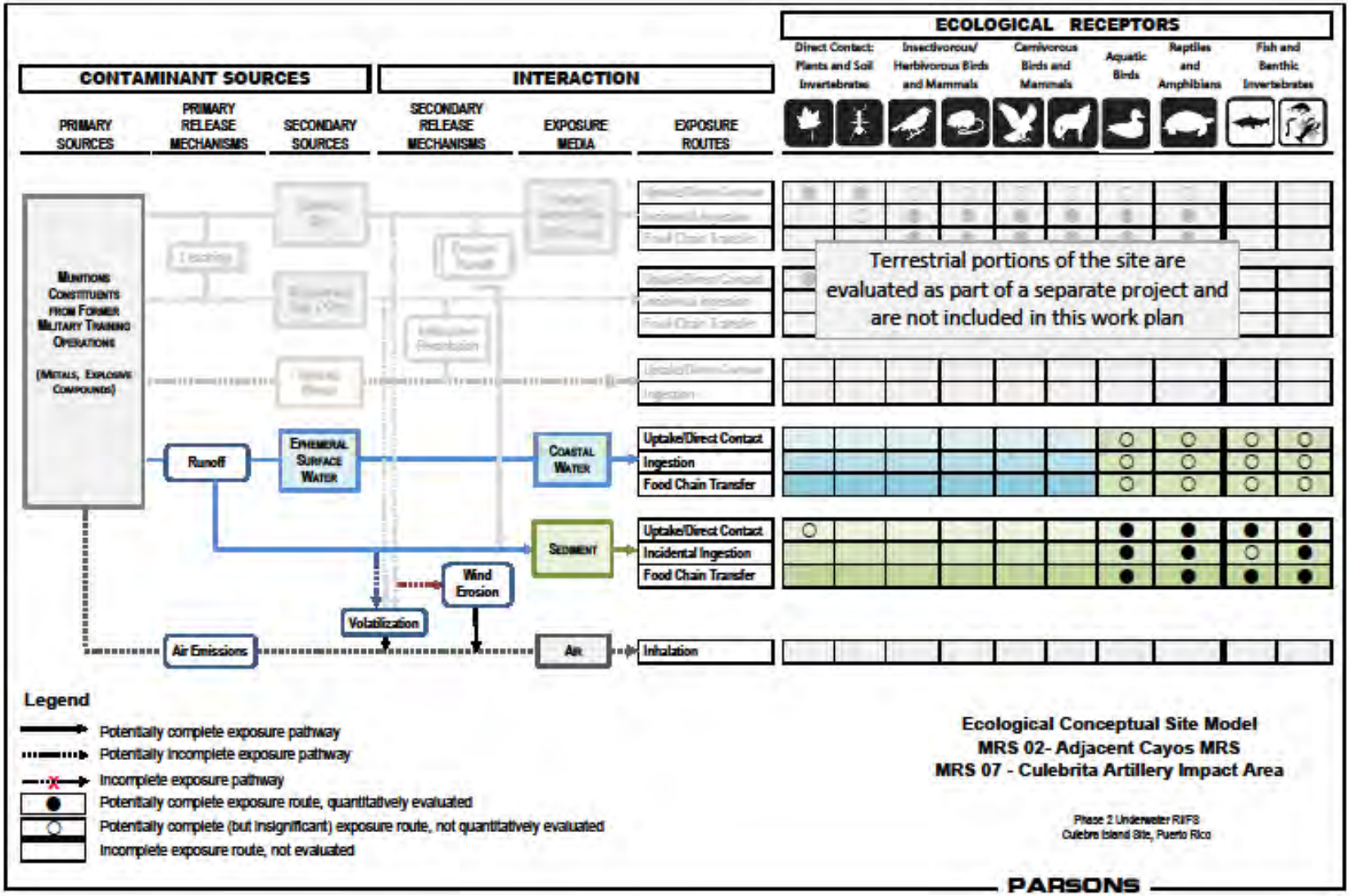

Figure 2-4: MRS 02 and 07 MEC/MC Ecological CSM

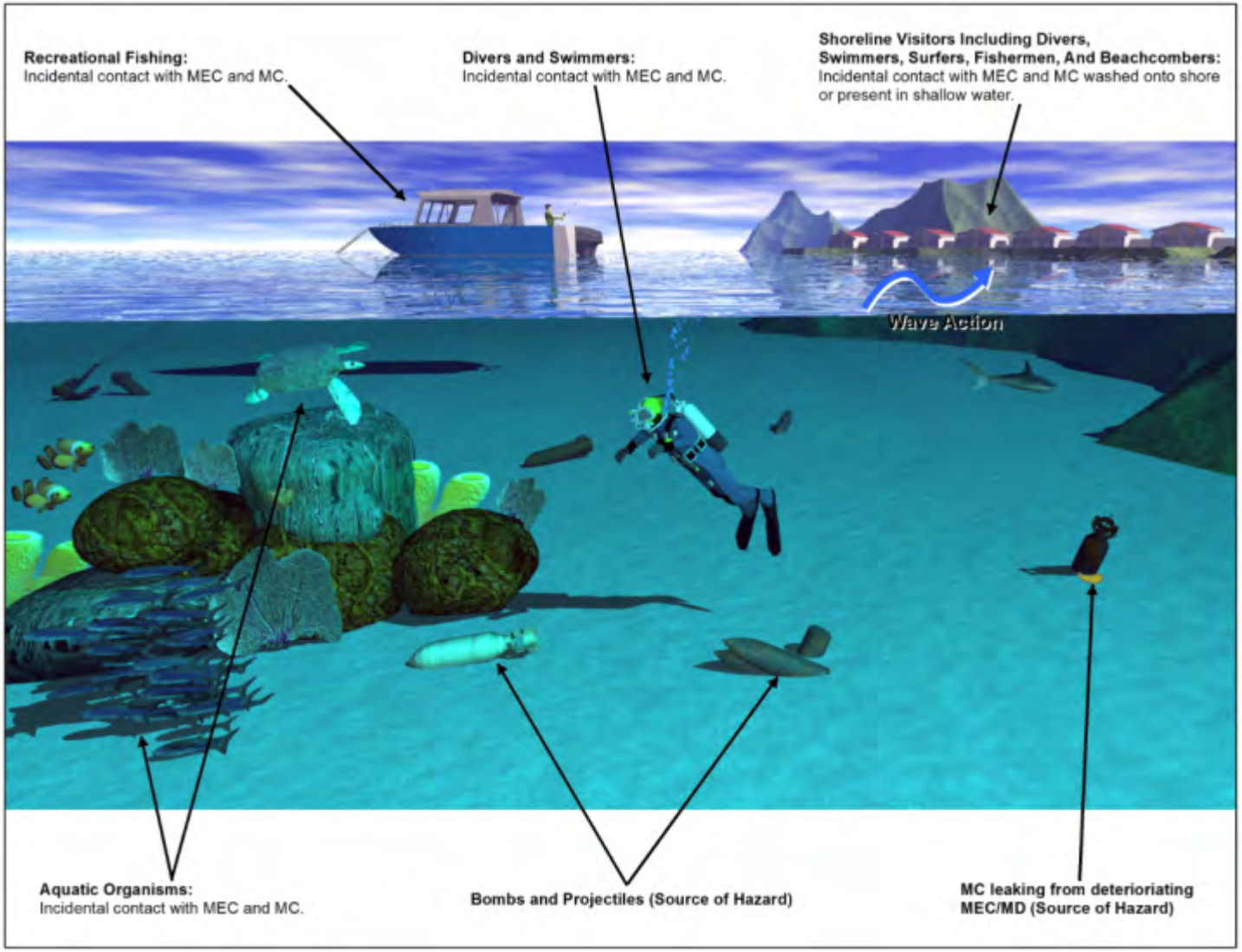

Figure 2-5: MRS 02 MEC/MC CSM

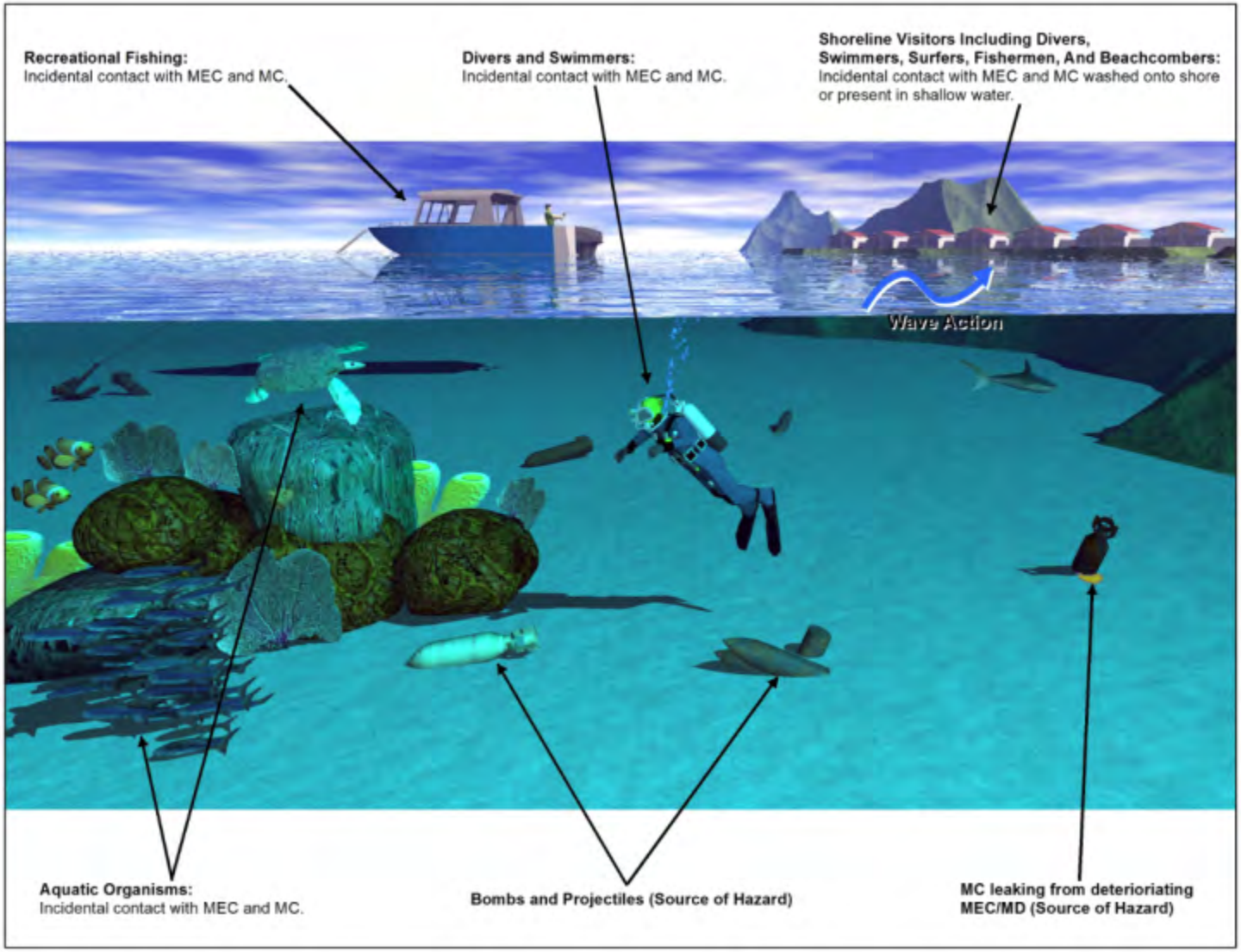

Figure 2-6: MRS 07 MEC/MC CSM

3.0 FIELD INVESTIGATION PLAN

3.1 OVERALL APPROACH TO MUNITIONS RESPONSE ACTIVITIES

This Field Investigation Plan outlines the site characterization goals for Phase 2 (DGM), Data Quality Objectives (DQO), MEC exposure analysis and the data to be incorporated into the RI/FS Report for the (U/W) areas surrounding MRS 07 and MRS 02 cayos.

3.1.1 SITE CHARACTERIZATION GOALS

The characterization goal for this RI is to characterize the nature and extent of the MEC and MC hazards.

The preliminary project goal is to determine if the surrounding coastal waters within each MRS are safe for continued use by property owners and the public. Based on this preliminary project goal, site characterization goals include:

- Document available information pertaining to the nature and extent of MEC within each MRS;
- Identify areas where further investigation is warranted;
- Conduct a field investigation of each MRS to characterize the nature and extent of MEC and MC within the MRS; and
    - Perform qualitative assessment of MEC and MC risk at each MRS (The data collected during this investigation will be sufficient to conduct a MEC HA).

The goals identified for MEC during Phase 2 will be achieved by:

- Conducting DGM transect surveys;
- Developing Anomaly density maps.

A secondary goal of the DGM site characterization effort conducted during this portion of the RI is to produce sufficient DGM data to facilitate the development of a Field Investigation Plan for the intrusive investigation work and Munitions Constituents assessment for MRS 02 and 07. The field investigation is designed to support this effort by completing a sufficient quantity of DGM transects with DGM targets identified by location and priority for intrusive investigation.

3.1.2 DATA QUALITY OBJECTIVES

Data Quality Objectives (DQOs) are qualitative and quantitative statements that clarify project objectives, define the appropriate type of data, and specify the tolerable levels of potential decision errors that are used as the basis for establishing the quality and quantity of data needed to support decisions. These project specific statements describe the intended data use; the data need requirements; and the means to achieve acceptable data quality for the intended use. DQOs established for the Phase 2 RI activities meet the USEPA *QA/G-4HW* Guidance's 7 step DQO criteria. Table 3-1 presents the Project DQOs for the Phase 2 RI activities.

Table 3-1: Project Data Quality Objectives

DQO STEPS	MRS LOCATIONS
Underwater Areas of MRS 02 and MRS 07	
1. State Problem(s)	Based on historical data, previous investigations, suspected MPPEH items identified during the EBS visual survey, reports of UXO sightings in the water by civilians, and documented UXO findings on land, MRS 02 and MRS 07 are confirmed to have been used for DoD training operations using munitions with an explosive potential. A. Receptors Human receptors include residents and tourists who use the U/W portions of MRS 02 and MRS 07 for diving, snorkeling, swimming, and fishing. The U/W portions of MRS 02 and MRS 07 are known to contain threatened and endangered ecological receptors and critical habitats. B. MEC It is highly possible that MEC is present in the U/W (benthic) portion of MRS 02 and MRS 07, and may present an explosive hazard to human and ecological receptors and critical habitats. C. MC It is possible that MC from munitions remaining on-site and deteriorating in the marine waters, may have contaminated marine sediments present within the MRSs.
2. Identify the Decisions	The decisions that need to be made to guide this investigation are in three general areas: A. Sensitive ecological receptors and critical habitats • Determine the species and habitats present in the study area. • Determine the presence of and identify Listed Endangered or Threatened Species, proposed for listing species, and critical habitat present in the near vicinity or on MEC/MPPEH. • Determine what removal or disposal procedures, and equipment to be used, will best protect the ecological resources and still remove or dispose of the hazard. • Determine the acceptable level of hazard to expose UXO Technician SCUBA divers in the process of protecting environmental resources. B. Potential Target Areas Establish presence/absence of potential target areas within MRS U/W investigative areas; if present, characterize nature and extent of contamination present. • Intrusive investigations will determine whether MEC is present or not. • Determine which procedures and equipment will be most appropriate to accurately detect MEC in the different marine environments present (shallow water, deep water). • Determine how investigative transects will be placed to characterize the presence of MEC with a 90% confidence of determining elevated anomaly density areas while protecting ecological resources and adequately considering the safety of UXO Technician SCUBA divers. • Determine the level of acceptable hazard for divers. • Establish which anomalies identified in the geophysical/analog investigation will be intrusively investigated. • Transects designed with Visual Sampling Plan (VSP) will determine areas of high

DQO STEPS	MRS LOCATIONS
Underwater Areas of MRS 02 and MRS 07	
	density that may indicate a target area. • When MEC are found, determine the disposal method appropriate to the item found which will protect ecological resources and minimize hazard for divers. • Determine what methods and standards will be used to delineate the estimated extent of contamination identified.
3. Identify Information Inputs	To establish presence/absence (nature and extent if present) of MEC contamination: • EBS Report data (Relative position of identified endangered species/ critical habitat, suspected MEC items identified), • Current/ future land use, potential receptors and accessibility (CSMs), • Historical records review (Archives Search Reports, previous investigations and Culebra Non-Time-Critical Removal Action (NTCRA) (EEG, February 2009), • Terrestrial RI data, • Presence of surface MEC items discovered within U/W investigations of the MRS (Bathymetry, Side Scan Sonar (SSS), visual data from geophysical investigation), • Presence of subsurface MEC items from information gathered in the intrusive investigation based on data from the geophysical investigation. • Validation of the geophysical equipment and positioning equipment are functioning correctly for daily instrument testing. • Information from additional transects as necessary to refine characterization of high density areas, if MEC contamination is established.
4. Define the Boundaries of the Study	The study boundary defines the population to be sampled and the decision units to which the data will be applied. The horizontal extent of the RI study boundary is defined by the MRS boundary and consists of the U/W (benthic) areas of MRS 02 and MRS 07.
5. Develop a Decision Rule	A. Characterization of U/W Habitat: If endangered and/or threatened species, proposed for listing species, and/or critical habitat within planned investigation areas are encountered, the field team will follow procedures for their protection in accordance with the *Final Supplemental Standard Operating Procedures for Endangered Species Conservation and their Critical Habitat with Addendum 1, DERP-FUDS Property No. I02PR0068, Culebra, Puerto Rico* (CESAJ, February 2015) which can be found in Appendix K. B. Characterization of MEC contamination: Geophysical investigation methods will be used to evaluate potential MEC presence. The geophysical investigation determines that metallic anomalies may be present, but doesn't identify the anomaly as MEC. An intrusive investigation will be conducted during Phase 3 to determine which metallic anomalies are MEC. Types of equipment used will be chosen based on the type of environment in which the transect is located. Information related to types of equipment is located in Chapter 3, Section 3.2, Underwater Geophysical Investigation, of this WP. o Geophysical platform selection - Geophysical platform selection will be determined by the site conditions and benthic habitat present for the transect being surveyed (Phase II).

DQO STEPS	MRS LOCATIONS
Underwater Areas of MRS 02 and MRS 07	
	▪ EM 61 Remotely Operated Vehicle (ROV) will be selected for transects deeper than 20ft. In some cases the Site Geophysicist may be going to less than 20ft if the position accuracy for the EM coil can be maintained per the Measurement Quality Objectives (MQO). The EM 61 ROV platform is best used in coral and consolidated hard bottom but can be used in all benthic types (Phase II). ▪ EM 61 Float platforms (small and large) will be selected for transects between 4 and 20 ft of water depth. The EM 61 float platforms can be used in all bottom types but is greatly affected by rough sea conditions (Phase II). ▪ Analog UXO Technician Diver/Snorkeler will be selected for transects or transect segments that reside in less than 4-ft of water or for transects or transect segments in which sea conditions are consistently unfavorable for the EM 61 float platforms. [Transects completed by UXO Technician Diver/Snorkelers (this portion of the geophysical survey will be conducted during Phase III since the task requires UXO divers) in lieu of the EM-61 float platforms must be accessible without risking impacts to natural resources (such as corals) or exposing the divers/snorkelers to unsafe conditions.] Areas consisting of unconsolidated sediment may be further investigated during the intrusive phase using Analog and Dig procedures in less than 2m up to the intertidal zone if step out transects are required. UXO Technicians are allowed to walk on unconsolidated sediment when performing step out transects. o Transect horizontal and vertical deviation evaluation (Phase II): ▪ Transect horizontal deviations >10m will be filled in, unless an obstacle is documented or the deviation is not accessible. Note that this horizontal deviation metric may be refined for closed spaced transects (Phase II). ▪ Data will be collected during transect horizontal diversions around obstacles in which gaps of data cannot be filled in during a transect horizontal deviation due to the size of an obstacle (Phase II). ▪ Transect vertical deviations >2m above bottom will be filled in, either by DGM (Phase II) or Divers (Phase III), unless an obstacle is documented or the deviation is not accessible. ▪ By carefully monitoring and limiting the horizontal and vertical transect deviations (recollecting exceedance portions of transects that do not document an obstacle), the project team can reasonably assume a 0% false negative rate. Add to this that the goal is to identify areas of elevated munitions use, so we are looking to detect concentrations of munitions (Phase II and Phase III).
6. Specify Limits on Decision Errors	Measurable decision errors are limited to the field and analytical QC processes for survey coverage. A. MEC Investigation • All geophysical activities will achieve applicable MQOs as stated in Chapter 3, Field Investigation Plan and confirmed/modified by the IVS, unless MQO failures can be adequately explained or justified. • The daily instrument checks, the monitoring of the sensor heights above bottom, DGM target reacquisition (offset), and data review will be performed to ensure that expected MEC or MEC indicators are detected.
7. Develop the Detailed Plan	A. Characterization of species and habitat The plan for evaluation of species and habitat within the U/W study area was developed in the

DQO STEPS	MRS LOCATIONS
Underwater Areas of MRS 02 and MRS 07	
for Obtaining Data	WP for the EBS. B. MEC The investigation transects for MRS 07 were designed in VSP software for detection of a MEC contaminated area by determining elevated anomaly density areas with a 90% confidence level above a background density. The VSP Report is included in Appendix M. The VSP designed transects are realigned to consider bathymetric contours delineated in the 2014 EBS Report, sensitive ecological receptors and critical habitat. The transect design separation for MRS07 is 50 m (164 ft). Transect width for the geophysical investigation is 1m (3 ft). Transect spacing for MRS 02 varies between the cayos with the intent to place one transect close to the 100-yd border and one transect that splits the MRS boundary. Each cayo land mass is considered to be the known target and the transect design is to identify high density areas. Refer to Figures B-1 through B-13 in Appendix B for planned transect locations. Data collection procedures and associated QC measurements are included in the Field Investigation Plan in Chapter 3.

Footnotes:
[1]*For the purposes of this DQO, "accessible" means:*

- *For Vessels: That access to the water portions of the MRS is <u>not</u> hindered by water depth, shallow rock or coral formations, or unsafe sea state conditions (consistently rough seas).*
- For Snorkeling or SCUBA Personnel: *That access to the water portions of the MRS is <u>not</u> hindered by unsafe sea state conditions (consistently rough seas) or waters that are too shallow for Snorkeling/SCUBA personnel to swim without impacting coral or consolidated hard bottom. Snorkeling/SCUBA personnel are allowed to stand and transit a transect or step out in unconsolidated sediment.*

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3.1.3 DATA INCORPORATION INTO THE RI/FS REPORT

The EBS Report, the Phase 2 and 3 field data, along with pertinent information provided by the local community, and the significant findings within each MRS will be incorporated into the RI/FS Report. Maps will be provided that show the transect designs, locations of the areas surveyed, intrusive investigations, and the locations, type, and nomenclature (if possible to determine) for MPPEH/MEC discovered. Personal Digital Assistant (PDA) GPS/Data Collection equipment will be used to record location data. A waypoint, brief description, and digital photograph will be electronically recorded for any MEC related items.

Locations and descriptions of craters or target remnants will also be recorded. A digital video, along with a detailed physical description of MEC and the natural resources in which they reside (for items left in place and not disposed of due to anticipated impact to listed threatened or endangered species), will be taken.

3.2 PHASE 2: UNDERWATER GEOPHYSICAL SURVEY

Phase 2 field activities will consist of performing geophysical surveys along the re-aligned RI transects established during Phase 1 (See Appendix B: Site Maps, Figures B-1 through B-13). The objective of these activities will be to collect EM anomaly data.

Table 3-2 presents the work elements and the supporting documents where the procedures for the work elements are discussed in detail.

Table 3-2: Project Activities and Supporting Documents

Definable Feature of Work	Supporting Document(s)
Mobilization	Appendix K: SOP
Site Specific Training/ IVS Certification	Section 3, Appendix D: APP, Appendix K: SOP, Appendix L: Dive Operations Plan
Snorkeling Operations	Appendix L: Dive Operations Plan
DGM Survey	Section 3, Section 6, Appendix K: SOP, Appendix L: Dive Operations Plan
Small boat operations	Section 6, Appendix D: APP, Appendix K: SOP

3.2.1 TRANSECT DESIGN

In order to satisfy the project DQO of establishing the presence/absence of potential target areas within MRS U/W investigative areas, VSP software was used to develop the transect design for MRS 07. Using the Final Report for the Non-Time Critical Removal Action (NTCRA), Culebrita Beaches, dated 2007 (USA Environmental, Inc,) as a historical reference, VSP software was used to develop the transect design for MRS 07. Inputs into VSP are as follows: A transect width of 1 meter was chosen as that is the width of a standard EM-61 system. The system being used is a Geonics EM61-MK2 High Power system. The EM-61 was chosen as DGM sensor for this project due to its ability to find smaller, shallower metal objects similar to the MEC items expected at MRS 07, is less affected by local geology, and has demonstrated acceptable performance at other Culebra MRSs. The EM-61 is an industry accepted system with documented and repeatable detection performance results. Based on intrusive results documenting 20mm projectiles found during the 2007 NTCRA of Culebrita and Culebra beaches, the smallest VSP MEC target area was used, leading to a circular target radius of 333 ft. It was decided that the transect spacing using this target size was too large and did not provide a reasonable coverage across the site; therefore, a smaller target radius of 150 ft. was used to develop transects. A background density of 25 anomalies per acre and an expected target area density of 200 anomalies per acre above background was estimated based on results from the 2007 NTCRA. For example, the removal actions at Flamenco Beach and the 5 beaches around Culebrita averaged 397 anomalies per acre. We expect the anomaly density to be lower in areas farther from the target. The transect spacing evaluation range of 25

to 50 meters was chosen to give enough evaluations to produce a useable Target Detection Performance graph. The distribution of MEC and MEC indicators is not known prior to survey, but given that the cayos were used as direct fire or bombing targets, the distribution is assumed to be bivariate normal with the highest concentration of items close to the target and less concentration as you move away from the target. The Max Error of 0.05 and Min Precision of 0.1 were left unchanged because these parameters were sufficient to produce a useable Target Detection Performance graph after running the Monte Carlo Simulations. The False Negative Rate of 0% as not changed as all detectable anomalies should be picked as targets from the DGM data. Since the coil altitude will be recorded, sections of transects where the coil is too high for detection of items of interest may be identified as data gaps. The maximum altitude of detection will be established at the IVS. Segments where the altitude is higher than the tolerances stated in the GSV Report will be edited out of the data. The resulting 50 meter (164 ft) transect spacing provides a 100% probability of traversing any potential MEC contaminated area with the characteristics described above. The small size of each MRS 02 cayo boundary (100-yd from shore) did not allow for multiple transects per VSP results. MRS 02 transects' spacing varied between each cayo and was selected to provide two transects within the 100-yard boundary. Each cayo land mass is considered as the primary target for the cayo. One transect was placed approximately in the middle of the 100 yard boundary with the second transect placed at or near the 100-yd boundary. The transect spacing is designed to detect high density areas within the MRS 02 boundary. Various types of munitions were used on the Cayos with the smallest of the munitions, according to the Archives Search Report Supplement (USACE, 2004), being the 20mm MK1 HEI projectile found on Cayo Lobo and the 37mm projectile (nomenclature not specified) suspected to have been used on most of the other Cayos. The goal for transect spacing is not to detect individual 20mm projectiles, or their individual fragments, but to detect areas with concentrations of these smaller projectiles and the larger munition items such as general purpose bombs and a variety of larger projectiles used on the cayos.

The EM 61 sensor detection capability remains constant, however its effectiveness at detecting metallic targets is dependent on the size of the object and its distance from the TX/RX coil. Therefore it is possible that small fragments or munitions, such as 20mm projectiles may not be detected if the underwater environment (coral heads, large corals, rock formations, item burial depth, etc.) does not allow for the coil to be close enough to the item. Therefore concentrations of DGM anomalies are investigated and not necessarily a single small fragment or munition. ISO Detection distances will be demonstrated during the initial IVS surveys and reported in the GSV report.

The VSP assumptions used in designing transect spacing will be assessed during post-processing, in addition to determining potential data gaps.

When the DGM survey is conducted over the sea floor (benthic habitat: coral bottom, rock bottom, sand bottom, seagrass etc) the altitude of the EM 61 is continuously measured (at a rate of ten times per second) to document height above bottom. As the DGM platform maneuvers over obstacles, such as coral heads, the obstacle's surface will become the bottom from which the altitude is measured. Any data collected that has a corresponding altitude greater than the maximum detection capabilities documented in the GSV Report will be identified as a potential data gap. These data gaps may require additional DGM or UXO SCUBA Diver surveys to fill the data gap unless the gaps can be sufficiently explained (i.e., shallow endangered corals that prevented DGM or UXO SCUBA Diver survey).

Transects represent ideal site coverage and were created with the understanding that field conditions such as shallow water, strong currents, and endangered species that are discovered during field work could cause deviations from the planned transects. These deviations would degrade the high probabilities of finding target areas outlined above. At the end of DGM survey operations, transect coverage will be assessed by running the Post-Survey Probability of Traversal tool. This tool will identify any data gaps in the surveyed transects that do not meet the VSP parameters outlined above. These data gaps may require additional DGM or UXO SCUBA Diver surveys to fill the data gap unless the gaps can be sufficiently explained (i.e., shallow endangered corals that prevented DGM or UXO SCUBA Diver survey).

At the completion of Phase 1, the transect design was adjusted with the results published in the Final Environmental Baseline Survey Report, Underwater Portions of MRSs 07 and 02, Culebra, Puerto Rico

(Parsons, 2014). The transect realignments and adjustments were the results of identifying: underwater hazards, the depth contours, shallow water areas, and other conditions that would pose a hazard to the vessel, crew or natural resources. These transect adjustments, in some cases, placed a transect segment outside of the parameters of the original transect design or created a gap in a transect segment in which the geophysical surveys could not be conducted. These gaps will remain as unsurveyed areas. To evaluate the original transect design and the revised transect design that will be used for Phase 2, refer to Final Environmental Baseline Survey Report, Underwater Portions of MRSs 07 and 02, Culebra, Puerto Rico (Parsons, 2014).

3.2.2 EM SURVEY PLATFORMS

For transects containing coral/rock and consolidated hard bottom, and/or Listed Threatened or Endangered Species, the survey methodology to be used will be tailored to cause minimal impact to the U/W environment. The U/W EM geophysical coil will be deployed using two types of system platforms, including 1) EM61 floating platforms and 2) an EM61 ROV platform (see Figure 3-1 to 3-3). As there is not a single EM system that will meet all of the objectives of the DQOs, multiple platforms will be used to survey the designated areas.

Figure 3-1: EM61 Deep and Shallow Floating Platforms

Figure 3-2: EM61 Deep Floating Platform

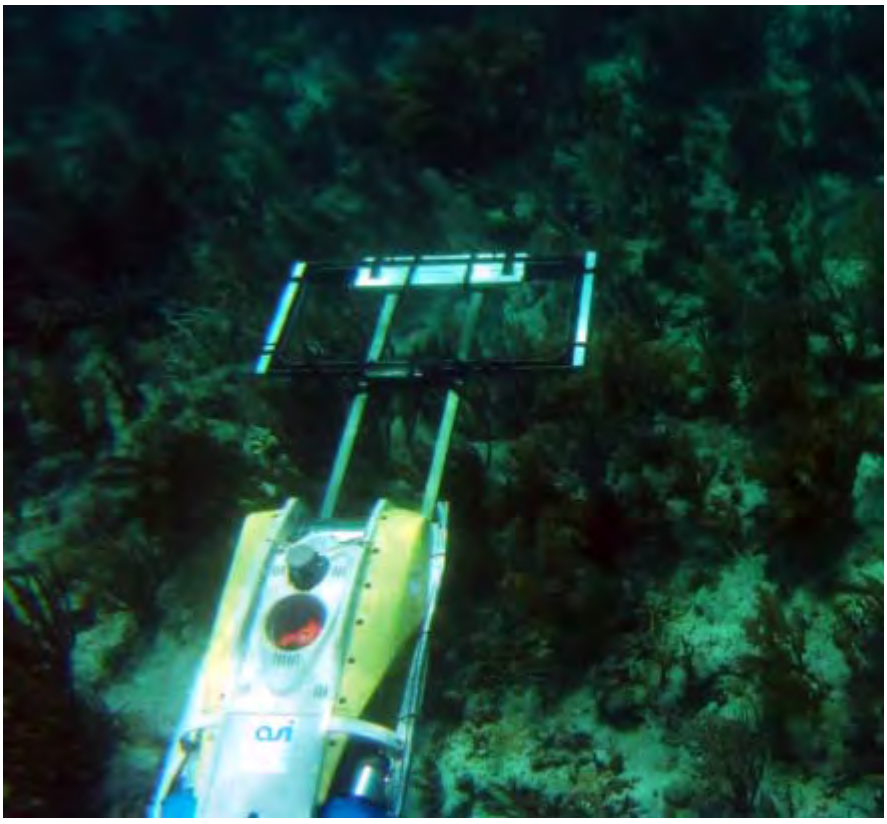

Figure 3-3: EM61 Attached to ROV

The system used in any given area will depend primarily on depth of water and benthic habitat type present (Figures B-14 to B-18). Based on the analysis of all of the EBS data, Parsons has assigned EM platforms to each of the RI transects/segments based on benthic habitat. Appendix B: Site Maps, Figures B-1 to B-13, illustrate the EM platform deployments for MRS 02 and MRS 07, with each color-coded to indicate the proposed EM platform that will be used. Descriptions of each EM platform are provided in the following sub-paragraphs, and methods/procedures for deployment are contained in Appendix K: Standard Operating Procedure (DSOP-12).

The selection of an applicable survey platform was based on the depth of water (bathymetry data) and type of bottom (corals, seagrass, etc.) from Phase 1 activities, and the anticipated sea state and the means in which the platform would be moved along segments of the transect. The GIS manager will provide the DGM team with "Way Point Files" that will be uploaded into the Real-time Kinematic Differential GPS (RTK-DGPS) to provide the field team with a site map that includes the DGM transects. If more than one EM Platform is planned for use on a transect, the "Way Point Files" will include the start and stop points for the EM Platforms..

3.2.2.1 EM ROV

The EM ROV platform is used to propel the Tx/Rx EM coil along the transect in deeper water where corals or obstructions are present. The ROV is equipped with a pressure sensor, altimeter, pitch sensor, roll sensor, and video cameras so real time monitoring of the coil is possible. The ROV is maintained under positive control by the ROV operator at all times, lending the ability to maneuver the ROV/EM coil around challenging bottom types (coral heads/ boulders). The EM coil is mounted in front of the ROV so it will be in the camera view at all times. Accurate positioning for the ROV and coil will be supplied by an Ultra Short Base Line (USBL) system set up between the survey vessel and the ROV system. This system uses a transceiver mounted on the survey vessel which locates a transponder on the ROV with sub-meter accuracy via the incorporation of inputs from the RTK-DGPS and satellite compass as well as information from a speed-of-sound cast. The system is pre-calibrated; therefore, no onsite calibration is necessary. The altitude will be monitored real-time by the ROV operator, and the survey will be conducted with the coil within 1 meter of the bottom as conditions allow. The sensor height above the seafloor will be measured with an acoustic altimeter sampling at the same rate as the EM system (approximately 10 times per second). In areas of coral reef, the altitude will be measured as the coil passes over the hard and soft corals. Soft corals are not typically detected by the altimeter, and if they are the readings typically are spikes above the hard bottom. In processing the altimeter data, it is de-spiked therefore the spikes created by soft corals will be removed and the coil altitude above hard bottom will be reported. In areas of scattered hard and soft corals, the altimeter will report height above hard bottom and in the same manner as over coral reef, soft coral spikes will be removed from the data. As corals often grow taller than 1 meter, the ROV will either divert around or go over the corals as needed and return to the preplanned transect/altitude as soon as it can safely do so. Data will be collected during these diversions. The maximum altitude of detection will be demonstrated at the IVS. Since the coil altitude will be recorded, sections of transects where the coil is too high for detection of items of interest may be identified as data gaps. Segments where the altitude is higher than the tolerances stated in the GSV Report will be edited out of the data.

3.2.2.2 EM Float

As the accuracy of USBL positioning degrades significantly in shallow water, the float system will be used for data collection where applicable. The float system consists of a floating raft which supports a rigid mast. A Tx/Rx EM coil is rigidly attached to the bottom of the mast. This allows for the EM coil to be deployed beneath the water surface at a fixed depth which can be adjusted depending on the depth of the planned transect. The EM floating platform provides a means to float the EM coil in shallow waters over coral reefs or areas with obstructions along the bathymetric contour line. The deep EM float can be rafted alongside the boat while the shallow EM float can be towed behind the boat or pushed along by snorkelers (see Appendix L: Dive Operations Plan). A RTK-DGPS will provide real time positioning by using the antenna mounted on the floating platform which is centered over the EM coil at the bottom of

the rigid mast. The coil will be set at a depth so that it will be within 1 meter of the bottom along the pre-planned transect.

DGM surveys conducted from the survey vessel will be limited to areas with 4-ft or greater depth. All shallow water depths of 2 to 4-ft will be collected by a snorkeling team as part of the shallow water survey activities outlined in Section 3 of this WP. The EM floating platform will be used over all bottom types and in waters with depths between 2 and 20 ft. Snorkelers will swim the EM floating platform when the depth of the water is too shallow for the boat to navigate. The EM ROV platform will be used in waters deeper than 20 ft.

Two different floating platforms will be used. The shallow EM platform will be used in waters less than 8 feet deep as seen in figure 3-1. The shallow EM platform will only be used if the waters visibility ensures the snorkelers can see far enough in front of the EM coil to avoid impacts with coral or underwater structures. The snorkelers also need to be able to see the ocean floor below the EM coil to maintain the correct altitude over the sea floor. The coil is set to a fixed depth based on the depth of the pre-planned transect and its altitude is monitored real-time by the snorkelers as they progress along the transect. If the altitude of the coil exceeds the maximum altitude of reliable detection as demonstrated at the IVS, the transect survey is stopped, the EM coil is raised or lowered manually by removing a pin adjusting the position to the appropriate depth, the EM coil is locked in place by reinserting the pin and the transect survey is resumed. The depth of the coil will be recorded for each transect. When applicable, tides will be optimized during the small float survey to allow for as much DGM coverage as possible by conducting the survey of shallow water transects segments that might not be able to be surveyed other than at high tide. The RTK DGPS antenna is centered over the EM coil. The DGM boat monitors the EM floats track in real time and communicates verbal course corrections to the snorkeling team. If the DGM boat is at a distance that is too far from the small float to communicate course corrections effectively, the snorkelers are provided with a sunlight readable handheld waterproof GPS which contains the transect routes in which the snorkelers push the EM float. The deep EM platform will be used for waters between 8 and 20 feet deep as seen in figure 3-2. This platform uses an Odom Echotrac CVM fathometer or equivalent to track both the seafloor and coil in real-time. This allows the altitude to be monitored, recorded and adjusted during the transects. If the altitude of the coil approaches the maximum altitude of reliable detection as demonstrated at the IVS, the coil is lowered to maintain an appropriate altitude. The EM float (small and large) is not equipped with pitch-roll sensors. Therefore, the system will not be used in rough conditions. To ensure data density is acceptable, the speed for the EM float will not exceed 5 mph. There are virtually no offset variations between the sensor and GPS during data collection.

3.2.2.3 DGM Vessel

DGM surveys will be conducted aboard a vessel with the approximate dimensions of a 30-ft fiberglass or aluminum small boat with a 10-ft wide beam and drafts 2.5 ft. The vessel operator will be a United States Coast Guard (USCG) licensed 100-ton Captain. All safety equipment will be certified by the USCG. The survey vessel will have a cabin where equipment can be stored and utilized in case of rain or bad weather. An on-board or portable generator will supply required power. The survey vessel will utilize a GPS Chart Plotter with depth finder. In addition, a 17-ft to 26-ft work boat (minimum of one) will serve as a support vessel to aid with GPS survey equipment (signal repeater), and to provide exclusion zone control while conducting surveys. All boats will utilize existing mooring buoys or will utilize the anchoring procedures outlined in this WP and Appendix K (Final Supplemental SOPs for Endangered Species Conservation and their Critical Habitat with Addendum 1 (CESAJ, February 2015)).

Table 3-3: Performance Metrics of Marine DGM Survey

Metric/Test	Applicability	Performance Standard	Frequency	Failure Consequence
Static repeatability (instrument functionality)	All	Response (mean static spike minus mean static background) within 10 percent of value from initial static test with the test item on all channels	2 times per day	Day's dataset fails.
Dynamic Repeatability	IVS	IVS seed item dynamic response within 75% of initial measurement or average of initial IVS runs, position offset less than 2 meters.	Once daily (beginning of the day)	Day's dataset fails
Along-line measurement spacing	All	98% <= 25 cm along line	By dataset	Dataset submittal fails.
Speed	EM ROV/EM Float (Large and Small)	95% less than 5 miles per hour	By dataset	Dataset submittal fails unless new maximum speed successfully demonstrated at IVS.
Altitude	All	95% less than 2 meters over sand/grass bottom Altitude over coral will be dictated by height of soft corals. ROV will survey as close to coral as possible without impacting. Altitude will be recorded and reported.	By dataset	Redo affected work where altitude too high
Target selection	All	All dig list targets are selected according to project design	By transect or dataset	Submittal fails.
Geodetic equipment functionality	All	Position offset of known/temporary control point within 10 cm.	Once Daily (beginning of the day)	Redo affected work or reprocess affected data.
Geodetic accuracy	Points used for RTK base stations	Project network tied to HARN, CORS, OPUS or other recognized network. Project control points that are used more than once must be repeatable to within 10 cm.	Repeat occupation of each point used monthly.	Reset points not located at original locations or resurvey point.
DGM Transect Deviation	All accessible DGM Transects	All planned and accessible DGM transects are followed within +/- 10m	By Transect or dataset	Transect segments exceeding the 10-m offset will be resurveyed.

3.2.2.4 IVS

Under the direction of the Site Geophysicist, three IVSs will be established to perform U/W EM transects. Proposed IVS locations will have the appropriate approximate water depth, be able to get RTK corrections from the base station, and be in relatively protected waters so the chance of the objects being moved by wave action are minimized. Phase 2 will have two different types of IVSs. The first type of IVS (deep) will be established from the water's surface or with divers in approximately 18 feet of water, and seed items will lay on the surface of the seafloor. This type of IVS will allow for the evaluation/verification

of the EM ROV and deep-water floating platforms. The second type of IVS (shallow) will be placed in approximately 7 ft of water for the evaluation/verification of the shallow-water floating platform. One IVS of the first type (deep) will be established for the nine Cayos of MRS 02 off the western side of Culebra. One of each type (shallow and deep) of IVS will be established for MRS 07 and for the remaining three Cayos of MRS 02 off the eastern side of Culebra. Appendix B, Figure B-25, provides the approximate locations for the IVS's. A survey of the proposed IVS sites will determine the final positions for the IVSs to be built and the location selected may vary from the location depicted in Figure B-25.

Prior to the construction of any IVS, a pre-survey of the proposed locations will be conducted to ensure there are no anomalies already present that would interfere with the constructed IVS. Should anomalies be found, the survey will be expanded. If the expanded survey still finds existing anomalies, an alternate location will be chosen and pre-surveyed until a suitable location is found. This pre-survey will also include sufficient coverage to insure the IVS can include a background noise line free of anomalies.

All IVS's will be seeded with items laid on the sediment, attached to non-metallic weights in order minimize the chance of movement once placed on the seafloor. The seed items will be left in place for the duration of Phase 2 survey activities after which time they will be removed. The as-installed locations will be surveyed in with the RTK DGPS. The RTK DGPS antenna will be mounted on top of a long pole and the pole will be placed on the item from the surface, and the location of the item will be recorded once the pole is vertical. A part of the IVS, with no seed items, will be used to establish dynamic background noise levels for each EM61 channel. The EM platform will be processed through the IVS using multiple passes in order to ensure all items are reliably detected.

A deep IVS for ROV operations for the nine western Cayos of MRS 02 will be constructed using one medium and one large Industry Standard Object (ISO) oriented horizontally (least favorable orientation) with ISOs placed approximately 20-ft apart. The locations that will be initially evaluated for this IVS will be inside the cove off the northeast side of Cayo Luis Peña or along the western shore of Culebra south of Punta Tamarindo Grande. A deep and a shallow IVS will be constructed for use while surveying the three eastern Cayos of MRS 02 and all of MRS 07. These IVSs will be constructed using one small and one medium ISO placed approximately 20-ft apart. The locations that will be initially evaluated for these IVSs will be within Tortuga Bay in MRS 07.

During the initial survey, the IVSs will be surveyed at varying altitudes of up to 2-3m to determine EM responses to various items at specific stand-off distances and to help determine the anomaly selection criteria. The results of each initial IVS will be documented in a GSV report, documenting background surveys, as built IVSs, initial seeded IVS survey results, and finalized anomaly selection criteria.

3.2.2.5 Pre-Survey Preparation

Prior to commencing DGM operations, the survey team will review applicable Endangered Species Act (ESA) requirements (Appendix K: Final Supplemental SOPs for Endangered Species Conservation and their Critical Habitat with Addendum 1 (CESAJ, February 2015)) related to conducting DGM activities. The survey team will then assemble the EM61 associated equipment and platforms, RTK-DGPS. At dockside, the team will verify that each component is installed on the vessel correctly, is working individually, and that the survey software is receiving data from the EM61.

The RTK-DGPS base station will be established on an established control point (certified by a PR Professional Licensed Surveyor [PLS]) located near the project site prior to the vessel leaving the dock. The required position QC check will be performed prior to conducting survey activities (see Table 3-3). Julissa 1, Julissa 2, Pusito 1, and Pusito 2 control points have been designated for use during this project (see Appendix B: Figure B-26).

Prior to conducting DGM survey activities, the team will conduct a morning static test and move the vessel to the IVS for equipment operation verification (see Table 3-3). The IVS data will be collected once daily. This data will include one or more passes over the ISOs as well as a background noise line free of anomalies. The team will also do a complete operational test of all field equipment and generate an

initial IVS report documenting system performance of each EM platform, and finalizing DGM metrics, including an initial DGM Transect anomaly selection channel and threshold value.

3.2.2.6 DGM Survey Operation

Using the pre-approved EM platform for each transect, or transect segment, the survey team will ensure that the line to be surveyed is the active line on the data logger. The vessel operator will begin the approach to the line with sufficient space to ensure a straight entry for the sensor platform. The survey team will begin logging data at the start of each survey line. Checks will be periodically made to ensure the data is logging and that sensor and position data are valid. Once at the end of the survey line, logging will be stopped. The previous survey line should increment or decrement to the next survey line to be run.

Following the DGM survey, VSP will be used to evaluate data gaps during post survey analysis. The post VSP analysis will be conducted following the completion of each Cayo surveyed. By isolating the Cayo from the MRS the data gaps can be identified while the other cayos undergo their DGM survey. The MRS 07 post VSP analysis will be completed either as a complete MRS or in quadrants which ever will ensure data gaps are identified prior to team demobilization. If the DGM team is still in the field, accessible data gaps will be filled in using DGM. Otherwise, accessible data gaps will be filled in by divers during Phase III – Intrusive Investigation.

3.2.2.7 Suspect MPPEH Discovery During DGM Survey

Suspect MPPEH may be discovered during the DGM Survey Operation through witnessing the suspect MPPEH item through the EM 61 platform camera, or by snorkelers as the small EM 61 float system is pushed along the transect. Suspect MPPEH will have the GPS coordinates, and photos recorded. The Ordnance and Explosives Safety Specialist (OESS) will be advised of the suspect MPPEH item. MPPEH locations will not be provided to parties outside of the USACE or Parsons. Results will be included in the DGM daily reports.

3.2.2.8 Vessel Operation Practices

The vessel 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 seagrass areas. Combining information from aerial photographs with hydrographic data will help to ensure that nautical charts are accurate. Vessel operators will maintain on board their boats and will use Phase 1 maps that provide benthic bottom types, locations of known listed or proposed to be listed threatened or endangered species, specifically corals as they relate to the transects identified for the DGM survey. The vessel operator and survey team will maintain a vigilant watch for coral reefs, colonized hard bottom and seagrass 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 should be avoided to keep from running aground. The vessel operator will stay at a minimum of 4-ft from the bottom of the vessel to the top of coral areas, to avoid accidental grounding, propeller wash, and propeller scarring. Vessels will be maintained away from areas with corals and seagrasses. Operations will be conducted in such manner that bottom scour or prop dredging will be avoided at all times. The vessel operator and survey team will consult Appendices K and L, which provide details on endangered species and critical habitat mitigation measures related to vessel and equipment operation.

3.2.2.9 Processing DGM Data

Following the survey, the DGM data will be processed and analyzed. Standard Oasis software will be used to generate X, Y, Z files, survey and target databases, color shaded relief maps, and GeoTIFF files for each map. Analysis of daily IVS data will include a running report (spreadsheet) of seed item response values, comparison to published or previous response values, seed item location accuracy, and background noise values. Transect data will be analyzed using an anomaly selection EM61 channel and threshold value established at the initial IVS testing. Parsons/USA expects an initial anomaly selection

threshold 4 to 6 times the background noise values established at the IVS. The transect DGM target database(s) will be exported to Excel files, and will be used to develop anomaly density maps, either in ESRI or VSP. Transect DGM anomalies selected for intrusive investigation will follow the selection and prioritization identified in Table 3-1 and will be finalized during the initial IVS testing. DGM data files will be provided by the site geophysicist to the project geophysicist daily. Geophysical data deliverables and delivery schedule will conform to DID WERS-004.01.

3.3 TIME CRITICAL REMOVAL ACTIONS

The procedures outlined in this WP apply to a RI/FS. Should circumstances justify the need for a Time Critical Removal Action, Parsons will follow the procedures established in USACE guidance.

3.4 GEOSPATIAL INFORMATION AND ELECTRONIC SUBMITTALS

This subsection details procedures that Parsons/USA will use to perform mapping and GIS integration during Phase 2.

3.4.1 ACCURACY

Parsons/USA will verify existing or establish new survey control on the site using Class I, Third Order control monuments by a local PLS. If additional control points (base station and check points) are needed, they will be measured from the established control. In the event that an established control point has been damaged or destroyed, the Parsons/USA survey team will re-establish the control point as close to the original point as possible. The survey team will set up the RTK-DGPS base station on an established control point that was certified by a PR Professional Licensed Surveyor and that has been inspected and determined to be in good condition (i.e., no evidence of tampering or disturbing of the control point). The survey team will locate a suitable area for the new point in close proximity to the old point and will establish the point with a method that is permanent in nature (ie. rebar with a cap driven into the ground, or a survey nail driven into the asphalt of a road). The RTK rover will be positioned over the control point, held steady with a bi-pod while ensuring that the survey range pole is level. The re-established control point will be measured by the RTK rover and its horizontal coordinates and elevation will documented for current and future use (see Appendix K: SOP 2). The horizontal control will be based on either the English or the metric system and will reference the NAD83 and the UTM Grid System. Any control points established or recovered will be constructed of iron or steel pins, concrete monuments, or other permanent construction method meeting the standards found in EM 1110-1-1002. This construction will ensure recoverability for any current or future work at the site. Parsons/USA will use a PLS registered in Puerto Rico to install control points. The northing and easting (X and Y) coordinates for all control points will be presented in a certified letter, or drawing, at the completion of the project. The PLS will provide all required data, and include the project-specific coordinate system, datum, and units (e.g., UTM Coordinate System, Zone 17 North, NAD83, and units in meters).

3.4.2 GIS INCORPORATION

The GIS database will be maintained by USA for Parsons at the USA corporate office located in Oldsmar, Florida. The GIS Manager will manage the database, which is used to store preliminary and final, or published versions, of project GIS data. The GIS Manager will also coordinate positional data generated by ASI's DGM team. This database is the official project repository of GIS data, including unprocessed feature and attributable data sources that may be used outside the GIS. The Oldsmar-based database is the main location for processing data sources into draft and final GIS products, as well as for production work.

USA will produce ArcGIS Projects in accordance with the PWS, and will update the GIS as often as necessary to enable planning and coordination of daily, weekly, and monthly activities. The ArcGIS project will be prepared in ArcGIS 9.x format and be compatible with ArcGIS 9.1.

Suspected U/W MEC items will have the original coordinates documented within the GIS. The layers will be completely independent, and produce a concise picture of all clearance activities completed during this

contract. Supporting tabular data will be provided in Microsoft Excel and/or Microsoft Access format at the completion of the project.

Throughout the project, USA will build the GIS database upon existing data, and will integrate the field data into the system. To enhance accuracy of the field data, USA/ASI will collect the field data using a ruggedized handheld GPS and electronic data collection system, as required. Project data will be downloaded on-site on a daily basis and digitally transferred to USA on at least a weekly basis. Upon receipt of the field data, the GIS Manager will perform an accuracy inspection of the data and import this data into the project GIS.

All GIS data will be in ESRI Shape file or Geodatabase format. Raster data, such as orthophotography, will be in Tagged Image File Format (TIFF) or MrSID-compliant format. Associated databases will be in Microsoft Excel format.

3.4.3 PLOTTING

All control points recovered or established will be plotted at the appropriate scale for the parcel being described. Maps and Drawings of the site will be plotted at an appropriate scale to ensure that enough detail is shown and easily identified. If necessary, sheet index for the project will be prepared that includes enough of the planimetric data to indicate the sheet's geographical location in the project area. This index will be shown on each map with the current sheet crossed-hatched or heavily outlined. If required, a separate sheet file may be utilized for the index.

3.4.4 MAPPING

The location, identification, coordinates, and elevations of all control points recovered or established at the site will be plotted on a map. Control points will be identified on the map by its name and number and the final adjusted coordinates and elevations. The coordinates for points of interest will be shown to the closest 1.0 ft. Locations of individual recovered MEC items will be located to a horizontal accuracy of plus or minus 1-ft within the grid and will be plotted on a map. Maps will have a revision block, title block, index sheet layout, legend, grid lines, scale bar, and a true north arrow. In general, the direction of north will run from the bottom of the file to the top, with no skew. A legend showing the standard symbols used for mapping will be on the map as well as a map index showing the site in relation to all other sites within the project boundary.

3.4.5 DIGITAL DESIGN DATA

All GIS Data will be delivered in ESRI Shapefile format. A READ ME file will be included with delivered data, which will contain basic information about each Shapefile.

3.4.6 COMPUTER FILES AND DIGITAL DATA SHEETS

All final document files will be delivered to USAESCH in IBM and MS Office compatible formats. The drawing and plot data will be provided in the UTM Coordinate System, NAD83, with units in meters. GIS data will be submitted in ESRI Arc Map-compatible format. Raster data, such as USGS Topographic Quadrangles or Orthophotography will be provided in either TIFF or MrSID format. All ArcGIS project files (.mxd) will be supplied with the appropriate final report. In addition to GIS data and project files, maps will be delivered in PDF format for viewing without modification.

All final GIS data generated from this project will conform to the Spatial Data Standards for Facilities, Infrastructure and Environment (SDSFIE).

3.5 PERSONNEL QUALIFICATIONS

As required by the specific task, all field personnel and its subcontractors (as applicable) will complete the OSHA 40-hour training course for hazardous waste site workers and an 8-hour refresher course as appropriate. Management and supervisory personnel will also complete supervisory training and refresher

training as required by CFR 1910.120 e (4) & (8). Additional site-specific training, in accordance with 29 CFR 1910.120, EM 385-1-1 (USACE Safety and Health Requirements Manual), and ER 385-1-92 (Safety and Occupational Health Document Requirements for HTRW Activities) will be provided to all personnel upon their initial mobilization. A Medical Surveillance Program is in place with the latest examination within the last 12 months. CPR training will be required for Field personnel and subcontractors that are participating in field operations.

3.5.1 UXO TECHNICIAN PERSONNEL QUALIFICATIONS

The USA U/W UXO Team will include UXO Technician III/IIs who will be qualified personnel, approved by the USACE. UXO Technician personnel must meet the requirements set forth in Department of Defense Explosives Safety Board (DDESB) Technical Paper (TP) 18, Personnel/Work Standards. UXO Technician personnel will be U.S. citizens and be graduates of the either the U.S. Naval EOD School, Eglin AFB, Florida; the U.S. Army Bomb Disposal School, Aberdeen Proving Ground, Maryland; the U.S. Naval Explosive Ordnance Disposal (EOD) School, Indian Head, Maryland; the EOD Assistants Course, Redstone Arsenal, Alabama; the EOD Assistants Course, Eglin AFB, FL or a DOD-Certified equivalent course. Credit for the EOD experience while assigned to the National Guard or Reserve will be based on the actual documented time spent on active duty, not on the total time of service.

3.5.2 SNORKELING AND UXO TECHNICIAN SCUBA TECHNICIANS

Snorkeling and UXO Technician SCUBA divers qualifications and team structure can be found in Appendix L, Dive Operations Plan.

3.6 INVESTIGATION DERIVED WASTE PLAN

Previous investigations and records detailing historical use of the MRS sites have not identified Recovered Chemical Warfare Materiel or any other hazardous material contamination at the project site. As a result, the project team does not anticipate recovery, handling, or disposal of Investigation Derived Waste during the course of the Phase 2 RI/FS investigation.

3.7 RISK CHARACTERIZATION AND ANALYSIS

3.7.1 CSM

A screening level risk assessment will be conducted as part of the RI Report after completion of the field work. Parsons will revise/identify source-receptor interactions for each MRS and exposure pathway, including source, access, activity, and receptor (human and ecological) for MEC as well as source, an exposure medium, an exposure route, and receptor (human and ecological) for MC. Interaction for the MEC component of these CSMs requires access and activity. Current and future access to the source area is limited, but current and future activities can bring receptors into contact with potential MEC.

The MC exposure media data and pathway analysis will be revised based on the results of the field investigation. For MC source areas, analytical results will be compared to project action levels and USEPA Regional Screening levels (RSLs) to determine the likelihood for potential risk to human and ecological receptors.

The CSM will be updated in the RI Report for each MRS.

3.7.2 MEC RISK

For the MEC risk characterization and assessment element, the MEC HA will be used. The MEC HA evaluates the level of risk to the public in terms of the likelihood of exposure and the severity of exposure to MEC. The MEC HA process entails definition of risk factors, MEC risk assessment, and assessment of response alternatives. The MEC HA is not designed to assess underwater munitions sites. However it will be used to evaluate MEC risk on a qualitative basis as it is the only HA tool currently available. The MEC HA will be included with the RI Report for each MRS.

3.7.3 MUNITIONS RESPONSE SITE PRIORITIZATION PROTOCOL (MRSPP)

In 2001, Congress directed that the DoD identify and then prioritize their MRSs. The protocol was published as a rule on 5 October 2005 (35 Code of Federal Regulations Part 179). The protocol was designed to: 1) maximize use of the latest MRS-specific data, and 2) be applied early in the munitions response process. The protocol assigns a relative priority to each location in the DoD's inventory of defense sites known or suspected of containing UXO, Discarded Military Munitions, or MC, and prescribes procedures for prioritizing the defense sites and general component responsibilities. The site priority ranking is based on the risk posed by potential hazards captured in data entered for three hazard evaluation modules of the MRSPP, explosive hazard evaluation (EHE) module, chemical warfare material hazard evaluation (CHE) module, and the health hazard evaluation (HHE) module. Separate MRSPP tables (EHE Tables 1 through 10, CHE Tables 11 and 20, HHE Tables 21 through 28, MRS Priority Table 29, and MRS Background Information, Table A) will be completed for each MRS in the RI Report.

3.7.4 ANALYSIS OF LAND USE CONTROLS

An institutional controls alternatives analysis will be conducted as part of the investigation process. This analysis will be carried out according to EP 1110-1-24, Establishing and Maintaining Land Use Controls for Munitions Response to Munitions and Explosives of Concern Projects and DID WERS-017.01. An Institutional Analysis Report, documenting the results of the analysis, will be prepared and included as an appendix in the RI Report.

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4.0 QUALITY CONTROL PLAN

4.1 INTRODUCTION

Parsons recognizes that the USACE is responsible for QA; however, Parsons also has a QA process that starts with top management's commitment and involvement. The process provides a permanent and workable system that allows each employee to understand the job performance expected. The Parsons QA and improvement process ensures that every employee is supported by the actions, procedures, tools, and training required to perform a job according to the requirements. By promoting teamwork and by focusing attention on the solutions, the quality of work can be increased and assured throughout the project.

Parsons Corporation Quality Policy

We are committed to providing quality services and products. We will, as a corporation and as individuals, meet the mutually agreed-to requirements the first time and strive for continuous improvement of our work processes.

The Parsons' QA Policy is based on the work and concepts of several recognized authorities on quality management in the United States, especially Mr. Philip Crosby, Dr. W.E. Deming, and Dr. J.M Juran. These three experts each have different methods of addressing and resolving problems. Parsons has taken unique portions of their concepts and has tailored them to corporate work processes. As a result, Parsons has placed a greater emphasis on the actual elements pertaining to work processes, project requirements, and lessons learned from past performances. These concepts have been developed into a systematic and practical approach for improving quality.

Generally, Parsons' QA Policy relies on four fundamentals, termed the "absolutes of quality". They answer these questions:

- What is quality? Conformance to Requirements
- How do we achieve it? *Prevention*
- What is our performance standard? *Zero defects*
- How can we measure quality? *Cost of Doing Things Wrong*.

The Quality Control (QC) process provides a permanent and workable system that allows each employee to understand the job performance expected within the assigned task. The QC and improvement process ensures that the training, actions, procedures, and tools support every employee according to the requirements and in such a manner that we protect the environment and minimize the impact of the project activities. Checklists have been developed to ensure that critical elements are addressed and that QC checks are documented for compliance with the WP, SOPs, policies and procedures. By promoting teamwork and by focusing attention on the solutions, the quality of work is increased and assured throughout the project.

This QCP provides the procedures and methods to be used for the field activities within the selected work areas. This plan addresses organizations and responsibilities, DQOs, QC test methods, audit procedures and pass/fail criteria, field operations, equipment testing maintenance and calibration, QC inspections, and of generated records reporting procedures. The QCP outlines procedures to ensure all personnel meet the qualification requirements and receive the site-specific training to perform the duties of the job for which they were hired and site-specific training requirements for visitors. The QCP also describes how lessons learned are captured, documented and submitted to the Government.

4.2 QUALITY MANAGEMENT STRUCTURE

The following paragraphs describe the organizational structure of the Parsons/USA Quality Management Team during operations at the project site. Names and qualifications of site personnel will be provided prior to mobilization.

4.2.1 PROJECT QUALITY CONTROL MANAGER (MR. ROBERT CROWNOVER-USA)

The Project QC Manager is responsible for reviewing and updating the QCP and verifying compliance with the plan. The Project QC Manager verifies compliance with the QCP by auditing project activities and instituting corrective actions. For this project, the UXOSO and UXOQCS is a dual-hatted position. The Project QC Manager has the following responsibilities:

- Preparation of project QC policies and procedures
- Ensuring timely submission of contract deliverables
- Providing training and assistance to the site project UXOSO/UXOQCS
- Reviewing employee qualification records to ensure accuracy
    - Conducting periodic field audits of sites, programs, and projects project activities to ensure QC compliance.

4.2.2 PROJECT MANAGER (MS. PATRICIA BERRY – PARSONS)

The PM is responsible for the overall performance during this project. The PM will develop and implement the site WP and also has the following responsibilities:

- Serve as primary point of contract with the USACE PM
- Monitor project performance, safety, quality, cost, and schedule
- Ensure timely submission of contract deliverables
    - Report directly to the Program Manager

4.2.3 PROJECT GEOPHYSICIST (MR. AL CRANDALL – USA)

The Project Geophysicist is responsible for the overall technical direction for DGM surveys to include the following:

- Provide overall technical direction for DGM surveys
- Supervise data processing and interpretation.
- Coordinate with the Site Geophysicist to verify the accuracy and completeness of project DGM documentation and target lists, IVS testing results, QC results and related DGM project documentation
    - Review all DGM data, confirm that DGM performance metrics are being maintained, and provide notification to USAESCH when data are available for their review.

4.2.4 SITE MANAGER/SENIOR UXO SUPERVISOR (SM/SUXOS) (JAE YUN)

The SM/SUXOS is responsible for the day-to-day field operations at the project site. The SM/SUXOS reports directly to the TM and has the following responsibilities:

- Implementation of work plan and QC policies and procedures
- Reporting to the TM on effectiveness, adequacy, and status of the project
- Ensuring the timely submission of contract deliverables
- Coordinating with project personnel for site tasking and schedules
- Reviewing any failures and implementing corrective actions
- Implementing additional guidelines used to assist in the development of site and task specific policies and procedures.

4.2.5 UXO SAFETY OFFICER/UXO QUALITY CONTROL SPECIALIST (UXOSO/UXOQCS) (HARRY CRAIG)

The UXOSO/UXOQCS is responsible for overseeing the site QCP in all field operations. The UXOSO/UXOQCS will be trained in QC techniques methodology and be qualified as a UXO Technician III. The UXOSO/UXOQCS coordinates with the TM for daily operations and maintains a direct line of communication to the PM and SM/SUXOS. The UXOSO/UXOQCS reports directly to the Project QC Manager and has the following responsibilities:

- Daily Safety Brief
- Daily Safety Inspections
- Weekly Safety Audit
- Conducting initial site safety orientation training
- Periodic safety training on relevant safety subjects
- Complete appropriate Accident Investigation and Accident/Incident Reports, as required
- Acting in an advisory capacity with the PM on safety related issues
- Working directly with the Dive Supervisor and SUXOS to ensure safe completion of operational tasks.
- Conducts daily audits of the DGM teams, equipment and procedures
- Conduct daily audits of the UXO teams, equipment and procedures
- Perform and document random sampling (by pieces, volume or area) of all MPPEH collected from the various teams to ensure no items with explosive hazards, engine fluids, illuminating dials and other visible liquid HTRW materials are identified as munitions debris or range-related debris as required for completion of the Requisition and Turn-in Document, DD Form 1348-1A

4.3 DATA QUALITY OBJECTIVES

The DQOs for this phase of the work (Phase 2 – U/W Investigation Geophysical Survey) are presented in Table 3-1. The data collected during this phase and the subsequent Phase 3 U/W Intrusive Investigation will be utilized in conjunction with the data previously collected during the Phase 1 Environmental Baseline Survey to assess the nature and extent of MC and the hazards or potential hazards presented by MEC.

The data collected from all three phases of work will be presented in the RI Report and will serve as the basis for determining whether sites (or portions of these sites) require further response actions.

4.4 QUALITY CONTROL TEST METHODS AND AUDIT PROCEDURES

This section discusses QC methods and procedures to be used during project operations.

4.4.1 INSPECTIONS

Parsons/USA will conduct inspections to verify whether quality-related activities comply with this QCP. A list of the audit procedures based on the Definable Feature of Work (DFW) is provided in Table 4-1. Internal inspections will address activities performed by the project team. External inspections will address activities performed by project subcontractors, laboratories, and equipment and material suppliers.

The UXOQCS will implement the three-phase control process for each of the DFWs in Table 4-1 to audit/inspect the subtasks for compliance with the approved WP, SOPs and DQOs. The three-phase control process includes the preparatory, initial, and follow-up phase audits/inspections. The inspections are documented using the QC Surveillance Forms prepared for each DFW (located in Appendix F).

4.4.1.1 Preparatory Phase

A preparatory phase inspection is performed prior to the beginning of work on each DFW. The UXOQCS will review the DFW scope and applicable specifications (MQOs) and verify that the necessary resources, controls, and conditions are in place and compliant with the WP before the work activities begin.

4.4.1.2 Initial Phase

The UXOQCS will perform an initial phase inspection for each DFW once a representative sample of the work has been completed. The purpose of this inspection is to check the preliminary work for compliance with procedures and contract specifications and to verify through inspection and testing the acceptable level of workmanship. The UXOQCS will review the minutes of the preparatory phase to check for omissions and resolve any differences of interpretation by project personnel and the contract requirements.

4.4.1.3 Follow-up Phase

The UXOQCS will perform a follow-up phase inspection periodically while work progresses for each DFW. The frequency of the follow-up phase is specified in Table 4-1, by DFW. The purpose of the inspection is to ensure continuous compliance and an acceptable level of workmanship. The UXOQCS will observe the same activities as under the initial inspection and ensure that discrepancies between site practices and approved specifications are identified and resolved. Corrective actions for unsatisfactory conditions or practices will be verified by the UXOQCS prior to continuing work on the affected DFW.

The inspection program is established to provide the following:

- An objective and independent evaluation of compliance with established policies and procedures (WP, SOPs, Activity Hazard Analyses (AHAs), etc.)
- A mechanism for verifying and implementing the corrective actions recommended as the result of inspections.

Personnel performing QC inspections are knowledgeable about, and have received training in, QC techniques and methodologies, this QCP and applicable regulations. They will also be technically knowledgeable of the processes being inspected. Inspections will be performed in accordance with written procedures or checklists. Personnel performing QC inspections will not have direct responsibilities in the areas they are assessing.

System and performance inspections will be undertaken. System inspections will evaluate the components of the QC system, including evaluating items such as approach and adequacy of the preparation step, inspection of the schedules and plan delivery dates, and tracking systems for QC activities. Performance inspections evaluate actual QC activities, such as design control, on-site data gathering, calibration and control, inspection and testing activities, and documentation.

Inspecting QC personnel will document inspection results, which will be reviewed by the PM. When unsatisfactory or nonconforming conditions or items are found, the responsible organization will implement corrective actions in a timely manner. Previously unsatisfactory areas will be re-inspected to ensure satisfactory corrective actions have been completed. The results of the inspections will be shared with the team with regard to needed rework and lessons learned.

Records of all inspections will be maintained and controlled as QC records.

Table 4-1: Definable Features of Work Audit Procedures

Note: QC audits/inspections for each DFW are documented using the QC Surveillance Forms located in Appendix F.

Definable Feature of Work	Reference	Audit Procedures	QC Phase	Frequency of Follow-on Inspections	Pass/Fail Criteria	Action if Failure Occurs
Mobilization & Site Specific Training	WP Sec- 3.5; Sec 4.9.2 Personnel Qualification Letter Site Specific Training Form	Visual Observation and Document Review	PP/IP/FP	Once, and follow-up as required	All personnel required for the work activities have been identified, are available, and meet the requirements and qualifications for the positions, or waivers from the USAESCH have been obtained.	Document deficiency and report to SM/SUXOS and PM for resolution, follow-up to verify compliance before personnel are assigned project tasks
	WP Sec- 4.9.2	Visual Observation and Document Review	PP/IP/FP	Once, and follow-up as required	All personnel are properly trained and certified to operate equipment and machinery.	Document deficiency and report to SM/SUXOS for resolution, follow-up to verify compliance before personnel operate equipment and machinery
	WP and APP	Document Review	PP/IP/FP	Once, and follow-up as required	All field personnel have reviewed the WP and APP.	Document deficiency and report to UXOQCS and SM/SUXOS for resolution, follow-up to verify compliance before personnel commence assigned project tasks
	APP App. F: Daily Safety Briefing Attendance Form	Document Review	PP/IP/FP	Once, and follow-up as required	All personnel have signed the Employee Sign-off Forms for the SSHP, the Certificate of Personal Protective Equipment (PPE) training and all AHAs have been completed.	Document deficiency and report to UXOQCS and SM/SUXOS for resolution, follow-up to verify compliance before personnel commence assigned project tasks
	APP	Document Review	PP/IP/FP	Once, and follow-up as Material is Introduced to Project	Material Safety Data Sheets are available on-site for all hazardous materials used or encountered onsite	Document deficiency and report to UXOQCS and SM/SUXOS for resolution, follow-up to verify compliance before personnel are exposed to the hazardous material of concern

Definable Feature of Work	Reference	Audit Procedures	QC Phase	Frequency of Follow-on Inspections	Pass/Fail Criteria	Action if Failure Occurs
	WP Sec- 2.6 Project Schedule	Visual Observation and Document Review	PP/IP/FP	Once and Follow-up as Required	All equipment is received on island as needed to support the project schedule.	Document deficiency and report to SM/SUXOS for resolution
	WP Sec- 2.2	Document Review	PP/IP/FP	Once	Coordination is performed with personnel on Culebra, FWS, DNER, PREQB, the U.S. Coast Guard, FAA and USAESCH.	Document deficiency and report to SM/SUXOS for resolution prior to initiating project tasks
	SSHP	Visual Observation and Document Review	PP/IP/FP	Daily	Work zones and exclusion zones are properly established.	Document deficiency and report to SM/SUXOS for resolution prior to initiating project tasks
	SSHP	Visual Observation and Document Review	PP/IP/FP	Weekly	Break and rest areas established in accordance with reference.	Document deficiency and report to SM/SUXOS for resolution prior to initiating project tasks
	App K Final Supplemental SOPs for Endangered Species Conservation and their Critical Habitat with Addendum 1 (CESAJ February 2015)	Visual Observation and Document Review	PP/IP/FP	Once and Follow-up as Required	All field personnel have received a review of the SOP from the team biologist or other qualified (USFWS, NOAA specialists, etc.)	Document deficiency and report to SM/SUXOS for resolution prior to initiating project tasks

Definable Feature of Work	Reference	Audit Procedures	QC Phase	Frequency of Follow-on Inspections	Pass/Fail Criteria	Action if Failure Occurs
IVS Installation	WP Sec 3.2.2.4	Visual Observation and Document Review	PP/IP/FP	Each Occurrence	Water Depth and proper site selection for the IVS for the DGM Platform the IVS is intended for. Pre-survey of the IVS site location The capture of GPS Coordinates for ISOs	Document deficiency and report to SM/SUXOS/Project Geophysicist for resolution. DGM survey will not be initiated until the deficiency has been resolved.
IVS Certification	WP Sec- 3.2.2.4 & 3.2.2.5	Visual observation	PP/IP/FP	Daily as required	Detect all ISOs at IVS	Deficiency will be reported to SM/SUXOS and personnel/equipment will undergo remedial training and certification. If the root cause is identified (e.g. faulty equipment or IVS survey procedures) and corrected, the IVS certification may be reattempted up to two times in a survey day.
	WP Sec- 3.2.2.5 App. L, App. K: Forms DGM (Phase 2) Prep, Initial, Follow-up	Visual observation	PP/IP/FP	Daily as required	DGPS checked at a known location and indicates accurate position	Deficiency will be reported to SM/SUXOS and personnel/equipment will undergo remedial training and certification
Snorkeling Operations	WP Sec-3.2 App. L	Document review	PP/IP/FP	Daily as required	Snorkeler maintains the small EM Float Platform on the transect line and ensures the EM coil is maintained as close to the bottom as possible without impacting corals or consolidated hardbottom	Deficiency will be reported to SM/SUXOS and personnel/equipment will undergo remedial training and certification
DGM Survey	WP Sec- 3.2.2.5 and Table 3-3 Appendix F: Forms DGM (Phase 2) Prep, Initial, and Follow-up	Visual Observation and Document Review	PP/IP/FP	Daily as Required	Pre-operations checks performed on detection equipment and ROV equipment	Deficiency will be reported to SM/SUXOS and personnel/equipment will undergo remedial training and certification Data may be re-collected depending on the results of the Root Cause Analysis (RCA)

Definable Feature of Work	Reference	Audit Procedures	QC Phase	Frequency of Follow-on Inspections	Pass/Fail Criteria	Action if Failure Occurs
	WP Sec- 3.2.2.7	Visual Observation, Document Review	IP/FP	Daily as required	Locations of suspected MPPEH discovered by Snorkelers-Small Float EM 61 or EM 61 ROV Camera recorded and reported to USACE	Deficiency will be reported to SM/SUXOS. UXOQC will verify resolution procedure Data may be re-collected depending on the results of the RCA
	WP Table 3-1	DGM Data Review	IP/FP	Daily (upon completion of a Transect)	Completed DGM Transects results were within the WP Parameters • Speed • Transect Offset • Along line • Altitude (as applicable)	Project Geophysicist will report deficiencies to SM/SUXOS. Site Geophysicist will propose resolution to deficiency and will be concurred with by Project Geophysicist, approved by SM/SUXOS.
Small Boat Operations	WP Sec- 3.2.2.8, Sec-6, App. K	Visual Observation	IP/FP	Daily as Required	Vessel operating in a manner to protect natural resources but remains functional in field operations	Deficiency will be reported to SM/SUXOS and boat operator will perform remedial training and certification.
Monitoring for marine mammals and sea turtles during water borne operations	App K Final Supplemental SOPs for Endangered Species Conservation and their Critical Habitat with Addendum 1 (CESAJ February 2015) App F: Form "Daily Observer Log" WP Sec – 6.3.4	Visual Observation and Document Review	IP/FP	Daily as Required	Daily Observer Log Sheet is completed and submitted daily following the parameters described in the listed SOP.	Deficiency will be reported to SM/SUXOS and personnel will undergo remedial training on completing and maintain the logs.

4.4.2 DEFICIENCY MANAGEMENT

All deficiencies or nonconforming conditions (as defined in the pass/fail criteria in Table 4-1) discovered during inspections or other QC functions will be noted on the Daily QC Inspection form. A log will be maintained to document and track corrective actions to closure, and will be included in the RI Report. The UXOQCS will be responsible for tracking deficiencies to closure and reporting their status on daily reports and log forms (see Appendix F for the Daily QC Inspection/Log forms).

4.4.2.1 Root Cause Analysis

If a requirement failure occurs, a root cause analysis will be performed by the Project Geophysicist who will then present the findings to the PM and Project QC Manager (using the Root Cause Analysis form in Appendix F) with suggested or required corrective actions. Once approved by management, the team will implement the corrective actions. The root cause analysis and corrective actions will be attached to the weekly QC report. All DGM metrics and requirements and intrusive quality control measures and metrics will be documented, with copies sent to the appropriate personnel for review and inclusion in other documents as deemed necessary.

Figure 4-1 illustrates the flow of the root cause and effect process that the UXOQCS will use to determine failure causes.

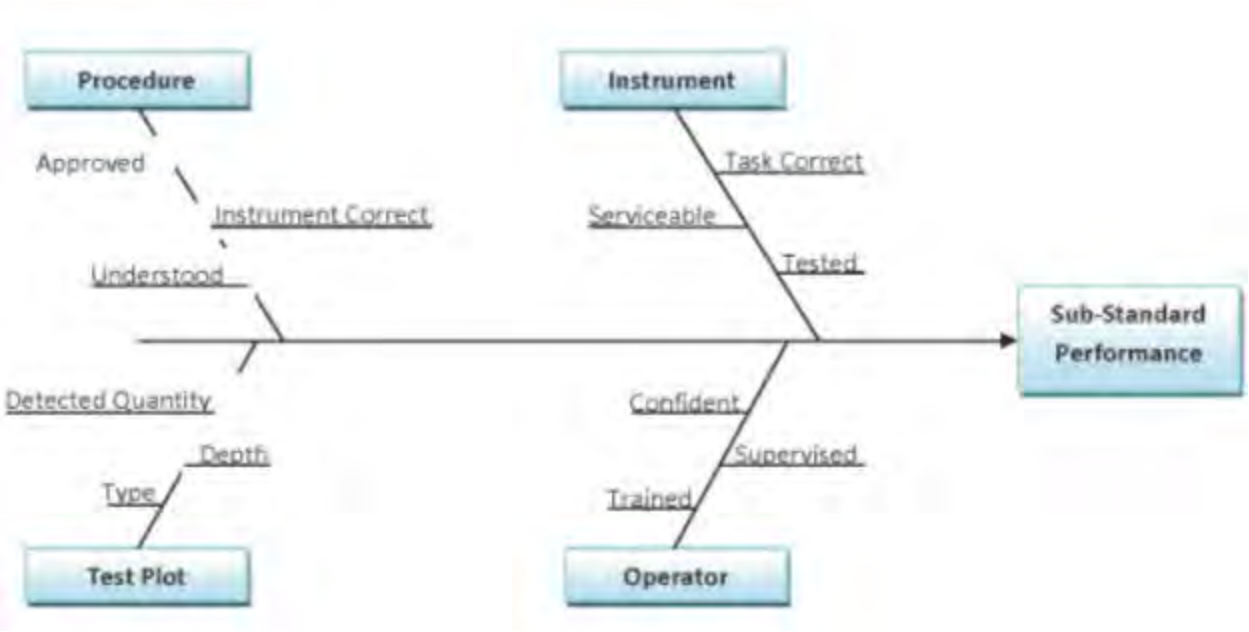

Figure 4-1: Cause and Effect Process

4.4.2.2 Corrective Actions

Following the root cause analysis and approval of corrective actions by management, project personnel will implement these actions to correct the problem. Potential remedies to be considered may include the following:

- Supplemental training of personnel
- Changes of equipment or modification to equipment currently in use
- Acquisition of supplemental equipment
- Implementation of new procedures or modification to existing procedures
- Change in QC procedures.

The UXOQCS will document the application of the corrective actions on the QC Inspection form. Through follow-up phase surveillance, the UXOQCS will verify that the corrective action implemented has rectified the deficient condition and is sufficient to prevent recurrence.

4.5 FIELD QUALITY CONTROL INSPECTIONS, AUDITS AND REPORTS

The UXOQCS is responsible for verifying that site personnel perform operational checks of instruments and equipment prior to using them on-site. The UXOQCS will periodically check the project logbooks listed below to ensure the log entries are complete and accurate. Inspections will be performed daily at random, with unscheduled checks of the site in general to ensure personnel accomplish all work as specified in the WP. The UXOQCS will utilize the process outlined in Figure 4-2 and Table 4-1, to ensure all field tasks meet quality standards prior to submittal for the Quality Assurance process. The UXOQCS will submit a report to the SUXOS detailing the results of these checks.

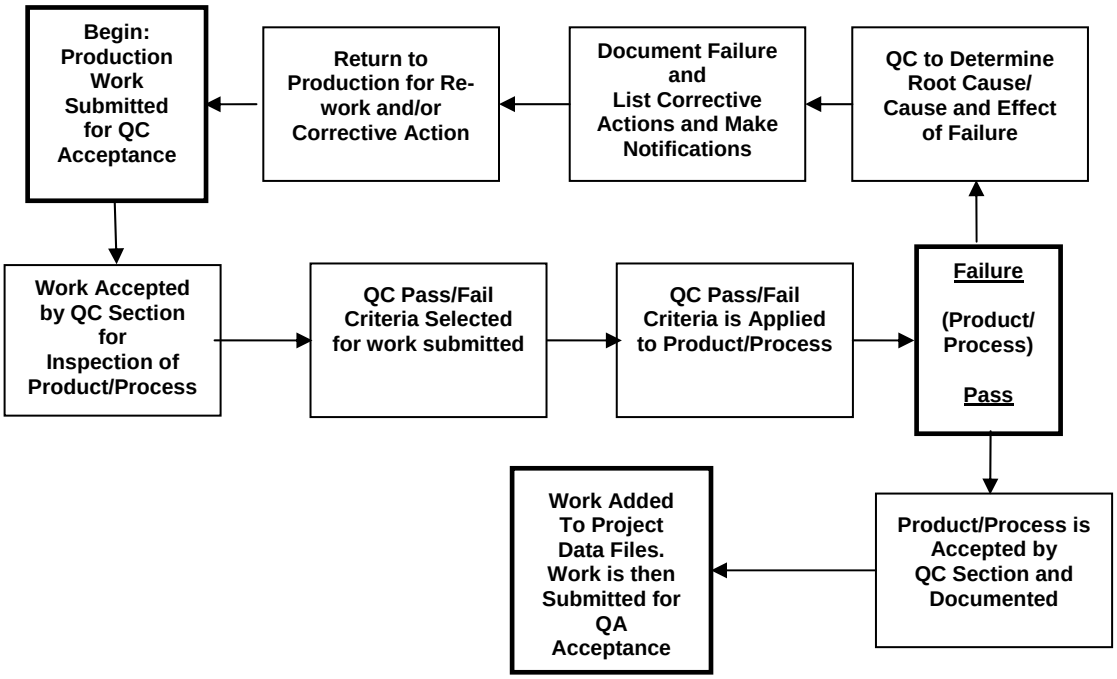

Figure 4-2: Quality Control Process

4.5.1 EQUIPMENT TESTING PROCEDURES AND FREQUENCY

Instruments and equipment, such as navigational, video, and data analysis and transfer systems, used to gather and generate site specific data, e.g., GPS, Geophysical data (results of geophysical tests will be recorded in the Access Database) to support the field activities, will be tested with sufficient frequency (see Section 3, Table 3-3) and in such a manner as to ensure the accuracy and reproducibility of results. Instruments or equipment failing to meet the standard will be repaired or replaced. Replaced instruments or equipment must meet the same specifications for accuracy and precision as the item removed from service. Operator proficiency will also be evaluated regularly for proper instrument set-up, operation, survey technique, and data transfer. Items such as cellular telephones and radios will be tested for serviceability at the start of each workday. Results of these tests will be recorded in the Daily Log. Items failing these tests will be repaired or replaced prior to operations commencing. Daily tests for the DGM equipment will include once daily geodetic functionality of the RTK system, once daily IVS data collection, and pre-survey and post survey static tests. Note that if a failure is noted during the initial IVS, the daily IVS may be reattempted a maximum of two times in a day before declaring an equipment, IVS procedure, or IVS seed item failure.

4.5.2 MAINTENANCE

The UXOQCS will check field logbooks to ensure that maintenance of vehicles and equipment are performed on a regular schedule and in accordance with the manufacturer recommendations or owner's manual for equipment requiring regular upkeep. The operating and maintenance manuals (if available) will be maintained with the equipment. A copy of each maintenance manual will be consolidated into a single binder and maintained in the field office by the UXOQCS.

Parsons will coordinate scheduled maintenance of the following equipment in accordance with manufacturer recommendations or the owner's manual.

- Vehicles
- Vessels (Boats)
- DGM equipment
- ROV
- Data Acquisition Systems
- Personal Protective Equipment
- Communications Equipment
- RTK-DGPS Equipment, and PDA
- Emergency Equipment.

Geophysical instruments will be checked on the test strip daily and after any repairs. They will be required to demonstrate a consistent detection rate for all seed items and any identified background anomalies. Repair or replacement of parts will meet the manufacturer specifications and recommendations. The UXOQCS will document and maintain records pertaining to the testing, repair, and/or replacement of equipment on site.

Repair or replacement parts will meet the manufacturer requirements and be installed by personnel authorized to replace parts or make repairs. Records pertaining to the testing, repair, or replacement of instruments and equipment will be maintained on-site by the UXOQCS.

4.5.3 LOGS AND RECORDS

Activity Logs will be maintained daily, as applicable; all entries will be in ink. Logbooks will be bound and pages consecutively numbered. Logbooks and records may be supplemented by the use of preprinted forms (e.g., safety inspection forms, safety briefings, etc.). These forms help to ensure uniformity of

activities being conducted, inspected, and reviewed. Forms are located in Appendix F of the WP. The following logbooks and records will be maintained on-site and are subject to inspection by the UXOQCS.

4.5.3.1 UXO Quality Control Report

The UXOQCS will prepare daily QC Reports (see Appendix F, Daily Quality Control Inspection, Audit, and Production Log). These reports will be kept on-site and include the following information:

- The daily assessment of work performed
- Significant QA/QC problems and corrective actions taken
- Conformance or non-compliance issues
- Work progress
- Lessons learned, and change recommendations
- Signature of the UXOQCS.

4.5.3.2 Daily Journal

The Daily Journal will be maintained by the SM or SUXOS and provides a summary of all operations conducted on-site, to include:

- Date and recorder of information
- Start and end time of work activities
- Work stoppage
- Visitors and escorts
- Weather conditions
- Changes to the WP, SSHP, policies or procedures
- Injuries and /or illnesses
- Safety briefings
- MEC encountered
- Daily Observer Log Sheets (see Appendix F)
- Relevant events and training
- Signature of the SM or SUXOS.

4.5.3.3 Field Logbooks

The Field Logbooks are maintained in a neat and legible manner by the Supervisory Personnel to record site activities and field data and to provide an historic record of site activities, including:

- Date and team location
- Personnel and work performed
- Equipment and instrument checks
- Injuries and/or illnesses
- Changes to work instructions
- Work stoppage
- Visitors
- Daily Observer Log Sheets (see Appendix F)
- Other relevant events
- Signature of Supervisor.

4.5.3.4 Safety Logbook

The site UXOSO will maintain the Safety Logbook. This logbook is used to record all safety matters associated with the project site, including:

- Safety briefings and/or meetings
- Training
- Safety inspections and audits performed
- Work stoppage due to safety issues
- Visitors
- Accidents, incidents, and near misses with corrective action taken
- Site control measures
- Other relevant events
- Date and teams checked
- Signature of the UXOSO.

4.5.3.5 Quality Control Logbook

The Quality Control Logbook will be maintained by the UXOQCS. This logbook is used to record all QC matters associated with the project site, including:

- Equipment testing and results
- QC inspections performed
- Work stoppage due to QC issues
- Equipment monitoring results
- Non-conformance reporting
- Other relevant events
- Date and teams checked
- Signature of UXOQCS.

4.5.3.6 Training Records

Training records will be maintained on-site and monitored by the PM as necessary. These records contain any licenses, permits, certificates, or other qualifying data, to include:

- Date and nature of training
- Personnel attending and instructor(s)
- Visitor training and briefings
- Signature of instructor and SUXOS, UXOSO or UXOQCS.

4.5.3.7 Photographic Logbook

The Photographic Logbook will be maintained by the SM or SUXOS. This logbook is used to record all photographs taken on the project site. These photographs are used to document MEC encountered, and before, during, and after work, and/or site conditions. Photographs will include:

- Date and time taken
- Unique identifying number(s) relating to the Photographic Logbook
- Location photograph was taken
- Brief description of the subject matter.

4.5.4 DAILY REVIEW OF FIELD DATA

During daily field activities, or at least once daily, the UXOQCS will review field data. The UXOQCS will ensure the following: The Daily Observer Log is being maintained, DGM Data is being collected and submitted to the Project Geophysicist daily, the Site Geophysicist and UXOSO are maintaining daily logs, Daily safety briefs and inspections are being completed per the APP.

4.6 CONTRACT SUBMITTAL QUALITY CONTROL PROCESS

Documents required under this contract will be developed and maintained by a project team consisting of the Parsons PM, USA TM, Project Engineer, Project Geophysicist, GIS Manager, and Project Quality Control Manager. These team members will contribute their corporate knowledge and experience to the documents to ensure technical quality.

- The PM will take the lead in the development of contract documents, and will schedule a peer review and a QC review in sufficient time to meet project milestones for delivery of submittals.
- The TM and Project Engineer will provide technical writing support to develop the documents, and will review completed documents to ensure accuracy and completeness.
- The PM will review and supply information and documents to ensure accuracy and completeness of procedures and reports.
- The Project Geophysicist will ensure a technically sound approach to fieldwork, and accuracy and completeness of reporting on geophysical data. All geophysical data will be prepared, maintained, submitted, and archived in accordance with DID WERS-004.01.
- The GIS Manager will develop digital database and maps, overlays of beaches and exclusion zones, and other spatial data. The GIS Manager will prepare all drawings or maps needed for submittals, and will perform QC of civil survey data. All geospatial data will be prepared, maintained, submitted, and archived in accordance with DID WERS-007.01.

After the project team has performed a review of documents, the Project Quality Control Manager will perform a QC review to ensure overall quality and completeness.

Comments on submitted documents will be directed by project personnel to the appropriate subject matter expert for resolution.

Changes to final WPs will be submitted by the PM to the Quality Control Manager for concurrence. Upon receiving concurrence, the PM submits the change as a Field Change Request to the USACE PDT for approval. The approved Field Change Request is then provided to the Regulators. The PM is responsible for ensuring that the changes are posted to the hard copy on file and that all field personnel are made aware of the changes.

4.7 FIELD QUALITY CONTROL INSPECTIONS, AUDITS, AND REPORTS

Project QC inspections, audits, and reports are planned for the DGM survey. Refer to previous sections for the inspections, reviews, corrections, and reports required.

The UXOQCS is responsible for the accomplishment of operational checks of instruments and equipment by site personnel. The appropriate log entries will be made. Inspections will be performed daily at random, with unscheduled checks of the site in general, to ensure personnel accomplish all work as specified in the WP. The UXOQCS will utilize the processes outlined in Table 4-1 and Figure 4-2 to ensure all field tasks meet quality standards prior to submittal for the QA process. The UXOQCS will submit a report to the SM or SUXOS detailing the results of these checks.

4.8 QUALIFICATIONS AND TRAINING

4.8.1 EMPLOYEE QUALIFICATIONS

The SM or SUXOS will maintain personnel files on each employee at the project site. These files include copies of necessary licenses, permits, training records, certificates of qualifications, and resumes that support the employee's placement and position. Prior to an employee's initial assignment, or before any change in duties or assignment, the SM or SUXOS will review the employee's files to ensure necessary qualifications are met. All site records and documentation are subject to inspection and review by the UXOQCS/SO.

- Site UXO personnel must meet the minimal qualifications as outlined in DDESB TP-18, dated 20 December 2004.
- Dive personnel must also meet the requirements set forth in the PWS, USACE requirements, and applicable sections of 29 CFR 1910.120, Subpart T.

4.8.2 EMPLOYEE TRAINING AND SITE SPECIFIC REQUIREMENTS

Parsons ensures that only qualified and properly trained personnel are assigned to positions on project sites. Prior to mobilization of personnel, Parsons ensures that training required by Parsons, OSHA 29 CFR 1910.120, and the EM 385-1-1 has been completed for all personnel assigned to the project as shown in Table 4-2.

Table 4-2: Training

Training Course	Personnel Attending
40-Hour HAZWOPER Training	All personnel who have not previously received this training or who do not qualify for certification through documented experience or training equivalent to that in paragraphs (e)(1) through (e)(4) of 29 CFR 1910.120.
8-Hour Supervisor Course	All management and supervisory personnel. This includes the SUXOS, UXOSO, UXOQCS, and UXO Technicians III.
8-Hour Refresher Course	All site personnel, except those who have completed their initial 40-Hour HAZWOPER training within the past year.
First Aid and Cardiopulmonary Resuscitation (CPR) Training	CPR training will be required for Parsons personnel and subcontractors that are participating in field operations.
30-Hour OSHA Construction Safety Course	Training Requirement for UXOSO IAW with EM 385-1-1, Section 01.A.17
Protected Species Identification Training/Briefing	All site personnel

In addition, prior to the start of operations all personnel will receive the following as a minimum:

- Familiarization with the WP and its policies and procedures
- APP/SSHP/AHA/SOP orientation
- Emergency Response Plan training

- PPE training
- Environmental considerations peculiar to the operations on the project site
- Instruction and training on equipment usage and safe work practices
- Daily safety training outlining the day's activities.

Visitors to the site will be provided with a site orientation and safety briefing prior to entering the exclusion area (while on-site, visitors will be escorted at all times by a UXO technician).

Training is conducted by the SUXOS, UXOQCS, or other designated personnel and records of attendance are maintained on-site. Certificates of Training are issued when applicable.

4.9 LESSONS LEARNED PROGRAM

As required by ER 1110-1-12, Parsons will utilize a Lessons Learned Program (LLP) to provide for the exchange of information regarding problems that may occur during the RI activities on this project.

4.9.1 LESSONS LEARNED PROGRAM OBJECTIVE

The objective of the LLP is to capture and share experience or recognized potential problems or better business practices to:

- Prevent the recurrence of repetitive design/execution deficiency
- Clarify interpretation of regulations or standards
- Reduce the potential for mistakes in high risk/probability areas of concern
- Pass on information specific to an installation or project
- Promote a good work practice that should be ingrained for repeat application
- Promote efficient and cost-effective business practice.

4.9.2 TEAM RESPONSIBILITIES

The Parsons project team will be responsible for identifying and submitting lessons learned for review and approval. Throughout this project, Parsons project team members will consider how their experiences might be appropriate for the LLP.

4.9.3 PROJECT MANAGEMENT RESPONSIBILITY

The PM will review and approve all lessons learned for submittal to the USACE PM for potential discussion with the project development team during After Action Reviews.

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5.0 EXPLOSIVES MANAGEMENT PLAN

This plan is required only when explosives will be utilized. Parsons will not use explosives in the execution of the Phase 2 DGM field activities.

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6.0 ENVIRONMENTAL PROTECTION PLAN

6.1 GENERAL

This Environmental Protection Plan (EPP) has been specifically developed to address environmental protection issues associated with performing the U/W RI field activities identified in this WP. Specifically, this plan is intended to provide adequate procedures to safeguard the environmental condition of land and water in and around each MRS, beaches and access routes, and to mitigate and/or minimize the environmental impact from project operations.

Appendix K contains the *Final Supplemental SOP for Endangered Species Conservation and their Critical Habitat (Addendum 1), DERP-FUDS Property No. I02PR0068, Culebra Island, Puerto Rico* (CESAJ, February 2015), which includes the *SOP for Endangered Species Conservation and their Critical Habitat during Underwater Investigations* as Appendix A. The final SOP provides specific procedures for DERP-FUDS operations in Culebra and surrounding cayos and is being referenced by section into this EPP. **Adherence to these SOPs will be strictly enforced.**

6.1.1 DEFINITIONS

For the purposes of this plan, the definitions of "Environmental Protection" and "Environmental Impact" are as follows:

- Environmental Protection: Preservation of the environment in its natural state to the greatest extent possible.
- Environmental Impact: Disturbance, damage, and/or contamination of the soil, air, and/or water.

6.1.2 ENVIRONMENTAL GOALS

The following are the environmental goals of the project:

- Perform operations in a manner that minimizes the disturbance of corals, seagrasses, sediment, and other U/W vegetation.
- Perform operations in a manner to avoid impact to Listed Threatened or Endangered Species.
- Leave the investigation footprint areas in as near a natural condition as operationally possible.
- Implement the procedures designed to protect the environment as agreed to during coordination with project stakeholders and regulators.

To accomplish these goals, Parsons will implement procedures to control sensitive and critical benthic habitat physical disturbances, air and/or noise pollution; manage site-wastes; and control water pollution throughout this project. These procedures will focus on preventing contaminants from leaving the source, from entering potential contaminant transport pathways, and from reaching receptors.

6.1.3 ENVIRONMENTAL COORDINATION

The SM or SUXOS will coordinate all land resources management, waste management, pollution control, and abatement activities with the on-site USACE OESS and PDT, to include USFWS/NOAA NMFS/PR DNER personnel. Photographs of cultural debris recovered from the MRS work sites will be sent to DNER to receive permission to dispose of the debris in the local land fill.

6.1.4 PROJECT STAKEHOLDERS:

The project stakeholders are those individuals and organizations directly impacted by the survey activities. Stakeholders include (but are not limited to):

- PR DNER
- PR EQB

- Culebra NWR
- USEPA
- USFWS
- NMFS
- NOAA

The stakeholders listed above participate in the TPP process for Culebra FUDS projects.

6.2 ENVIRONMENTAL BASELINE SURVEY RESULTS

The main island of PR and its associated islands support 82 federally listed threatened and endangered species consisting of 33 animals and 49 plants. Among this diverse group of fauna and flora are multiple species that are known to exist, potentially exist, or temporarily use areas within the Culebra Island archipelago. Of the 82 federally listed species, 16 are known or are suspected to occupy Culebra Island and/or the associated cayos. In addition to the federally listed species, two state-listed species are known to occupy Culebra Islands. The federally and state-listed species include both terrestrial and marine life. The federally listed species of most concern for the wildlife refuge are the green sea turtle, hawksbill sea turtle, leatherback sea turtle, and loggerhead sea turtle. Due to declining populations, the pillar, elkhorn, rough cactus coral, lobed star, mountainous star, boulder star, and staghorn corals in the surrounding waters are federally listed as threatened species.

According to the NWR System, portions of Culebra Island and 22 of the associated cayos are considered NWR area. The three largest cayos are Culebrita, Cayo Norte (privately owned), and Cayo Luis Peña. These resemble Culebra in that they all have sandy beaches, rugged coastline, and gentle to steep hills. Vegetation ranges from moderate to extremely dense. The smaller cayos are primarily solid rock with sparse or no vegetation. A few of the smaller cayos have small beaches; however, most are rugged rock all around.

According to the PR DNER, the conservation priority areas for Culebra and associated cayos are as follows:

- Designated Critical Habitat
- All of the lagoons on Culebra
- All beaches around Culebra
- Flamenco Peninsula
- Punta Soldado
- Ensenada del Cementerio
- The Canal Luis Peña Marine Reserve.

6.2.1 OBSERVED BENTHIC HABITAT TYPES

6.2.1.1 Description of Observed Benthic Habitats in MRS 02 and 07

The following section provides a description of the results from the benthic habitat analysis performed by Parsons/USA. Parsons/USA utilized the data collected for hydrographic and U/W towed camera video surveys which includes snorkeler video surveys during Phase 1, along with the NOAA benthic GIS, to characterize the benthic habitat classifications. According to the NOAA GIS effort (Kendall, M.S., et al. 2001), there are 26 distinct benthic habitats located within near shore waters of Puerto Rico and the U.S. Virgin Islands. The NOAA dataset was loaded into GIS software and used in conjunction with the results of Phase 1A and 1B surveys in evaluating benthic habitats present within the survey areas. During the course of completing the EBS analysis, it was observed that the benthic habitats located within the water portions of MRS 02 and MRS 07 consist primarily of unconsolidated sediments (sand), submerged vegetation (sea grass/microalgae), and coral reef/hardbottom (colonized and uncolonized pavement) habitats. For the purposes of evaluating the implementability of subsequent RI fieldwork actions

(conducting Geophysical surveys and intrusive investigations), Parsons simplified these bottom types into two main benthic habitats, unconsolidated sediments/submerged vegetation and coral/hard bottom classifications. The following paragraphs summarize the observations for these two classifications. Appendix B: Site Maps Figures B-14 through B-18 illustrate the two benthic classifications projected on GIS within both MRS 02 and MRS 07.

6.2.1.2 Unconsolidated Sediments/Submerged Vegetation

The unconsolidated sediments habitat classification consists primarily of mud or sand with varying coverage (density) of submerged vegetation (seagrass and macroalgae). Submerged vegetation populated the unconsolidated sediment habitats over much of the survey area. For MRS 02, both mud and sand cover were observed with sand being the majority of this classification. In MRS 07, sand was observed to be the primary cover, given the amount of wave energy present in most areas. A moderate amount of unconsolidated sediments within MRS 02 and MRS 07 were observed to be adjacent to hard bottom areas where sand cover over hard bottom is present. Some areas contained individual corals or rocks that were distinctive, but made up a very small percentage of the total cover. Species indentified in this habitat type included, but are not limited to: *Thalassia testudinum* (turtle grass), *Syringodium filiforme* (manatee grass), *Dictyota sp.* (Y-branched algae), *Halimeda sp*.(leaf algae), *Penicillus dumetosus* (bristle ball brush algae), *Caulerpa sp.* (feather algae), *Udotea sp.* (Mermaid's fans), and *Galaxaura sp*.(tubular thicket algae). These areas can be seen in SSS mosaic as being flat with no relief or sand ridges.

6.2.1.3 Colonized or Uncolonized Hard Bottom and Coral Reef

The second observed class consisted of colonized or uncolonized hard bottom and coral reef. This class also included scattered coral or rock in unconsolidated sediment. In both MRS 02 and MRS 07, the majority of hard bottom structure was considered to be the pavement cover in the form of flat, low-relief, solid carbonate rock with coverage of macroalgae, hard coral, zoanthids, and other sessile invertebrates that are dense enough to have begun to obscure the underlying surface. The various species identified included, but are not limited to: *Briareum abestinum* (corky sea fingers), *sea rods* (various species), *Pseudopterogorgia sp*. (sea plumes), *Gorgonia ventalina* (common sea fan), *Acropora palmata* (elkhorn coral), *Acropora cervicornis* (staghorn coral), *Porites porites* (finger coral), *Dendrogyra cylindrus* (pillar coral), *Madracis sp.* (finger coral), *Orbicella annularis (lobed star coral), Orbicella faveolata (mountainous star coral), Orbicella franksi (genus Orbicella sp. formerly known as Montastrea sp.) (boulder star corals)*, *Dichocoenia stokesi* (elliptical star coral), *Siderastrea sp*.(starlet coral), and *Diploria sp.*(brain corals). These areas can be seen in the SSS mosaic as appearing rough in texture and having closely packed light and dark spots caused by the high reflectivity and vertical relief of the structures.

6.2.2 PRESENCE OF ESSENTIAL FISH HABITATS

Essential fish habitat (EFH) is identified for species managed in Fishery Management Plans under the Magnuson-Stevens Fishery Conservation and Management Act. EFH is the habitat necessary for managed fish to complete their life cycle, thus contributing to a fishery that can be harvested sustainably. EFH applies to each life stage of approximately 1,000 managed species. Different life stages of the same species often use different habitats. Habitat types used by different life stages of fish include sand bottoms, submerged aquatic vegetation, coral reefs, and mangrove areas. Submerged aquatic vegetation helps stabilize sand and mud bottoms, filter polluted runoff, provide living space and refuge from predators. It acts as a food source as well as a nursery area for fish, crabs, and other aquatic species. Coral reefs support sharks, turtles, and more than 4,000 species of fish worldwide. They offer refuge from predators as well as places to feed and reproduce. Mangrove areas serve as spawning grounds, nurseries, and shelter for different life stages of various fish. As identified by the NOAA EFH mapper, the waters around Culebra have the potential to be EFHs for corals, queen conch, two species of lobster, three species of shark, and 43 different species of fish at either certain stages of or through their entire life cycle.

6.2.3 PRESENCE OF THREATENED AND ENDANGERED SPECIES

6.2.3.1 Federally Listed Species Potentially Present

6.2.3.1.1 Endangered Species:

- *Balaenoptera musculus* (Blue whale)
- *Balaenoptera physalus* (Fin whale)
- *Megaptera novaeangliae* (Humpback Whale)
- *Balaenoptera borealis* (Sei Whale)
- *Physeter macrocephalus* (Sperm Whale)
- *Eretmochelys imbricata* (Hawksbill Sea Turtle)
- *Dermochelys coriacea* (Leatherback sea turtle)
- *Epinephelus striatus* (Nassau grouper) – Commonwealth of PR listing
- *Epinephelus itajara* (Goliath grouper) – Commonwealth of PR listing
- *Trichechus manatus* (Antillean Manatee)

Manatees are most abundant along the south and east coasts of the main island, particularly in the area of Fajardo and Ceiba and in the Jobos Bay area between Guayama and Salinas.

On September 2, 2014, NMFS issued a proposed rule, request for comments (79 FR 51929) and announced a 12-month finding and listing determination on a petition to list the Nassau grouper (*Epinephelus striatus*) as threatened or endangered under the ESA. The document comment period ends on December 31, 2014.

6.2.3.1.2 Threatened Species:

- *Hippocampus spp.* (Sea horses) – Commonwealth of PR listing
- *Chelonia mydas* (Green sea turtle)
- *Caretta caretta* (Loggerhead sea turtle)
- *Acropora cervicornis* (staghorn coral) is found in shallow waters from 1 to up to 160 feet depending on water conditions (though rarely seen below 60 feet). Colonies form antler-like racks of cylindrical branches that often grow in great tangles. The surface is covered in small, protruding, tubular corallites. Live staghorn coral is brown to yellow-brown. Once abundant throughout the region, it suffered mass mortality since the early 1990s in many areas due to white band disease. Though it was not observed in waters greater than 20 feet during the video transect survey, it has the potential to be in deeper water, therefore, all areas of reef within both MRSs were considered to have staghorn present.
- *Acropora palmata* (elkhorn coral) is found in shallow waters from 1 to up to 55 feet depending on water conditions (though rarely seen below 35 feet). Colonies form flattened branches resembling the horns of moose or elk. The surface is covered in small, protruding, tubular corallites. Live elkhorn coral is brown to yellow-brown. Once abundant throughout the region, it suffered mass mortality since the early 1990s in many areas due to white band disease. Though it was not observed in waters greater than 20 feet during the video transect survey, it has the potential to be in deeper water, therefore all areas of reef within both MRSs are considered to have elkhorn present.

- On September 10, 2014 the NMFS published a final rule in the Federal Register (79 FR 53851) to implement a final determination to list 20 coral species as threatened, under the Endangered

Species Act (ESA) of 1973, as amended (effective date listed as October 10, 2014). Five of these species are known to occur in Puerto Rico including:

- *Dendrogyra cylindrus*, (pillar coral)
- *Mycetophyllia ferox*, (rough cactus coral)
- *Orbicella annularis*,(lobed star coral)
- *Orbicella faveolata* (mountainous star coral)
- *Orbicella franksi* (genus *Orbicella* sp. formerly known as *Montastrea* sp.) (boulder star coral)

- On September 2, 2014 NMFS published a final rule in the Federal Register (79 FR 38213) to list the Central and Southwest (SW) Atlantic Distinct Population Segment (DPS) of scalloped hammerhead shark (*Sphyrna lewini*) as threatened species under the ESA. NMFS is also considering critical habitat for the Central & SW Atlantic DPSs.
- The Nassau grouper (*Epinephelus striatus*) is a candidate for the US Endangered Species List. There has been a complete ban on the fishing of Nassau grouper in the US federal waters since 1990. This includes federal waters around Puerto Rico and the U.S. Virgin Islands. There is also a ban on U.S. state waters.

As both MRSs 02 and 07 contain live specimens of the staghorn, elkhorn, Orbicella franksi formerly known as Montastrea sp (boulder star coral) and pillar corals. Areas of these MRSs are designated critical habitat (CH) for elkhorn and staghorn corals as well as for the green sea turtle for the planning of future activities (See Table 6-2 for known coral locations as found in the Environmental Baseline Survey Report, Underwater Portions of MRSs 07 and 02, Culebra, Puerto Rico (Parsons, 2014).

6.2.3.2 Critical Habitat

Critical habitat (CH) is designated for the survival and recovery of species listed as threatened or endangered under the ESA. CH includes those areas occupied by the species, in which are found physical and biological features that are essential to the conservation of an ESA listed species, and which may require special management considerations or protection. As of 2 September 1998, all waters surrounding Culebra from the high water mark out 3 nautical miles, as well as the surrounding cayos, were designated as CH for the green sea turtle. Green sea turtles are generally found in fairly shallow waters (except when migrating) inside reefs, bays, and inlets. The turtles are attracted to lagoons and shoals with an abundance of marine grass and algae. Open beaches with a sloping platform and minimal disturbance are required for nesting. These conditions are present at both MRSs 02 and 07. In addition MRS 02 and MRS 07 have been designated as Elkhorn and staghorn coral critical habitat

6.2.3.3 Threatened or Endangered Species Observed

During all phase 1A and 1B survey activities, avoidance measures were strictly followed as defined in the USACE SOP, *Final Endangered Species and Conservation and Their Critical Habitat During Underwater Investigations (Addendum 1), DERP-FUDS Property No. I02PR0068, Culebra Island, Puerto Rico*. Threatened species observed included *Dendrogyra cylindrus (pillar coral), Orbicella franksi* formerly known as *Montastrea sp* (boulder star coral), *Acropora cervicornis* (staghorn coral), and *Acropora palmata* (elkhorn coral) as well as green sea turtles. During phase 1A operations, the Multibeam Bathymetry Survey (MBS) transducer was at the same depth as the vessel hull. The altitude of the SSS towfish was monitored real-time during survey operations and the cable tender was in constant communication to insure the towfish did not contact the bottom. During phase 1B, the previously collected bathymetry was displayed along with the NOAA chart in relation to the vessel position to predict depth changes and allow the camera to be raised before contacting the bottom.

At MRS 02, no sea turtles were observed. Staghorn and/or elkhorn corals were observed at 8 of the 12 cayos. *Montastraea sp* (star corals) were present at all cayos. *Dendrogyra cylindrus* (pillar coral) was observed at 7 of the cayos of MRS 02.

At MRS 07, one hawksbill turtle, currently on the endangered species list, was encountered during the Phase 1 survey activities. It was observed during the video transect survey off of transect 1B. It was on the surface, greater than 50 meters to seaward of the vessel, and appeared to swim off in the opposite direction. Constant observation did not show the turtle to reappear and as the turtle was beyond 50 meters, the survey continued at idle speed. The survey vessel departed the survey area at idle speed to insure no accidental contact would be made should the turtle reappear suddenly. Green sea turtles were observed within Tortuga Bay. Turtles ranged in size from approximately 1 ft to 3 ft long. None were observed within 50 meters of the survey vessel while the surveying was underway. When the vessel was moored, turtles were seen within a 20 meter radius around the moored vessel as the turtles swam past the vessel. Since the vessel was moored and was not moving, the vessels presented no risk to the turtles. During snorkeling operations, turtles were observed by the snorkelers and avoidance measures were taken, ensuring the turtles were not harassed. Table 6-1 provides the locations of where sea turtles were sighted during Phase 1. Table 6-2 provides the locations and findings for the spot investigations. Elkhorn corals were seen off the southern coast of Culebrita, off the north and east sides of Cayo Botella, and on the shallow reefs on the east and west sides of Tortuga bay. Staghorn coral was seen in the same areas as the elkhorn coral as well as along much of the western side of Culebrita and south of Cayo Botella. *Montastraea sp* (star corals) were observed as a basic reef building coral within the MRS. Appendix B (Figures B-19 through B-23) provides maps with locations for “listed” coral species witnessed during Phase 1.

Table 6-1: Sea Turtle Sighting Summary Table

Type	Date	MRS	Lat/Long
Green Sea Turtle	8-13-13	MRS 07	18 19’ 11.36 N / 65 13’ 36.81 W
Hawksbill Turtle	8-21-13	MRS 07	18 18’ 4025 N / 65 13’ 16.54 W
Green Sea Turtle	8-22-13	MRS 07	18 19 10.26 N / 65 13’ 49.06 W
Green Sea Turtle	8-22-13	MRS 07	18 19.141’N / 65 13.721’ W

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Table 6-2: Biological Spot Investigations

Location ID	Description	Photo ID (Appendix D)	Longitude	Latitude	Benthic Habitat Classification
MRS 02- 1	Sea Rods (various species), *Pseudopterogorgia sp*.(sea plumes), *Gorgonia ventalina* (common sea fan)	MRS 02- 1 Alcarazza 1	249726.43	2031627.21	Coral Reef and Colonized Hardbottom
MRS 02- 2	Sea Rods (various species), *Pseudopterogorgia sp*.(sea plumes), *Gorgonia ventalina* (common sea fan), *Orbicella sp. formerly known as Montastrea sp* *(star corals), tube sponges, barrel sponges	MRS 02- 2 Alcarazza 2	249821.26	2031714.42	Coral Reef and Colonized Hardbottom
MRS 02- 3	Sea Rods (various species), *Pseudopterogorgia sp*.(sea plumes), *Gorgonia ventalina* (common sea fan)	MRS 02- 3 Alcarazza 3	249855.21	2031792.68	Coral Reef and Colonized Hardbottom
MRS 02- 4	Sea Rods (various species), *Pseudopterogorgia sp*.(sea plumes), *Gorgonia ventalina* (common sea fan), tube sponges, barrel sponges	MRS 02- 4 Alcarazza 4	249713.83	2031892.54	Coral Reef and Colonized Hardbottom
MRS 02- 5	Sea Rods (various species), *Pseudopterogorgia sp*.(sea plumes), *Gorgonia ventalina* (common sea fan), tube sponges, barrel sponges	MRS 02- 5 Alcarazza 5	249834.94	2031818.98	Coral Reef and Colonized Hardbottom
MRS 02- 6	Sea Rods (various species), *Pseudopterogorgia sp*.(sea plumes), *Gorgonia ventalina* (common sea fan), *Orbicella sp. formerly known as Montastrea sp* *(star corals), *Dendrogyra cylindrus**(Pillar coral)	MRS 02- 6 Lobito 1	247252.68	2029037.45	Coral Reef and Colonized Hardbottom
MRS 02- 7	Sea Rods (various species), *Pseudopterogorgia sp*.(sea plumes), *Gorgonia ventalina* (common sea fan), *Orbicella sp. formerly known as Montastrea sp* *(star corals), *Dendrogyra cylindrus**(Pillar coral), tube sponges, barrel sponges	MRS 02- 6 Lobo 1	248402.92	2027703.33	Coral Reef and Colonized Hardbottom
MRS 02- 8	Sea Rods (various species), *Pseudopterogorgia sp*.(sea plumes), *Gorgonia ventalina* (common sea fan), *Orbicella sp. formerly known as Montastrea sp* *(star corals), tube sponges	MRS 02- 6 Lobo Bio	248902.44	2027287.05	Coral Reef and Colonized Hardbottom
MRS 02- 9	Sea Rods (various species), *Gorgonia ventalina* (common sea fan), *Orbicella sp. formerly known as Montastrea sp* *(star corals)	MRS 02- 6 Somb 1	262809.01	2029008.98	Coral Reef and Colonized Hardbottom
MRS 02- 10	Sea Rods (various species), *Pseudopterogorgia sp*. (sea plumes), *Gorgonia ventalina* (common sea fan), *Orbicella sp. formerly known as Montastrea sp* *(star corals), barrel sponges	MRS 02- 6 Tib 1	263384.72	2029791.64	Coral Reef and Colonized Hardbottom
MRS 02- 11	Sea Rods (various species), *Pseudopterogorgia sp*.(sea plumes), *Gorgonia ventalina* (common sea fan)	MRS 02- 6 Tib 2	263458.07	2029906.42	Coral Reef and Colonized Hardbottom
MRS 07- 1	*Syringodium filiforme* (manatee grass), *Halimeda sp*.(leaf algae), *Dictyota sp.* (Y-branched algae)	MRS 07- 7 Bio1	264295.84	2027175.63	Submerged Vegetation-Macro algae
MRS 07- 2	*Syringodium filiforme* (manatee grass), *Thalassia testudinum* (turtle grass), *Halimeda sp*. (leaf algae), *Dictyota sp*. (Y-branched algae)	MRS 07- 8 Bio 2	264370.40	2027027.82	Submerged Vegetation-Macro algae
MRS 07- 3	*Syringodium filiforme* (manatee grass), *Thalassia testudinum* (turtle grass), *Halimeda sp*. (leaf algae), *Dictyota sp*. (Y-branched algae) *NOTES: (*) indicates a species currently listed as threatened or endangered*	MRS 07- 9 Bio 3	264487.59	2027041.54	Submerged Vegetation-Macro algae

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6.3 MEASURES TO AVOID OR MINIMIZE POSSIBLE IMPACTS TO THE ENVIRONMENT

The following paragraphs present the measures that will be implemented to avoid or minimize impacts to threatened or endangered species, critical habitat, and EFH during U/W investigation activities.

6.3.1 PHASE 2 UNDERWATER GEOPHYSICAL TRANSECT SURVEYS

Phase 2 field activities will consist of performing geophysical surveys along the re-aligned RI transects established during Phase 1 (EBS Report, Parsons 2014). The objective of these activities will be to collect EM anomaly data while creating the least amount of impact and still acquiring the highest quality data possible. The data collected during Phase 1 was used to plan Phase 2. The U/W EM61 geophysical coil will be deployed using two types of system platforms. As there is not one single EM system that is both highly efficient and can guarantee no environmental impact in all habitat types present in the areas surveyed, multiple platforms will be used to survey the designated areas. The system used in any given area will depend primarily on depth of water and habitat type present. Based on the analysis of all of the EBS data, Parsons has assigned suggested EM platforms along each segment (as required) to each of the RI transects based on benthic habitat avoidance. Appendix B: Site Maps, Figures B-1 through B-13, illustrate the EM platform deployments for MRS 02 and MRS 07. Each EM platform shown on these figures are color coded.

6.3.2 EM PLATFORM SELECTION PROCESS

The EBS Report evaluated the U/W video and SSS data collected for each transect during Phase 1 (EBS Report, Parsons 2014). While evaluating the SSS data and video of each of the transects, transect segments were designated an EM platform that would be best suited for the transect surveys during Phase 2. Consideration was given to the depth of water (bathymetry data), type of bottom (corals, seagrass, etc.) as interpolated from SSS data and validated by transect videos, and the anticipated sea state and means in which the platform would be moved along segments of the transect (EBS Report, Parsons 2014). Based on this analysis, maps were then generated depicting the proposed EM platform to be used for each RI transect segment. The EM ROV, EM Sled and EM Float (large and small float systems) were selected for the DGM transects as identified in the EBS Report (EBS Report, Parsons 2014). The EM sled was selected for transects inside the bay located on Culebrita. During the final planning for Phase 2 it was determined the EM ROV and EM Float could complete the transects avoiding direct contact with the ocean floor, therefore the Sled would not be required (The EM Sled is dragged along the sea floor and is only used on unconsolidated sediment bottoms). The EM ROV and EM Float systems will meet the objectives of the project and will avoid direct contact with the ocean floor. The EM ROV was selected for all of the MRS 02 DGM Transects and provides the ability to avoid corals and underwater obstructions (EBS Report Parsons, 2014).

6.3.3 GENERAL CONSERVATION MEASURES

To find general conservation measures as it applies to EFH, critical marine habitat, and Listed Threatened or Endangered Species, see Appendix K (Final Supplemental SOP for Endangered Species Conservation and their Critical Habitat (Addendum 1) (CESAJ, February, 2015), Appendix A, Section 4.1).

Anchoring on an established seagrass beds or coral is prohibited IAW Appendix K: (Final Supplemental SOP for Endangered Species Conservation and their Critical Habitat (Addendum 1) (CESAJ, February 2015), Appendix A, Section 4.3.8). Field teams will anchor small boats in areas with sand bottoms in waters with depths of at least 4-ft. The ROV and U/W camera, or snorkeling, can be utilized to survey the U/W area to ensure the condition of the seafloor is known prior to anchoring. If mooring buoys are available, these will be used rather than deploying an anchor.

If during the U/W investigation work, any “listed” coral is injured, whatever activity causing the damage will be stopped, the injured “listed” coral will be left in place and the USACE PM, USCG, NMFS Boquerón

Office, and DNER will be immediately notified. If listed corals are injured, the Parsons PM will also contact the NOAA Office of Law Enforcement at 1-800-853-1964. The following information will be provided:

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

If the vessel runs aground, the operator will perform the following:

- Turn off the engine.
- Do not try to use the engine to power off the reef, hardbottom or seagrass.
- Raise the propeller, and allow the boat to drift free.
- Radio the Coast Guard, Marine Patrol or VHF Channel 16 for assistance.
- If any "listed" coral or seagrass is injured, the USA PM will follow the procedures described above for damage to "listed" corals.

During an emergency to save a vessel or to protect the crew, such as during a boat fire or loss of power with the vessel on a lee shore, the vessel captain has an obligation to take whatever measures he deems necessary to protect the boat's passengers and crew. In these situations, the above anchoring restrictions will not apply. For additional information on anchoring guidance and restrictions, see Appendix K, Final Supplemental SOP for Endangered Species Conservation and their Critical Habitat (Addendum 1) (CESAJ, February 2015), Appendix A, Section 4.3.

6.3.4 MARINE MAMMAL AND SEA TURTLE DAILY OBSERVER LOG (SEE APPENDIX F)

The Daily Observer Log will be maintained under the direction of the team biologist and will record all sightings and observations to fullest extent possible in the form provided in Appendix F. Further guidance can be found in Appendix K, Final Supplemental SOPs for Endangered Species Conservation and their Critical Habitat (Addendum 1) (CESAJ, February 2015) (See SOP para 4.1.5, and Appendix B).

6.3.5 SPILL CONTROL AND PREVENTION

All fueling and maintenance of vehicles will be performed off-site at appropriate commercial or private facilities. If a severe leak of fuel or other fluids, such as antifreeze or transmission fluid, occurs in the field because of a tank puncture or a ruptured line, the following procedures should be implemented.

- Promptly berm the site with dirt so that the fuel or fluid does not spread along the ground surface.
- Apply oil-absorbing material such as sorbent booms, sawdust or kitty litter to the spill.
- Report the spill to National Response Center (NRC), at 1-800-424-8802, and follow their instructions for cleanup. It is anticipated that this cleanup usually will involve digging up and drumming contaminated soil, and subsequently disposing of it in an approved landfill. Spills of gasoline into the sea water will be reported to the USEPA or PR EQB through approved channels.
- The fuel tank will not be filled to more than approximately three-quarters full to prevent overfilling in the field.

6.3.6 ALL STORAGE AREAS

No storage areas are anticipated within any of the MRS water areas.

6.3.7 VEHICULAR ACCESS ROUTES

Although most of the Phase 2 field activities will be conducted on water, some land areas will still be required to be accessed such as QC checks for the RTK on the designated control point, etc. Field crews entering and exiting the work sites will use existing roads and easements. Off-road vehicle travel will be kept to a minimum, and prior to establishing any off-road routes necessary to gain access to sites, consideration will be given to the possible consequences resulting from the channeling of run-off water in ruts. Additionally, local agencies, USFWS, PR DNER, and the USACE OESS will be notified, and approval from proper authority will be obtained prior to initiating off-road travel or operations. In such cases, Appendix K, Final Supplemental SOPs for Endangered Species Conservation and their Critical Habitat (Addendum 1) (CESAJ, February 2015) will be adhered to and the following additional measures will be taken to minimize the environmental effects.

- Personnel will remain at the off-road site until investigations there are completed for the day. For example, field crews will not start work at an off-road site, leave for a lunch break, and subsequently return to finish the job.
- Any ruts or new roads or tracks that are created by field activities will be restored. The ruts will be filled in and leveled.
- In a situation where the area is wet and rut damage to the environment is certain, the crews should drive on roads and paths to a point as close to the site as possible, and then walk the remaining distance to the site.

6.3.8 TREES AND SHRUBS PROTECTION AND RESTORATION

It is unlikely that any trees will be removed during the Phase 2. Therefore, no provisions for tree restoration are required.

6.3.9 TEMPORARY FACILITIES

Parsons will establish a field office in which briefings and the loading of equipment will take place. Trash will be collected and will be dumped or removed, as appropriate.

6.3.10 DECONTAMINATION AND DISPOSAL OF EQUIPMENT

This project does not involve any hazardous materials or hazardous wastes.

6.3.11 MINIMIZING AREAS OF DISTURBANCE

Procedures for minimizing areas of disturbance are described throughout this EPP and include such measures as complying with the procedures in Appendix K, Final Supplemental SOP for Endangered Species Conservation and their Critical Habitat (Addendum 1) (CESAJ, February 2015).

6.4 PROCEDURES FOR POST-ACTIVITY CLEANUP

All wastes will be removed from each site immediately upon completion of each day's field activities. Therefore, no post-activity cleanup will be required.

6.5 AIR MONITORING PLAN

Air monitoring is not being performed during this RI. Parsons work procedures are designed to minimize vapors, gases, and particulate emissions.

6.6 PRELIMINARY IDENTIFICATION OF APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS) AND "TO BE CONSIDERED" INFORMATION

As amended, the 1986 SARA, Section 121(d)(2) of the CERCLA requires that on-site remedial actions attain (or waive) Federal and more stringent State applicable or relevant and appropriate requirements (ARARs) of environmental laws upon completion of the remedial action. The revised National Oil and Hazardous Substances Pollution Contingency Plan (NCP) of 1990 requires compliance with ARARs during remedial actions as well as at completion, and compels attainment of ARARs during removal actions to the extent practicable, considering the specifics of the situation.

The "Applicable" portion of the term is defined as:

- Cleanup standards, standards of control, and other substantive requirements, criteria or limitations promulgated under Federal environmental or state environmental or facility citing laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those state standards that are identified by a state in a timely manner and that are more stringent than Federal requirements may be applicable.

The "Relevant and Appropriate" portion of the ARAR term is defined as:

- Cleanup standards, standards of control, and other substantive requirements, criteria or limitations promulgated under Federal environmental or state environmental or facility citing laws that, while not 'applicable' to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. Only those state standards that are identified by a state in a timely manner and that are more stringent than Federal requirements may be relevant and appropriate.

Although compliance is not required, in order to incorporate guidance and other information into the alternatives developed, some remedial actions identify "To Be Considered (TBC)"criteria which are defined as:

- Non-promulgated advisories, criteria, and guidance are not ARARs, but may sometimes be useful in developing a CERCLA remedy. When this is the case, at the discretion of the lead agency, they can be specified as "To-Be-Considered (TBC)" criteria. TBC criteria can be taken into consideration during evaluation of remedial alternatives, but unlike ARARs, identification of TBCs is not mandatory nor is compliance with TBCs a selection criterion for a remedial action.

The documents that are TBC are incorporated as appropriate into the RI and FS Reports and are not called out in a table, to avoid confusion with the ARARs. Compliance with these documents is not required under CERCLA or the NCP, therefore, no tabulation is provided.

Any substantive environmental or facility citing requirement has the potential to be an ARAR. To assist in identification, ARARs are divided into three categories: chemical-specific ARARs, location-specific ARARs, and action-specific ARARs. These three categories are defined as follows:

- Chemical-specific ARARs are promulgated health-based or risk-based numerical values that establish the acceptable amount or concentration of a chemical that may remain in, or be discharged to, the ambient environment. Where more than requirement addressing a contaminant is determined to be an ARAR, the most stringent requirement should be used. Risk-based screening levels (for example, EPA Regional Screening Levels) are not considered chemical-specific ARARs because they are not promulgated.
- Location-specific ARARs generally are restrictions placed on the concentration of a hazardous substance or the conduction of activities solely because they are in special locations. Requirements addressing cultural resources, historic places, floodplains, wetlands, or sensitive ecosystems and habitats are potential location-specific ARARs.

- Action-specific ARARs are usually technology or activity-based requirements or limitations placed on actions taken with respect to remedial/removal actions, or requirements to conduct certain actions to address particular circumstances at a site. Regulations that dictate the design, construction and operating characteristics of air stripping units, incinerators, landfills or other waste management facilities are examples of action-specific ARARs. No action-specific ARARs have been identified for this site.

ARARs are identified during the response process prior to issuance of the ROD/DD, and they may continue to evolve over time. The NCP requires the lead agency to formally request ARARs from support agencies at completion of the RI. For an alternative to pass into the detailed analysis stage of the RI/FS, and thus become eligible for selection, it must comply with its ARARs or a waiver should be identified and the justification provided for invoking it. An alternative that cannot comply with ARARs, or for which a waiver cannot be justified, should be eliminated from consideration for further discussion as a potential alternative. Updates to ARARs are then requested during development of the FS as details of remedial alternatives become known. Thus, potential ARARs are initially identified on a broad basis, refined to specific requirements during the FS, and finalized at signature of the DD.

As the RI/FS process continues, the list of ARARs will be updated, particularly as the response actions are selected and reviewed by state and federal agencies. ARARs will be used to establish the appropriate extent of site cleanup; to aid in scoping, formulating, and selecting proposed treatment technologies; and to govern the implementation and operation of the selected remedial alternative. As part of the FS, primary consideration should be given to remedial alternatives that attain or exceed the requirements of the identified ARARs. Throughout the RI/FS, ARARs are identified and used by taking into account the following:

- Contaminants suspected or identified to be at the site;
- Chemical analysis performed or scheduled to be performed;
- Types of media (air, soil, groundwater, surface water, and sediment);
- Geology and other site-specific characteristics;
- Use of site resources and media;
- Potential contaminant transport mechanisms;
- Purpose and application of potential ARARs; and
- Remedial alternatives considered for site cleanup.

The potential ARARs identified for the RI are presented in Table 6-3.

Table 6-3: Potential ARARs

Requirement	Status /Synopsis of Requirement	Action to be Taken to Attain Requirement
Endangered Species Act (USC Title 16 chapter 35§1538)	Relevant and Appropriate - Location-Specific /The ESA protects federally listed species (fish, wildlife, and plants) which are either endangered or threatened and preserves critical habitat. The substantive requirement within the Act prohibits the "taking" of listed species (reference: 16 USC 1538; 50 CFR 17.95; 50 CFR 226.208))	When evaluating remedial alternatives, consideration must be given to avoiding impacts to the endangered species and its habitat. The development of the Environmental Baseline Survey Report identified CH and the presence or absence of Listed Threatened or Endangered Species. USACE in coordination with NOAA and DNER authored the: Final Supplemental SOPs for endangered Species Conservation and their Critical Habitat (Addendum 1) (2015) SOPs for Endangered Species Conservation and their Critical Habitat, 2012 Addendum to the SOPs for Endangered Species Conservation and their Habitat (2011)

Requirement	Status /Synopsis of Requirement	Action to be Taken to Attain Requirement
		SOPs for Endangered Species Conservation and their Habitat (2008) The processes identified in the above listed SOPs provide procedures that allow for the RI to be completed and avoids impact to endangered species. A remedial alternative which "takes" an endangered species or destroys its habitat does not qualify as a suitable remedial alternative because the ESA ARAR would not be satisfied. Either a different alternative which does not impact the endangered species be pursued or an exception allowing the taking of the species is needed, or a waiver of the ARAR is required.
New Wildlife Law of Puerto Rico No. 241	The purpose of this law is to protect, conserve and enhance both native and migratory wildlife species; declare all wildlife species within its jurisdiction property of Puerto Rico, regulate permits, regulate hunting activities, and regulate exotic species among others. This law also protects plants.	When evaluating remedial alternatives, consideration must be given to avoiding impacts to the endangered species and its habitat. USACE in coordination with NOAA and DNER authored the: Final Supplemental SOP for Endangered Species Conservation and their Critical Habitat Addendum 1 (CESAJ, February 2015). The above mentioned SOP addresses Plants and migratory birds and their nesting seasons. Project schedule and procedures that impact wildlife species, plants and Critical Habitats will not satisfy the ARAR
Commonwealth Law 147	The PR DNER is responsible for the management of 25 areas with marine components including Natural Reserves, a Commonwealth Forest and a Marine Reserve. The Natural and Marine Reserves are managed by the Natural Reserves and Commonwealth Forests Divisions of the Bureau of Reserves, Refuges, and Coastal Resources of DNER. Through the passage of Puerto Rican Law 147 (Coral Reef Conservation Act of 1999), the Commonwealth has elevated the concern for and protection of coral reefs as a natural and protected resource, vital to sustaining fish and biodiversity within state waters.	When marine related operations are conducted the Final Supplemental SOP for Endangered Species Conservation and their Critical Habitat Addendum 1 (CESAJ, February 2015) will be enforced. The processes listed in this SOP will ensure the RI avoids impact to corals. If a procedure is planned that has the potential to injure or destroy coral the ARAR would not be satisfied.

7.0 PROPERTY MANAGEMENT PLAN

A Property Management Plan is not required for this project. This chapter serves as a placeholder only.

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8.0 INTERIM HOLDING FACILITY SITING PLAN FOR RECOVERED CHEMICAL WARFARE MATERIEL

An Interim Holding Facility Siting Plan is not required for this project. This chapter serves as a placeholder only.

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9.0 PHYSICAL SECURITY PLAN FOR RECOVERED CHEMICAL WARFARE MATERIEL SITES

A Physical Security Plan is not required for this project. This chapter serves as a placeholder only.

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10.0 REFERENCES

The following are references that may apply to the overall RI/FS project and RI field activities. Following their substantive requirements will ensure compliance with Section 121 of CERCLA and listed federal and local laws.

10.1 U.S. ARMY CORPS OF ENGINEERS GUIDANCE DOCUMENTS

- EM 200-1-4. Environmental Quality – Risk Assessment Handbook, 1999.
- EM 1110-1-1002. Engineering and Design – Survey Markers and Monumentation, 1990.
- EM 200-1-15. Technical Guidance for Military Munitions Response Actions.
- EM-1110-1-100 Engineering and Design – Conceptual Site Models for Ordnance and Explosives (OE) and Hazardous, Toxic, and Radioactive Wastes (HTRW) Projects, 2003.
- EM 385-1-97 Explosives Safety and Health Requirements Manual
- EM 385-1-1. Safety and Health Requirements Manual, 2008.
- ER 200-3-1. Environmental Quality – Formerly Used Defense Sites (FUDS) Program Policy, 2004.
- ER 385-1-92. Safety - Safety and Occupational Health Requirements for Hazardous, Toxic, and Radioactive Waste (HTRW) Activities, 2007.
- ER 1110-1-12. Engineering and Design – Quality Management, 2006.
- EP 1110-1-18. Military Munitions Response Process, 2006.
- EP 1110-3-8. Engineering and Design – Public Participation in the Defense Environmental Restoration Program (DERP) for Formerly Used Defense Sites (FUDS), 2004.
- EP 1110-1-24. Establishing and Maintaining Institutional Controls for Ordnance and Explosives Projects, 2000.
- EP 75-1-2. Munitions and Explosives of Concern (MEC) Support During Hazardous, Toxic, and Radioactive Waste (HTRW) and Construction Activities
- EP 75-1-4. Recurring Reviews on Ordnance and Explosives (OE) Response Actions, 2003.
- Final Supplemental Standard Operating Procedures for Endangered Species Conservation and their Critical Habitat with Draft Addendum 1, DERP-FUDS Property No. I02PR0068, Culebra, Puerto Rico (November 2014)

10.2 U.S. ARMY DOCUMENTS

- Army MMRP, Remedial Investigation / Feasibility Study Guidance, 2009.
- TM 60A 1-1-31, Explosive Ordnance Disposal Procedures, 1994.
- AR 385-64, Ammunition and Explosives Safety Standards, 1999.
- AR 190-11, Physical Security of Arms, Ammunition and Explosives, 2006.

10.3 DEPARTMENT OF DEFENSE DOCUMENTS

- DoD 6055.09-M, Department of Defense Ammunition and Explosives Safety Standards
- DoD 4145.26-M, Contractor's Safety Manual for Ammunition and Explosives
- DDESB TP-18, Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel

10.4 OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

Occupational Safety and Health Administration (OSHA) 1994 *General Industry Standards*, 29 CFR 1910 and *Construction Industry Standards*, 29 CFR 1926; especially 1910.120/29CFR 1926.65-*Hazardous Waste Site Operations and Emergency Response*.

10.5 U.S. ENVIRONMENTAL PROTECTION AGENCY

Risk Assessment Guidance for Superfund (RAGS), 1989.

10.6 FEDERAL REGULATIONS

- Code of Federal Regulations (CFR)
  - 33 CFR 320 Wetlands Protection Act
  - 40 CFR 300.430 National Oil and Hazardous Substances Pollution Contingency Plan (NCP) 1993.
  - 40 CFR Part 261.23 Resource Conservation and Recovery Act.
  - 49 CFR Parts 100-199 Transportation.
  - 62 Federal Register 6622, 1997 Military Munitions Rule.
- Fish and Wildlife Coordination Act 16 U.S.C. 661 et seq.
- Endangered Species Act 16 U.S.C. 1531-154.
- Migratory Bird Treaty Act 16 U.S.C. 703-712.
- National Historic Preservation Act 16 U.S.C. 1470.
- Clean Water Act 33 U.S.C. 1151 et seq., 1251 et seq., 40 U.S.C. 3906 et seq.
- Comprehensive Environmental Response, Compensation, and Liability Act 42 U.S.C. 9601-11050.
- National Wildlife Refuge System Improvement Act of 1997, U.S. Fish & Wildlife Service, Culebra National Wildlife Refuge.

10.7 COMMONWEALTH OF PUERTO RICO REGULATIONS

- Law 147 of 1999 (Act for the Protection, Conservation and Management of the Coral Reefs in Puerto Rico)
- Law 241 of 1999 (New Wildlife Law)
- Law 278 of 1998 (Puerto Rico Fisheries Law)
- Regulation 2577 (Regulation to Control the Extraction, Possession, Transportation and/or Sale of Live or Dead Coral)
- Forestry Law #133
- Sand, Gravel and Rock Law #132 of 25 June 1968
- Law of Docks and Ports of Puerto Rico of 1968 (Law 151)

10.8 OTHER DOCUMENTATION/SURVEYS AND STUDIES

- Environmental Science & Engineering, Inc. (ESE) 1997. Final Engineering Evaluation/Cost Analysis: Former Culebra Island Naval Facility, Culebra Island, Puerto Rico. DERP-FUDS Project Number I02PR006802. March.
- Explosive Ordnance Technologies, Inc. 2010. Final Site Specific Work Plan for Remedial Investigation / Feasibility Study at the Culebra Island Site, Puerto Rico. March 2010.
- Kendall, M. S.[1], M. E. Monaco[1], K. R. Buja[1], J. D. Christensen[1], C. R. Kruer[2], and M. Finkbeiner[3], R. A. Warner[1]. 2001. (On-line). Methods Used to Map the Benthic Habitats of Puerto Rico and the U.S. Virgin Islands URL: http://biogeo.nos.noaa.gov/projects/mapping/caribbean/startup.htm. Also available on U.S. National Oceanic and Atmospheric Administration. National Ocean Service, National Centers for Coastal Ocean Science Biogeography Program. 2001. (CD-ROM).Benthic Habitats of Puerto Rico and the U.S. Virgin Islands. Silver Spring, MD: National Oceanic and Atmospheric Administration.
- Parsons, 2007. Final Site Inspection Report, Culebra Island Site, Puerto Rico. September.
- Parsons, 2014. Final Environmental Baseline Survey Report, Underwater Portions of MRSs 07 and 02, Culebra, Puerto Rico. March.
- U.S. Army Corps of Engineers (USACE). 1991. DERP-FUDS Findings and Determination of Eligibility, Culebra Island NWR, P. R., Project No. I02PR006800. Prepared by USACE Jacksonville District.
- U.S. Army Corps of Engineers (USACE). 1995. Archives Search Report Findings for Culebra Island National Wildlife Refuge, Culebra, Puerto Rico. Project No. I02PR006802. Prepared by USACE Rock Island District. February.
- U.S. Army Corps of Engineers (USACE). 2004a. *ASR Supplement for the Culebra Island NWR*. Prepared by USACE Rock Island District. 26 November.
- U.S. Army Corps of Engineers (USACE). 2005b. *Supplemental Archives Search Report for Culebra, Puerto Rico*. Project No. I02PR0068. Prepared by USACE St. Louis District. September.

[1] NOAA National Ocean Service, Biogeography Branch; N/SCI 1, SSMC4; 1305 East West Highway; Silver Spring, MD 20910

[2] P.O. Box 753; Sheridan, MT 59749

[3] NOAA Coastal Services Center, 2234 South Hobson Avenue; Charleston, SC 29405

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APPENDIX A. PERFORMANCE WORK STATEMENT (PWS)

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Performance Work Statement
Remedial Investigation / Feasibility Study
MRS 07 Culebrita Artillery Impact Area Water Acreage
And all Cayos of MRS 2
Culebra, PR
I02PR0068
12 January 2012
Revision 1: 29May 2012

The purpose of Revision 1 dated 17 May 2012 is to affect the following changes:

- ***a) add sub task 2c Baseline Survey Work plan***
- ***b) Add sub task 2d Investigation Work plan***
- ***c) Add sub task 2e Intrusive Investigation Work plan***

1.0 OBJECTIVE:

The objective of this task order is to produce an RIFS and achieve acceptance of Decision Document(s) in compliance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, and Department of Defense, Army, and USACE Regulations and Guidance to include Interim Guidance and Data Item Descriptions (DID) at the referenced Munitions Response Sites which are Culebrita (MRS7) and all the Cayos of MRS 2 which are Cayo Lobo, Cayo Lobito, El Mono, Cayo Del Agua, Cayo Yerba, Cayo Raton, Alcarraza, Los Gemelos, Piedra Stevens, Cayo Tiburon, Cayos Geniqui, and Cayo Sombrerito,

2.0 BACKGROUND:

2.1 Work under this Performance Work Statement (PWS) falls within the Military Munitions Response Program (MMRP) for the MRS 07 and the Cayos of MRS 2 defined in Paragraph 1.0. These areas were used for artillery, straffing and bombing training. The Contractor shall perform all work in compliance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Contingency Plan (NCP), 40 CFR Part 300. All activities involving work in areas potentially containing explosive hazards shall be conducted in full compliance with United States Army Corps of Engineers (USACE), Department of the Army (DA), and Department of Defense (DOD) regulations.

2.2 Available Site Specific information will be provided with the request for proposal for contractor review and use via either a designated Internet site or delivery of recorded data on CD/DVD. This information may include but is not limited to general site history, previous investigations and other documentation.

3.0 GENERAL REQUIREMENTS:

3.0.1 Contractor Methods: This is a performance based task order. The performance objectives and standards included herein are the basis of the task order requirements. The technical approach and level of effort expended to achieve task order objectives and standards are solely up to the contractor to select and adjust as necessary through the life of the task order. Government recognizes the contractor's right to change the technical approach and level of effort from that proposed with the understanding that the contractor shall still meet all project objectives and gain government Quality Assurance acceptance in order to receive payment. Given the short time available during the pre-award phase to evaluate the site it is possible that after award and refinement of the conceptual site model and data needs that the contractor will wish to adjust the investigation strategy. If after the TPP but before the field work begins an adjustment in the quantities or types field investigations are required to achieve the performance standard or the Government determines that the performance standard must be adjusted the Government at its discretion may choose to modify the contract with the price adjustment based upon the prorated unit prices proposed in the accepted offer. Once these adjustments are complete the contractor shall be obligated to deliver the required performance standard making adjustments in the field strategy as may be necessary to achieve the standard without a change in price.

3.0.2 Quality monitoring and measurement: The contractor will be evaluated periodically during performance of this task order to ensure compliance with the proposed and accepted performance goals, regulations, guidance and DIDs, and to document that acceptance criteria (AC), delivery schedule, and the overall completion date are being met. This evaluation will be performed according to a Quality Assurance Surveillance Plan (QASP). A programmatic QASP will be provided by the government as a starting point for the contractor prepared Draft QASP per Task 2. The government

will finalize the contractor's Draft QASP. This final QASP will be supplied to the contractor and used by the government to evaluate the contractor's performance. Failure to adequately complete any service or submittal to at least a satisfactory level of quality or timeliness may result in a repeat of the work, or a poor performance evaluation, or both.

3.0.3 Performance Requirements. Performance requirements are addressed in each task and summarized in the Performance Requirements Summary (PRS) provided in Attachment A. Performance metrics are provided in Attachment B. If discrepancies or ambiguity exists between the documents, the order of precedence is 1) the Task; 2) Performance Requirements Summary; 3) Performance Metrics

3.0.4 Task pricing: A pricing schedule is provided in Attachment D which will be used as a basis for negotiation of price increase or decrease due to government changes in the specified performance objectives.

3.1 Task 1, Technical Project Planning (TPP): This is a Firm Fixed Price/Unit Price task.
Objective: Implement the four-phase TPP process.

Performance Standard: Achieve the objectives of each TPP phase as listed in EM 200-1-2, EM 1110-1-4009 and applicable Interim Guidance Documents. Facilitate meetings in a professional and organized manner.

AC: Acceptance of TPP documents (meeting presentations, agenda, handouts, Conceptual Site Model (CSM) and memorandums) with up to one (1) revision. Meetings held are organized; accomplish requirements of the TPP process; and are conducted in a professional manner. Zero letters of reprimand, grievances, or formal complaints.

Measurement / Monitoring: A TPP checklist for each phase, as provided in the EM 200-1-2, EM 1110-1-4009 and applicable Interim Guidance Documents, will be used to measure and document progress; guidance cited will be used to evaluate content of documents for acceptance / non-acceptance. The Government will attend and evaluate organization and facilitation of the meetings, and professional nature of the meetings.

Incentives/Disincentives: Satisfactory or greater Contractor Performance Assessment Reporting System (CPARS) rating/poor CPARS rating and/or re-performance of work at contractor's expense.

Specific Task Requirements: The contractor shall utilize the TPP process to obtain consensus on specific Data Quality Objectives (DQO). The contractor shall present DQOs necessary to achieve the performance standards in task 4.0, which were proposed and accepted at the time of task order award. The Contractor shall plan for meetings to occur as follows: first meeting, pre-Work Plan with resulting DQOs and CSM, and TPP Memorandum; second meeting, to finalize Work Plan with resulting TPP addendum; third meeting, verify all data gaps have been filled and finalize Remedial Investigation Report with resulting TPP addendum. The contractor shall organize and coordinate all meetings; identify and involve all stakeholders, upon approval by the Government; and be responsible for the logistics of these meetings to include, but not limited to, providing a facilitator, obtaining meeting location, and sending invitation letters (pending government review and acceptance). The Contractor shall prepare, submit for review and gain acceptance of a TPP memorandum or addendum for each meeting. If a site visit is planned prior to acceptance of a Work Plan, the Contractor shall prepare and submit for acceptance an Abbreviated Accident Prevention Plan (AAPP). The Contractor shall utilize statistical methods (such as Visual Sample Plan (VSP) software) to support the decision making processes used to characterize both MEC as well as munitions constituents (MC). The contractor shall include all munitions response sites (MRS), to include optional MRSs, in the TPP process. The Contractor shall prepare a preliminary Munitions Response Prioritization Protocol for each Munitions Response Site covered under this task order.

3.2 Task 2, Remedial Investigation (RI)/Feasibility Study (FS) Work Plan (WP), Uniform Federal Policy for Quality Assurance Project Plan (UFP-QAPP) and QASP: This is a Firm Fixed Price task.
Objective: Prepare, submit and gain acceptance of a WP, and MC UFP-QAPP and QASP that are detailed and comprehensive plans covering all aspects of site characterization, risk assessment and methodology, and project execution. UFP-QAPP is only required for ~~to~~ environmental sampling. ~~but may be used for the entire WP is USACE guidance is available.~~

Performance Standard: Prepare the WP in accordance with DID WERS-001.01 and other applicable DIDs for sub plans, EM 1110-1-4009, EM 385-1-1, EM 385-1-97, Army RI/FS guidance, Interim Guidance (Draft Army Regulation XXX) Chemical Warfare Materiel Responses and Related Activities as appropriate and other Interim Guidance as appropriate. Prepare the sampling and analysis plan, field sampling, and UFP-QAPP in accordance with EM 1110-1-4009, DID WERS-009.01, Intergovernmental Data Quality Task Force UFP-QAPP Manual, as appropriate. Prepare a risk

assessment work plan as part of the overall project work plan incorporating implementation of the risk assessment and methodologies per USEPA Risk Assessment Guidance (RAGS), and USACE EM 200-1-4, Volumes I and II, as appropriate. UFP-QAPP content shall also meet the requirements of DoD Quality Systems Manual for Environmental Laboratories (current version). Draft QASP includes requirements in regulations, guidance, DIDs and the Quality Control Plan included in the WP.

AC: Acceptance of WP and UFP-QAPP with two revisions. Draft QASP reflects requirements of the WP and the Quality Control Plan (QCP) with one revision required.

Measurement / Monitoring: Review of WP, UFP-QAPP and QASP to verify that the minimum acceptable content has been provided and meets applicable guidance.

Incentives/Disincentives: Satisfactory or greater CPARS rating/poor CPARS rating and/or re-performance of work at contractor's expense.

Specific Task Requirements: Incorporate all decisions pursuant to the TPP process. The sampling and analysis plan (SAP) shall include the Contractor's phased approach, address contaminants of interest, sample media (soil/groundwater/sediment/surface water/air), and methods that will be utilized to ensure that data generated are of an acceptable quality for its intended use. The contractor shall discuss quantity, quality and the methods used to verify adherence to the PARCCS parameters for sample collection, handling, laboratory analysis, verification and validation. All MRSs shall be included in the WP to include optional MRSs.

3.2 ~~Optional~~ Task 2a, Explosive Siting Plan: This is a Firm Fixed Price task. If this optional task is not awarded, an Explosive Siting Plan will be provided by the government for inclusion in the WP.

Objective: Prepare, submit and gain acceptance of an Explosives Siting Plan (ESP).

Performance Standard: Prepare required submission in accordance with DoD 6055.09-M, EM 385-1-97, Errata Sheet #3, and DID WERS-003.01 as a standalone document for inclusion after acceptance into the WP.

AC: Acceptance of submission with two revisions. One additional revision is acceptable to incorporate EM-CX, USATCES and DDESB comments.

Measurement / Monitoring: Review by Government using guidance cited to determine acceptability.

Incentives/Disincentives: Satisfactory or greater CPARS rating/poor CPARS rating and/or re-performance of work at contractor's expense.

Specific Task Requirements: Once the ESP has been reviewed and acceptance by the Design Center, the document will be reviewed by the CEHNC-EM-CX, USATCES and DDESB. All comments shall be incorporated. Allow eight (8) weeks in the schedule for DDESB approval after submission of final document to the CEHNC-EM-CX.

3.2.2 ~~Optional~~, Task 2b, Dive Plan: This is a Firm Fixed Price task.
Objective: Prepare, submit and gain acceptance of a Dive Plan.

Performance Standard: Prepare, submit and gain acceptance of a Dive Plan that is a detailed and comprehensive plan covering <u>all</u> aspects of dive operations in accordance with EM 385-1-1.

AC: Acceptance of submission with two revisions.

Measurement / Monitoring: Review by Government using guidance cited to determine acceptability.

Incentives/Disincentives: Satisfactory or greater CPARS rating/poor CPARS rating and/or re-performance of work at contractor's expense.

Specific Task Requirements: None.

3.2.2. Task 2c, Baseline Survey Work Plan: This is a Firm Fixed Price task. The objective of this task is for the Contractor to prepare, submit and gain acceptance of a Baseline Survey WP that is a detailed and comprehensive plan covering <u>all</u> aspects of the Baseline Survey underwater work in accordance with data item description (DID) MR-001 and EM 1110-1-4009.

3.2.3 Task 2d, Underwater Investigation Work Plan: This is a Firm Fixed Price Task. The objective of this task is for the Contractor to prepare, submit and gain acceptance of a Work Plan that is a detailed and comprehensive plan covering all aspects of the underwater investigation phase of the underwater work in accordance with data item description (DID) MR-001 and EM 1110-1-4009.

3.2.4Task 2e, Underwater Intrusive Investigation Work Plan: This is a Firm Fixed Price Task. The objective of this task is for the Contractor to prepare, submit and gain acceptance of a Work Plan that is a detailed and comprehensive plan covering all aspects of the underwater intrusive investigation phase of the underwater work in accordance with data item description (DID) MR-001 and EM 1110-1-4009.

3.3 Task 3, GeoSpatial Data: This is a Firm Fixed Price/Unit Price task.
Objective: Utilize a geographic information system (GIS) in the development of the Conceptual Site Model (CSM) and maintain and manage all project and geospatial data.

Performance Standard: Manage and maintain project data, and develop CSM in GIS IAW DID WERS-007.01, EM 200-1-2, EM 1110-1-4009 and applicable Interim Guidance Documents.

AC: Acceptance of CSM and GeoSpatial Data submissions, which also meet quality and formatting requirements.

Measurement / Monitoring: Review by Government using cited to determine acceptability to determine acceptability.

Incentives/Disincentives: Satisfactory or greater CPARS rating/poor CPARS rating and/or re-performance of work at contractor's expense.

Specific Task Requirements: The GeoSpatial Data shall include:
- A comprehensive CSM
- A pre and post-project response action geospatial data analysis will be performed using a GIS.
- All available existing data that is applicable to the project will be consolidated into the GeoDatabase and analyzed to relay pertinent information to the Project Delivery Team (PDT). If an existing GIS database is available, it will be provided by the government.
- The analysis of data from the GIS shall support all conclusions of the CSM.
- The information attained through the pre-RI analysis will be documented in the work plan.
- The information attained in the post-RI and FS analysis will be documented in the RI and FS reports.
- The pre-RI analysis will encompass social, environmental and/or economic entities that will be or may be impacted by response-action activities.
- The post-RI and FS analysis will detail entities impacted by RI/FS activities and impacts of future response action activities (if applicable).
- The pre and post-RI and FS analyses may detail the fieldwork strategies, areas of concern, survey requirements, environmental concerns, milestones and/or other factors that affect product delivery and future action planning.
- Entities that may be affected by response actions include but are not limited to: landowners, homeowners, rental tenants, schools, utilities, roads, businesses, recreational areas, air traffic, water bodies and/or industries.
- The GeoDatabase shall be a living repository that is refined throughout the life of the project.
- Incorporate layers that overlay on maps of the site that identify physical features, and Material Potentially Presenting Explosive Hazard (MPPEH)/Munitions Debris (MD) found during the investigation. Examples include: streets, anomalies, Munitions and Explosives of Concern (MEC) positively identified, identifiable MD, sampling location, cultural resources, environmental, biological, and socio-economic variables.
- Archeological site locations will not be released to the public without written permission from USACE.
- Perform civil surveys IAW EM 1110-1-4009 and DID WERS-007.01
- Final GIS deliverable shall include all documentation, reports, meeting minutes databases, etc. created developed or modified under this task order in original and PDF format. This deliverable shall meet QA acceptance prior to payment of final invoice.
- Property owner privacy will be preserved. Property owner names shall not be disseminated in any documents.

- Provide the Government and Stakeholders internet access to the GIS database.

3.4 Task 4, RI/FS Field Activities: This is a Cost Plus Fixed Fee (CPFF) and Firm Fixed Price/Unit Price Task (FUP/UP.
Objective: Conduct a remedial investigation in accordance with CERCLA, as amended, characterizing the nature and extent of MEC at the MRSs meeting the project DQOs as defined during the TPP process. This task shall include all field activities necessary to execute this task. For MC contamination, collect sufficient data that meets the project DQOs as defined during the TPP process, of known quality and quantity to determine the nature and extent of munitions constituents (MC) to support and perform a human health and ecological baseline risk assessment.

3.4.1 Task 4a, MRS 07 Culebrita Artillery Impact Area Water Acreage, FUDS Project No. I02PR006807-M01 to historical project documentation of site locations, and historical information, and boundaries. **For MRS 7, the RIFS is to go to the boundry of the MRS as defined in Figure 1.**

3.4.1.1 Task 4a1, Bathymetry. This task is Firm Fixed Price (FFP/UP).

3.4.1.2 Task 4a2, Side Scan Sonar. This task is Firm Fixed Price (FFP/UP).

3.4.1.3 Task 4.a3, ROV/AUV Underwater Video. This task is Firm Fixed Price (FFP/UP).

3.4.1.4 Task 4.a4, Magnetometer/ EM Survey. This task is Firm Fixed Price (FFP/UP).

3.4.1.5 Task 4.a5, Underwater Intrusive Investigation. This task is Cost Plus Fixed Fee (CPFF).

3.4.2 Task 4b MRS 02 Accessible Cayos Water Acreage, FUDS Project No. I02PR006802-M01. For this task the contractor will only go out 100 yards from the shoreline of each cayo. See Figure 2 and 3 for general location of Cayos.

3.4.2.1 Task 4a1, Bathymetry. This task is Firm Fixed Price (FFP/UP).

3.4.2.2 Task 4a2, Side Scan Sonar. This task is Firm Fixed Price (FFP/UP).

3.4.2.3 Task 4.a3, ROV/AUV Underwater Video. This task is Firm Fixed Price (FFP/UP).

3.4.2.4 Task 4.a4, Magnetometer/ EM Survey. This task is Firm Fixed Price (FFP/UP).

3.4.2.5 Task 4.a5, Intrusive Investigation. This task is Cost Plus Fixed Fee (CPFF).

3.4.4 The following applies to all MRSs listed above:

Performance Standard: Field work, data quantity and quality, and analysis of said data (does not include area where Rights-of-entry were not obtained) provides the following results in the RI report:
- Work shall be performed in accordance with the applicable laws, regulations, and guidance documents;
- Demonstrate that data inputs from the RI into the FS will enable remediation cost estimates with an accuracy of +50%/-30%. The work and reporting shall address the surface and sub-surface metallic anomaly density distribution (anomaly/acre) across identified MEC contaminated areas as well as other remediation cost drivers such as vegetation type and density, terrain conditions, soil type, exclusion zone evacuation costs, etc each to a level of accuracy within the range specified herein.

- Demonstrate that there is at least a 90% chance of detecting areas with elevated anomaly density [If the historical site information indicates the presence of areas unlikely to contain a target with elevated anomaly density, but with the potential for MEC/MC contamination (e.g. burial pits) a geophysical and intrusive investigation that is designed to find the MEC/MC contamination should be implemented.];
- Areas defined as MEC contaminated should be bounded and the error of that boundary should be determined. The bounded area, known error in the boundary and estimated anomaly densities should be used to comply with the +50%/-30% remediation cost estimate requirement

- Determine the nature (type, depth and density) of MEC and MEC related debris, for MEC contaminated area.

Additionally:
- Perform the RI field activities in accordance with the accepted Work Plan and UFP-QAPP.
- Proper processing and disposition of UXO, DMM, and MC encountered in accordance with approved plan(s).
- All Material Potentially Presenting an Explosive Hazard (MPPEH) and munitions debris (MD) processed in accordance with EM 385-1-97 and applicable Errata Sheets.
- Meet the project DQOs as defined by the TPP process.
- All geophysics shall be IAW DID WERS-004.01, with the following exception for marine field work. Marine field work QC shall be recommended by the Contractor in the QCP. Government QA is expected to be limited to visual observation of the Contractors intrusive work and QC operations due to the dynamics of this high energy environment. The government recognizes that submerged metallic items have the potential to move great distances due to the local current and surf conditions and that prolonged seeding of test items may not be feasible. The government requests that the Contractor submit a modified QC Requirements table for government acceptance for the marine and beach portions of the project to meet the needs of the project and still insure acceptable data quality to meet the project objectives.
-For this task order 1 acre of transects equals 14,520 lf (2.75 miles) of transects 3 feet wide. One acre's worth of grids equals seventeen (17) 2500 sf grids or four (4) 10,000 sf grids.

-To the maximum extent practicable the contractor should conduct the field investigation by gathering sensor data that is digitally recorded and geo-referenced (geo-referencing need be no more accurate than is needed for the use of the data). Exceptions may include situations where other methods provided data and/or significant cost value in which case the contractor shall provide detailed justification in their proposal describing why the other methods provide a better value. In any case a geo-referenced permanent record of the investigation shall be delivered as part of the RI report (GIS of traverse and items located, digital geophysical data, etc).
- MC analyses shall be performed in accordance with the requirements of the Department of Defense (DoD) Quality Assurance Manual (QAM), WERS-009.01 Munitions Constituents Chemical Data Quality Deliverables, and the approved project specific UFP-QAPP.
- As appropriate, the contractor shall implement statistical methods for its sampling plan using discrete samples.

AC: Conduct the RI in accordance with the accepted/approved WP, UFP-QAPP, and Dive Plan. QC data submitted meets requirement described in DID WERS-004.01.
- Sampling field work and data meets established criteria within the accepted Uniform Federal UFP-QAPP, SAP, and Work Plan.
- No more than 3-4 CARs/948s for non-critical violations and/or 1 CAR/948 for critical violation. No unresolved Corrective action requests.
- All final data and QC tests/documentation submitted. Government QA acceptance of QC tests/documentation gained.
- No Class "A" Safety accidents, contractor at fault; No Class "B", contractor at Fault, no more than 1 non-explosive Class C accident; and <2 non-explosive related Class D accidents, IAW AR 385-40.
- Major safety violations, no more than 1 non-explosive related safety violation.
- Minor safety violations, no more than 2 safety violations.
- Zero letters of reprimand, grievances, or formal complaints.

Measurement / Monitoring: Period inspection/review of field work and data. Verify compliance with accepted WP, UFP-QAPP and Dive Plan. Quality control tests/documentation submitted per the QASP for government review. Additionally, statistical confidence will be calculated using the Visual Sampling Plan software, UXO Estimator or some other statistical method. Boundary precision will be determined by evaluation of the sampling footprint as it relates to the reported contaminated/uncontaminated areas in question. Anomaly density profile and other remediation cost driver precision will be verified by QA of methods used.

Incentives/Disincentives: Satisfactory or greater CPARS rating/poor CPARS rating and/or re-performance of work at contractor's expense.

Task Specific Requirements:
- Restore all areas to their original condition; all access/excavation/detonation holes shall be backfilled.
- Maintain a detailed accounting of all UXO, DMM, MD and range-related debris encountered per DID WERS-004.01. This accounting shall include: amounts of UXO, DMM and MD; nomenclature; location and depth of UXO/DMM; location of MD; and final disposition. The accounting system shall also account for all demolition materials utilized on site. Digital photographs of UXO and DMM and examples of MD found during the investigation are to be taken.

- All UXO, DMM, and MC encountered during this munitions response shall be processed in accordance with the approved work and safety plans.
- Any deviations from the accepted SAP shall be documented in the Daily Quality Control Reports (DQCR) and conveyed to USAESCH personnel immediately.
- The contractor will provide and price an independent laboratory to analyze QA samples separate from the contractor's primary laboratory. Additionally, contractor shall validate primary and QA samples. Both laboratories used shall be DOD Environmental Laboratory Accreditation Program (ELAP) certified.

3.5 Task 5, Remedial Investigation Report: This task is a Firm Fixed Price/Unit Price task.
Objective: Prepare, submit and gain acceptance of a RI report.

3.5.1 Task 5a, MRS 07 Culebrita Artillery Impact Area Water Acreage, FUDS Project No. I02PR006807-M01

3.5.2 Task 5b, MRS 02 Accessible Cayos Water Acreage, FUDS Project No. I02PR006802-M01

Performance Standard: The RI report shall document the results of the RI and previous investigations, and the Contractor shall prepare the report in accordance with EP 1110-1-18, EM CX Interim Guidance 06-04, Army RI/FS guidance. The ecological and human health risk assessment shall be performed in accordance with the EPA Risk Assessment Guidance (RAGS) and USACE EM 200-1-4, Volumes I and II, as appropriate.

AC: Acceptance of RI with two revisions.

Measurement / Monitoring: Review of RI against guidance to verify that the minimum acceptable content has been provided.

Incentives/Disincentives: Satisfactory or greater CPARS rating/poor CPARS rating and/or re-performance of work at contractor's expense.

Specific Task Requirements:
- Use EPA MEC Hazard Assessment, not Ordnance and Explosives Risk Impact Assessment.
- Incorporate all RI data and data from previous investigations, historical documents, PA/SI into this RI report.
- The Contractor shall provide a discussion on data evaluation and fate and transport analysis. The potential for fate and transport will address all transport pathways, and it should also address future degradation products resulting from biodegradation, photolysis, and chemical reactions.
- Recommend changes in realignment of MRSs dependent on RI findings.
- Prepare, as an appendix to this report, a new or update Munitions Response Site Prioritization Protocol (MRSPP) for each MRS dependent upon RI findings using the MRSPP worksheets, http://www.lab-data.com/MRSPP/ .

3.6 Task 6, Feasibility Study and Report: This task is a Firm Fixed Price/Unit Price task.
Objective: Conduct a feasibility study and prepare, submit and gain acceptance of a FS report.

3.6.1 Task 6a, MRS 07 Culebrita Artillery Impact Area Water Acreage, FUDS Project No. I02PR006807-M01

3.6.2 Task 6b, MRS 02 Accessible Cayos Water Acreage, FUDS Project No. I02PR006802-M01

Performance Standard: The FS report shall document the results of the FS and prepared in accordance with EP 1110-1-18, EM CX Interim Guidance 06-04, and Army RI/FS guidance.

AC: Acceptance of FS with two revisions.

Measurement / Monitoring: Review of FS against guidance to verify that the minimum acceptable content has been provided.

Incentives/Disincentives: Satisfactory or greater CPARS rating/poor CPARS rating and/or re-performance of work at contractor's expense.

Specific Task Requirements: None.

3.7 Task 7, Proposed Plan: This task is a Firm Fixed Price/Unit Price task.
Objective: Prepare, submit and gain acceptance of Proposed Plans (PP).

3.7.1 Task 7a, MRS 07 Culebrita Artillery Impact Area Water Acreage, FUDS Project No. I02PR006807-M01

3.7.2 Task 7b, MRS 02 Accessible Cayos Water Acreage, FUDS Project No. I02PR006802-M01

Performance Standard: Prepare the PP(s) in accordance with, ER 200-3-1, EP 1110-1-18, EM-CX Interim Guidance 06-04, EPA 540-R-98-031 and CERCLA, as amended.

AC: Acceptance of PP with two revisions.

Measurement / Monitoring: Review of PP against guidance to verify that the minimum acceptable content has been provided.

Incentives/Disincentives: Satisfactory or greater CPARS rating/poor CPARS rating and/or re-performance of work at contractor's expense.

Specific Task Requirements: After government & regulator review, the revised draft-final version of the Proposed Plan will be subject to a minimum 30-day public review. A public meeting shall be held to present the Proposed Plan to the public. This public meeting falls under Task 9, Community Relations Support.

3.8 Task 8, Decision Document: This task is a Firm Fixed Price/Unit Price task.
Objective: Prepare, submit and obtain acceptance of DDs for **each** delineated MRS resulting from the RI.

3.8.1 Task 8a, MRS 07 Culebrita Artillery Impact Area Water Acreage, FUDS Project No. I02PR006807-M01

3.8.2 Task 8b, MRS 02 Accessible Cayos Water Acreage, FUDS Project No. I02PR006802-M01

Performance Standard: Prepare the DDs in accordance with ER 200-3-1, EP 1110-1-18, Attachment C, herein, EPA 540-R-98-031 and CERCLA, as amended.

AC: Acceptance of DD(s) with two revisions.

Measurement / Monitoring: Review of DD(s) against guidance to verify that the minimum acceptable content has been provided.

Incentives/Disincentives: Satisfactory or greater CPARS rating/poor CPARS rating and/or re-performance of work at contractor's expense.

Specific Task Requirements: PWS Attachment C provides new formatting requirements for the DD(s). For formatting of Decision Documents, Attachment C supersedes CEHNC-EM-CX Interim Guidance 06-04.

3.9 Task 9, Community Relations Support: This task is a Firm Fixed Price/Unit Price task.
Objective: Successfully complete public meetings and support the Jacksonville District with community relations.

Performance Standard: Contractor attends and participates in meetings. Meeting materials are accepted by the government as required. Meeting transcripts for PP meeting are accurate and prepared by a professional court reporter.

AC: Acceptance of meeting materials with two revisions and acceptance of PP meeting transcripts in one revision. Meetings held are organized; and professional in nature. Contractor personnel in attendance are thoroughly familiar with the project. Zero letters of reprimand, grievances, or formal complaints.

Measurement / Monitoring: Acceptance of required materials for meetings. Government will attend and evaluate the contractor's attendance, participation and professional demeanor.

Incentives/Disincentives: Satisfactory or greater CPARS rating/poor CPARS rating.

Specific Task Requirements: Work shall be executed in accordance with the accepted Public Involvement Plan (PIP). The Contractor shall attend and participate in Three (3) public meeting(s). These meetings are different from and in addition to TPP meetings. If additional public meetings are required they will be purchased separately according to the FUP in the attached price spreadsheet, Attachment D. These meetings will be held near the project site; specific location to be determined as part of the PIP development. Support shall include, but is not limited to: preparation and delivery of briefings, graphics, maps, posters, and support of question and answer sessions during public meetings, supply printing services. The Contractor shall also obtain the meeting site, provide sound equipment as needed, perform public notification and prepare any correspondence necessary to meeting the objectives of this task. The government shall approve all correspondence, public notices and all other materials prior to being presented/distributed to the public. These actions are independent of the field activities that involve interaction with the community. The meeting for the Proposed Plan shall be covered under this task. Transcripts of the public meeting for the Proposed Plan shall be included without editing or deleting anything from the official document with the exception of redactions to protect Personally Identifiable Information (PII) if needed and shall be included in the Administrative Record and placed in information repositories. The Contractor shall provide support as needed for development and maintenance of the USACE FUDS website for the project.

3.10 Task 10, Public Involvement Plan (PIP): This task is a Firm Fixed Price task.
Objective: Update, submit and gain acceptance of a PIP.

Performance Standard: Prepare the PIP in accordance with EP 1110-3-8, ER 200-3-1, EM-CX Interim Guidance 06-04, guidance provided in the FUDS Public Involvement Toolkit and DENIX website.

AC: Acceptance of PIP with two revisions.

Measurement / Monitoring: Review of PIP against guidance to verify that the minimum acceptable content has been provided.

Incentives/Disincentives: Satisfactory or greater CPARS rating/poor CPARS rating and/or re-performance of work at contractor's expense.

Specific Task Requirements: This effort shall include, but is not limited to: preparation and delivery of stakeholder surveys, review and presentation of survey findings, completion of stakeholder interviews, determining a list of local, state, and federal representatives for the area, determining proposed locations for public meetings, determining best methods of communicating to the public (radio, television, mail outs, etc). The government shall approve **all** correspondence, survey content, and all other materials prior to being presented/distributed to the public. These actions are independent of the field activities that involve interaction with the community.

3.11 Task 11, Administrative Record: This task is a Firm Fixed Price task.
Objective: Maintain the Administrative Record for each MRS throughout the period of performance of this Task Order.

Performance Standard**:** Prepare in accordance with the guidance in EP 1110-3-8, Chapter 4 (Establishing and Maintaining Administrative Records) and Standard Operating Procedure for Formerly Used Defense Sites (FUDS) Records Management, Revision 5, dated January 2008 (or most recent version).

AC: Administrative record will be evaluated against guidance for compliance with requirements, accuracy and completeness of the record, with up to one uncorrected deficiency remaining during the period of performance.

Measurement / Monitoring: The government will visit, at least once, the administrative record's location and check for completeness and compliance with referenced EP; electronic submissions will be evaluated randomly upon receipt as data is entered into the record.

Incentives/Disincentives: Satisfactory or greater CPARS rating/poor CPARS rating and/or re-performance of work at contractor's expense.

Specific Task Requirements: Secure a location such as a public library for a place to house the Administrative Record in the local city or community for each MRS. This task requires close coordination with the Jacksonville District (CESAJ)

and USAESCH to secure all required documents to support the Administrative Record. Provide copies of all final documents posted to the Administrative Record on CD/DVD to USAESCH and SAJ, 2 copies each. These files shall be suitable for placement on the FRMD web site.

3.12 Optional Task 12, Implement Innovative Technology: This task is a Firm Fixed Price task.
Objective: Evaluate and demonstrate the effectiveness of the innovative technology selected by the contractor.

Performance Standard: Perform field activities using innovative technology while meeting the established criteria in tasks 4. Evaluation is supported by data and documented in a letter report that obtains Government QA acceptance with two revisions.

AC: Applicable field work and data meets established criteria within the accepted Uniform Federal UFP-QAPP, SAP, and Work Plan.

Measurement / Monitoring: Period inspection/review of field work, and data and compliance with accepted WP, UFP-QAPP and {List other plans as appropriately}. Quality control tests/documentation submitted per the QASP for government review.

Incentive/Disincentive: Satisfactory or greater CPARS rating/poor CPARS rating and/or re-performance of work at contractor's expense.

Specific Task Requirements: The contractor shall select an innovative technology to demonstrate during the implementation of tasks 4. The contractor shall provide in its proposal how the technology will be used, how it will evaluate the technology, and how it will document the effectiveness of the technology. This task shall cover the full cost of implementing, evaluating and documenting effectiveness of the technology.

3.13 Task 13, ~~**Optional**~~ **Baseline Survey Report:** This task is a Firm Fixed Price Task.
Objective: Contractor shall prepare, submit and gain approval of a Baseline Survey Report documenting the results from the bathymetry, side scan sonar, and magnetometer/EM and ROV/AUV investigation, as appropriate to include map(s) indicating location of surface MEC, benthic terrain and the location and identification of underwater biota to include threatened and endangered species.

Performance Standard:

AC:

Measurement/Monitoring:

Incentive/Disincentive: Satisfactory or greater CPARS rating/poor CPARS rating and/or re-performance of work at contractor's expense.

Task Specific Requirements: The contractor shall provide map(s) indicating the location of MEC and the location and identification of coral species and threatened and endangered plant species.

3.14 Task 14, ~~Optional~~ Beach Monitoring: This task is a Firm Fixed Price Task.
Objective: The Contractor shall provide a qualified Project Biologist for daily beach monitoring prior to intrusive ordnance activities as described in the Standard Operation Procedure for Endangered Species Conservation, USACE, Jacksonville District. Project Biologist qualifications shall reflect 2-4 years experience in related work, working independently under general supervision (equivalent to industry Biologist II).

4.0 SUBMITTALS:

Even though draft and draft final submittals are requested, the term "draft" shall not reflect upon the quality of the submittal being provided by the Contractor. Submittals shall include all supporting materials including supporting data whether electronic or hardcopy. Submittals not meeting the requirements of referenced guidance or Data Item Descriptions or missing supporting data may be rejected and revised by the contractor at the contractor's own expense.

4.1 The Contractor shall deliver the specified number of copies shown in Table 4.2 of each report listed in Table 4-1 to the following addressees (addresses to be verified by Contractor):

US Army Engineering & Support Center, Huntsville
Attn: CEHNC-CT-E (Janice Jamar)
PO Box 1600
Huntsville, AL 35807-4301
4820 University Square
Huntsville, AL 35816-1822

US Army Engineering & Support Center, Huntsville
Attn: CEHNC-(Roland Belew) (PM and COR)
PO Box 1600
Huntsville, AL 35807-4301
4820 University Square
Huntsville, AL 35816-1822

Commander
U.S. Army of Corps of Engineers, Jacksonville District
Attn: CESAJ (Tom Freeman) (PM)
701 San Marco Blvd
Jacksonville, FL 32207-0000

Contractor to obtain and/or verify addresses.

4.2 Submittals and Due Dates.

The Contractor shall submit 1 copy of the entire submittal on a CD with each hard copy of a submittal (Reports, Plans, etc) in accordance with DID WERS-007.01. Hardcopies shall be printed on both sides of the paper whenever possible. Note government review durations require 14 calendar days for USACE PDT to review document and to back check revisions. After Draft Final is acceptable it goes to the USACE CX for a 21 day review with the same back check duration of 14 days from after receipt of revised document. Regulator review of the Draft Final document will then take 45 days for the work plan, RI, FS, PP, and DD. These durations must be factored into the schedule.

Table 4-1 List of Submittals

Submittal	**Due Date (Calendar Days)**
Meeting minutes for Kickoff phone conference	7 days after Kickoff phone conference
Proposed Schedule	7 days after kickoff conference call
Pre-TPP Meeting Materials	14 Days prior to TPP meetings
Conceptual Site Model (CSM)	With Pre-TPP materials
AAPP (If required)	14 days prior to site visit
Draft TPP Memorandum	14 days after first TPP meeting
Final TPP Memorandum	7 days after acceptance of comment responses
Draft TPP Memorandum Addendum	7 days after second TPP meeting
Final TPP Memorandum Addendum	7 days after acceptance of comment responses
Draft TPP Memorandum Addendum	7 days after third TPP meeting
Final TPP Memorandum Addendum	7 days after acceptance of comment responses
Draft Public Involvement Plan	TBD
Draft-Final Public Involvement Plan	14 days after acceptance of comment responses
Final Public Involvement Plan	7 days after acceptance of comment responses
Pre-Public Meeting Materials	14 Days prior to public meetings
Final Public Meeting Materials	no later than day of Meeting
Draft Baseline Survey Report	TBD
Draft Final Baseline Survey Report	TBD
Final Baseline Survey Report	TBD
Draft Work Plan/Dive Plan/ESP and Draft QASP	21 days after acceptance of TPP memorandum
Draft Final Work Plan/Dive Plan/ESP	14 days after acceptance of comment responses
Final Work Plan/Dive Plan/ESP	14 days after acceptance of comment responses and TPP meeting

Quality Control Documents	**As required by Regulation, guidance, DIDs, QCP, QASP, or agreed to in project schedule, to include the following**:
Daily QC Report for Environmental Sampling	Daily during Sampling Activities
Analytical Data Submittal for QA Evaluation	30-45 days after completion of fieldwork
Electronic Laboratory Data Submittal	45-60 days after completion of fieldwork
Draft RI Report	60-81 days after completion of field work
Draft Final RI Report	21 days after acceptance of comment responses
Final RI Report	14 days after acceptance of comment responses and TPP meeting
Draft FS Report	21 days after acceptance of the RI Report
Draft Final FS Report	14 days after acceptance of comment responses
Final FS Report	14 days after on board Review
Draft Proposed Plan	14 days after acceptance of the FS Report
Draft Final Proposed Plan	14 days after acceptance of comment responses
Final Proposed Plan	14 days after PP public meeting
PP Meeting Transcripts	with final Proposed Plan
Responsiveness Summary	with Decision Document Submittals
Draft Decision Document	14 days after acceptance of Proposed Plan
Draft Final Decision Document	7 days after acceptance of comment responses
Final Decision Document	7 days after acceptance of comment responses
Final Administrative Record (On CD/DVD)	Upon completion of the Record
Final GIS Files on CD	End of Project

Overall Period of Performance to complete all work is 890 days from date of award.

4.3 Submittal Quantities
Provide the number of submittals shown in Table 4-2 to the addressees given in Section 4.2. No draft documents shall be released to the regulatory community until reviewed by the government. All deliverables will be hard copies with a CD attached to the inside cover.

Table 4-2 Submittal Guidance

	Draft Documents	Draft Final/Final Documents
KO/COR	1 each	1 each
USAESCH	3	3
SAJ	3	6

4.4 Period of Performance: The Completion Date for this Task Order will be March 15, 2014. The contractor shall state in your proposal that you will meet this date and this will be reflected in the schedule due 7 days after award.

5.0 MILESTONE PAYMENTS: (for firm fixed price tasks): Milestones will be considered met or completed when the required QC documentation has been submitted, QA completed and the submittal and/or product is accepted. Any payment vouchers submitted that do not coincide with the final accepted milestones or do not have the appropriate QC documentation will be rejected. All payments will be made utilizing an agreed upon Payment Milestone Schedule. The Contractor shall provide suggested milestones for payment. Milestones for payment shall be shown on the project schedule.

5.1 The following is a list of potential milestones for payment:
- Final Submittals: upon government acceptance, for example: Final WP
- Field Work: for defined units and activities completed and QA review and acceptance, for example: Final QC density data package.
- Meetings: after completion of meetings with government acceptance of meeting minutes, for example: Final PP meeting transcripts.

6.0 REFERENCES:

6.1 Refer to "Base Contract."

6.2 Data Items Descriptions at the following website:

http://www.hnd.usace.army.mil/engr/WERS.aspx .

6.3 **Site Specific References**

Culebra Archives Search Report, 1995
Former Culebra Island Naval Facility EE/CA, 1997
Culebra Supplemental Archives Search Report, 2005
Former Culebra Island Naval Facility EE/CA, 2006
Culebra Site Inspection Report, 2007
NTCRA Culebrita and Culebra Beaches, 2009

7.0 GENERAL CONDITIONS: See the Base Contract Section C, Section 10 General Conditions and the following addendums:

7.1 This is a performance based task order. The inclusion of unit prices in the proposal shall in no way be construed to mean that the Government is procuring a specified number of units of any given service.

7.2 Government acceptance of the proposed technical approach and/or price does not relieve the Contractor from full responsibility for the viability, productivity, and efficiency of the approach used to meet the performance requirements of the PWS at the price proposed. The task order is for the provision of services that ultimately meet the performance requirements of this task. If the contractor must adjust its technical approach or perform more field work than anticipated in order to achieve the proposed performance goal then the contractor will do so with no change in task order price.

7.3 If the Government at its sole discretion chooses to modify the performance standard the parties to this task order will assess the impact on the estimated amount of field work required to achieve the new performance standards and will negotiate a price adjustment based upon the unit prices providing as price proposal supporting documentation (See Attachment D).

7.4 The Contractor attests that it applied due diligence in the research and development of its proposal has priced reasonable estimates of the site conditions and the associated risks into the price. The Contractor accepts full and sole responsibility for identifying and considering all factors that may affect the cost to execute the work. The act of signing this task order signifies that the Contractor has been given ample opportunity to assess the conditions under which the work will be performed and the Contractor either fully understands those conditions or has factored the risk into the price.

7.5 The Government provided the Contractor with historical documents and documents from previous site activities. The Contractor attests it interpreted the data utilizing an experienced understanding of how the data of this type is collected, analyzed, interpreted, and presented.

8.0 ARMY CONTRACTOR MANPOWER REPORTING:

8.1 Implementation.

8.1.1 The Office of the Assistant Secretary of the Army (Manpower & Reserve Affairs) operates and maintains a secure Army data collection site where the contractor will report contractor manpower information (including subcontractor manpower information) required for performance of this contract. The contractor shall submit all the information required in the format specified at the following web address: **https://cmra.army.mil/default.aspx**

8.1.2 The Contractors shall fill in the required information on the website, fields are shown below:

- Contract Number
- Delivery Order Number (if applicable)

- Task Order Number (if applicable)
- Requiring Activity Unit Identification Code (UIC)
- Command
- Contractor Contact Information
- Federal Service Code (FSC)
- Direct Labor Hours
- Direct Labor Dollars
- Location Information (where contractor and subcontractors (if applicable) performed the services

8.1.3 Reporting period will be the period of performance not to exceed 12 months ending September 30 of each government fiscal year and must be reported by 15 October of each calendar year.

8.1.4 If your particular contract crosses fiscal years, 2 entries must be made to capture the data for the contract period; for example if the contract start date is 1 January 2007 and ends 31 December 2007, the data for the period from 1 January 2007 through 30 September 2007 shall be entered not later than 15 October 2007 and the period 1 October 2007 through 31 December 2007 shall be entered not later than 15 January 2008.

Attachment A
Performance Requirements Summary:

A.1 The Contractor shall meet the following performance requirements. Performance requirements are addressed in each task and summarized in the following Performance Requirements Summary. If discrepancies or ambiguity exists between the documents, the order of precedence is 1) the Task; 2) Performance Requirements Summary; 3) Performance Metrics

Table A-1 Performance Requirements Summary

Task Application	Objective	Performance Standard	Minimum Acceptable Criteria	Measurement / Monitoring	Incentive/ Disincentive
1	Implement the four-phase TPP process.	Achieve the objectives of each TPP phase as listed in EM 200-1-2, EM 1110-1-4009 and applicable Interim Guidance Documents. Facilitate meetings in a professional and organized manner.	Acceptance of TPP documents (meeting presentations, agenda, handouts, Conceptual Site Model (CSM) and memorandums) with up to one (1) revision. Meetings held are organized; accomplish requirements of the TPP process; and be conducted in a professional manner. Zero letters of reprimand, grievances, or formal complaints.	TPP checklist for each phase as provided in the EM 200-1-2, EM 1110-1-4009 and applicable Interim Guidance Documents will be used to measure and document successful progress; guidance cited will be used to evaluate content of documents for acceptance / non-acceptance. Government will attend and evaluate organization and facilitation of the meetings, and professional nature of the meetings.	Satisfactory or greater Contractor Performance Assessment Reporting System (CPARS) rating/poor CPARS rating and/or re-performance of work at contractor's expense.
2	Prepare, submit and gain acceptance of a WP, and MC UFP-QAPP and QASP that are detailed and comprehensive plans covering all aspects of site characterization, risk assessment and methodology, and project execution. UFP-QAPP is only required	Prepare the WP in accordance with DID WERS-001.01 and other applicable DIDs for sub plans, EM 1110-1-4009, EM 385-1-1, EM 385-1-97, Army RI/FS guidance, Interim Guidance (Draft Army Regulation XXX) Chemical Warfare Materiel Responses and Related Activities as appropriate and other Interim Guidance as appropriate. Prepare	Acceptance of WP and UFP-QAPP with two revisions. Draft QASP reflects requirements of the WP and the Quality Control Plan (QCP) with one revision required.	Review of WP, UFP-QAPP and QASP to verify that the minimum acceptable content has been provided and meets applicable guidance.	Satisfactory or greater CPARS rating/poor CPARS rating and/or re-performance of work at contractor's expense.

	for to environmental sampling but may be used for the entire WP is USACE guidance is available.	the sampling and analysis plan, field sampling, and UFP-QAPP in accordance with EM 1110-1-4009, DID WERS-009.01, Intergovernmental Data Quality Task Force UFP-QAPP Manual, as appropriate. Prepare a risk assessment work plan as part of the overall project work plan incorporating implementation of the risk assessment and methodologies per USEPA Risk Assessment Guidance (RAGS), and USACE EM 200-1-4, Volumes I and II, as appropriate. UFP-QAPP content shall also meet the requirements of DoD Quality Systems Manual for Environmental Laboratories (current version). Draft QASP includes requirements in regulations, guidance, DIDs and the Quality Control Plan included in the WP.			
2a	Prepare, submit and gain acceptance of an Explosives Siting Plan (ESP).	Prepare required submission in accordance with DoD 6055.09-M, EM 385-1-97, Errata Sheet #3, and DID WERS-003.01 as a standalone document for inclusion after acceptance into the WP.	Acceptance of submission with two revisions. One additional revision is acceptable to incorporate EM-CX, USATCES and DDESB comments.	Review by Government using guidance cited to determine acceptability.	Satisfactory or greater CPARS rating/poor CPARS rating and/or re-performance of work at contractor's expense.
2b	Prepare, submit and gain acceptance of a Dive Plan.	Prepare, submit and gain acceptance of a Dive Plan that is a detailed and	Acceptance of submission with two revisions.	Review by Government using guidance cited to determine	Satisfactory or greater CPARS rating/poor CPARS rating and/or re-

		comprehensive plan covering all aspects of dive operations in accordance with EM 385-1-1.		acceptability.	performance of work at contractor's expense.
3	Utilize a geographic information system (GIS) in the development of the Conceptual Site Model (CSM) and maintain and manage all project and geospatial data.	Manage and maintain project data, and develop CSM in GIS IAW DID WERS-007.01, EM 200-1-2, EM 1110-1-4009 and applicable Interim Guidance Documents.	Acceptance of CSM and GeoSpatial Data submissions, which also meet quality and formatting requirements.	Review by Government using cited to determine acceptability to determine acceptability.	Satisfactory or greater CPARS rating/poor CPARS rating and/or re-performance of work at contractor's expense.
4	Conduct a remedial investigation in accordance with CERCLA, as amended, characterizing the nature and extent of MEC at the MRSs meeting the project DQOs as defined during the TPP process. This task shall include all field activities necessary to execute this task. For MC contamination, collect sufficient data that meets the project DQOs as defined during the TPP process, of known quality and quantity to determine the nature and extent of munitions constituents (MC) to support and perform a	Field work, data quantity and quality, and analysis of said data (does not include area where Rights-of-entry were not obtained) provides the following results in the RI report: - Demonstrate that the work was performed in accordance with the applicable laws, regulations, and guidance documents; - - - - - Demonstrate that data inputs from the RI into the FS will enable remediation cost estimates with an accuracy of +50%/-30%. The work and reporting shall address the surface and sub-surface metallic anomaly density distribution (anomaly/acre) across identified MEC contaminated areas and other remediation cost drivers such as	Conduct the RI in accordance with the accepted/approved WP, UFP-QAPP, and Dive Plan. QC data submitted meets requirement described in DID WERS-004.01. - Sampling field work and data meets established criteria within the accepted Uniform Federal UFP-QAPP, SAP, and Work Plan. - No more than 3-4 CARs/948s for non-critical violations and/or 1 CAR/948 for critical violation. No unresolved Corrective action requests. - All final data and QC tests/documentation submitted. Government QA acceptance of QC tests/documentation gained. - No Class "A" Safety accidents, contractor at fault; No Class "B", contractor at Fault, no more than 1 non-explosive Class C	Period inspection/review of field work and data. Verify compliance with accepted WP, UFP-QAPP and Dive Plan. Quality control tests/documentation submitted per the QASP for government review. Additionally, statistical confidence will be calculated using the Visual Sampling Plan software, UXO Estimator or some other statistical method. Boundary precision will be determined by evaluation of the sampling footprint as it relates to the reported contaminated/uncontaminated areas in question. Anomaly density profile and other remediation cost driver precision will be verified by	Satisfactory or greater CPARS rating/poor CPARS rating and/or re-performance of work at contractor's expense.

	human health and ecological baseline risk assessment.	vegetation type and density, terrain conditions, soil type, exclusion zone evacuation costs, etc each to a level of accuracy within the range specified herein. - Demonstrate that all areas with elevated anomaly density or with potential to contain MEC traversed at the completion of fieldwork and that there is at least 90% chance of detecting these areas; Demonstrate that the boundaries of all identified MEC contaminated areas have been delineated to an accuracy of at least 250 feet. Demonstrate that a 90 % confidence in the nature (type and density) of MEC and MEC related debris, for each relatively homogeneous MEC contaminated area, has been achieved. - For areas unlikely to contain a target with elevated anomaly density, but with the potential for MEC/MC contaminations (e.g. burial pits) the investigation strategy and implemented plan should incorporate the site specific information to design a geophysical survey capable of locating MEC contaminated areas. Additionally: - Perform the RI field activities in	accident; and <2 non-explosive related Class D accidents, IAW AR 385-40. - Major safety violations, no more than 1 non-explosive related safety violation. - Minor safety violations, no more than 2 safety violations. - Zero letters of reprimand, grievances, or formal complaints.	QA of methods used.	

		accordance with the accepted Work Plan and UFP-QAPP. - Proper processing and disposition of UXO, DMM, and MC encountered in accordance with approved plan(s). - All Material Potentially Presenting an Explosive Hazard (MPPEH) and munitions debris (MD) processed in accordance with EM 385-1-97 and applicable Errata Sheets. - Meet the project DQOs as defined by the TPP process. - All geophysics shall be IAW DID WERS-004.01, with the following exception for marine field work. Marine field work QC shall be recommended by the Contractor in the QCP. Government QA is expected to be limited to visual observation of the Contractors intrusive work and QC operations due to the dynamics of this high energy environment. The government recognizes that submerged metallic items have the potential to move great distances due to the local current and surf conditions and that prolonged seeding of test items may not be feasible. The government requests that the Contractor submit a modified QC Requirements table for government			

		acceptance for the marine and beach portions of the project to meet the needs of the project and still insure acceptable data quality to meet the project objectives. -For this task order 1 acre of transects equals 14,520 lf (2.75 miles) of transects 3 feet wide. One acre's worth of grids equals seventeen (17) 2500 sf grids or four (4) 10,000 sf grids. - To the maximum extent practicable the contractor should conduct the field investigation by gathering sensor data that is digitally recorded and geo-referenced (geo-referencing need be no more accurate than is needed for the use of the data). Exceptions may include situations where other methods provided data and/or significant cost value in which case the contractor shall provide detailed justification in their proposal describing why the other methods provide a better value. In any case a geo-referenced permanent record of the investigation shall be delivered as part of the RI report (GIS of traverse and items located, digital geophysical data, etc). - MC analyses shall be performed in accordance with the requirements of the			

		Department of Defense (DoD) Quality Assurance Manual (QAM), WERS-009.01 Munitions Constituents Chemical Data Quality Deliverables, and the approved project specific UFP-QAPP. - As appropriate, the contractor shall implement statistical methods for its sampling plan using discrete samples.			
5	Prepare, submit and gain acceptance of a RI report.	The RI report shall document the results of the RI and previous investigations, and the Contractor shall prepare the report in accordance with EP 1110-1-18, EM CX Interim Guidance 06-04, Army RI/FS guidance. The ecological and human health risk assessment shall be performed in accordance with the EPA Risk Assessment Guidance (RAGS) and USACE EM 200-1-4, Volumes I and II, as appropriate.	Acceptance of RI with two revisions.	Review of RI against guidance to verify that the minimum acceptable content has been provided.	Satisfactory or greater CPARS rating/poor CPARS rating and/or re-performance of work at contractor's expense.
6	Conduct a feasibility study and prepare, submit and gain acceptance of a FS report.	The FS report shall document the results of the FS and prepared in accordance with EP 1110-1-18, EM CX Interim Guidance 06-04, and Army RI/FS guidance.	Acceptance of FS with two revisions.	Review of FS against guidance to verify that the minimum acceptable content has been provided.	Satisfactory or greater CPARS rating/poor CPARS rating and/or re-performance of work at contractor's expense.
7	Prepare, submit and gain acceptance of Proposed Plans (PP).	Prepare the PP(s) in accordance with, ER 200-3-1, EP 1110-1-18, EM-CX Interim Guidance 06-04, EPA 540-R-98-031	Acceptance of PP with two revisions.	Review of PP against guidance to verify that the minimum acceptable content has been provided.	Satisfactory or greater CPARS rating/poor CPARS rating and/or re-performance of work at

		and CERCLA, as amended.			contractor's expense.
8	Prepare, submit and obtain acceptance of DDs for **each** delineated MRS resulting from the RI.	Prepare the DDs in accordance with ER 200-3-1, EP 1110-1-18, Attachment C, herein, EPA 540-R-98-031 and CERCLA, as amended.	Acceptance of DD(s) with two revisions.	Review of DD(s) against guidance to verify that the minimum acceptable content has been provided.	Satisfactory or greater CPARS rating/poor CPARS rating and/or re-performance of work at contractor's expense.
9	Successfully complete public meetings and support the Jacksonville District with community relations.	Contractor attends and participates in meetings. Meeting materials are accepted by the government as required. Meeting transcripts for PP meeting are accurate and prepared by a professional court reporter.	Acceptance of meeting materials with two revisions and acceptance of PP meeting transcripts in one revision. Meetings held are organized; and professional in nature. Contractor personnel in attendance are thoroughly familiar with the project. Zero letters of reprimand, grievances, or formal complaints.	Acceptance of required materials for meetings. Government will attend and evaluate the contractor's attendance, participation and professional demeanor.	Satisfactory or greater CPARS rating/poor CPARS rating.
10	Update, submit and gain acceptance of a PIP.	Prepare the PIP in accordance with EP 1110-3-8, ER 200-3-1, EM-CX Interim Guidance 06-04, guidance provided in the FUDS Public Involvement Toolkit and DENIX website.	Acceptance of PIP with two revisions.	Review of PIP against guidance to verify that the minimum acceptable content has been provided.	Satisfactory or greater CPARS rating/poor CPARS rating and/or re-performance of work at contractor's expense.
11	Maintain the Administrative Record for each MRS throughout the period of performance of this Task Order.	Prepare in accordance with the guidance in EP 1110-3-8, Chapter 4 (Establishing and Maintaining Administrative Records) and Standard Operating Procedure for Formerly Used Defense Sites (FUDS) Records Management, Revision 5, dated January 2008 (or most recent version).	Administrative record will be evaluated against guidance for compliance with requirements, accuracy and completeness of the record, with up to one uncorrected deficiency remaining during the period of performance.	The government will visit, at least once, the administrative record's location and check for completeness and compliance with referenced EP; electronic submissions will be evaluated randomly upon receipt as data is entered into the record.	Satisfactory or greater CPARS rating/poor CPARS rating and/or re-performance of work at contractor's expense.

12	Propose, utilize and evaluate effectiveness of innovative technology selected by the contractor.	Perform field activities using innovative technology while meeting the established criteria in tasks 4. Evaluation is supported by data and documented in a letter report that obtains Government QA acceptance with two revisions.	Applicable field work and data meets established criteria within the accepted Uniform Federal UFP-QAPP, SAP, and Work Plan.	Period inspection/review of field work, and data and compliance with accepted WP, UFP-QAPP and {List other plans as appropriately}. Quality control tests/documentation submitted per the QASP for government review.	Satisfactory or greater CPARS rating/poor CPARS rating and/or re-performance of work at contractor's expense.
13	Contractor shall prepare, submit and gain approval of a Baseline Survey Report documenting the results from the bathymetry, side scan sonar, and magnetometer/ EM and ROV/AUV investigation, as appropriate to include map(s) indicating location of surface MEC, coral species and other threatened and endangered plant species.				Satisfactory or greater CPARS rating/poor CPARS rating and/or re-performance of work at contractor's expense.
14	The Contractor shall provide a qualified Project Biologist for daily beach monitoring prior to intrusive ordnance activities as described in the Standard Operation Procedure for Endangered				

	Species Conservation, USACE, Jacksonville District. Project Biologist qualifications shall reflect 2-4 years experience in related work, working independently under general supervision (equivalent to industry Biologist II).				

Attachment B
PERFORMANCE METRICS

B.1 Performance Metrics for Performance Assessment Record (PAR)

	Exceptional	Very Good	Satisfactory	Marginal	Unsatisfactory
PAR Category: Quality of Product or Service					
Performance indicator: Document reviews					
Draft Plans, Reports, and documents [Plans, documents and reports are considered draft until accepted as final by the Government]	All contract-milestone documents accepted as submitted	No substantive comments (i.e. limited to grammar, spelling, terminology) to any of the documents, but a few exceptions were noted and corrected	Contractor met Acceptance Criteria	One or more documents required revisions to be resubmitted for approval prior to proceeding. Two backchecks were required on one or more documents before original comments were resolved satisfactorily.	One or more documents did not comply with contract requirements, or one or more documents required more than two backchecks before original comments were resolved satisfactorily, or more than one document was rejected.
Performance indicator: Project Execution					
Process Compliance	Zero Corrective Action Requests (CAR) or 948s	{1-2} CARs/948s for non-critical violations to WP requirements	Contractor met Acceptance Criteria	{5-6} CARs/948s for non-critical violations and/or {2} CARs/948 for critical violations	{>6} CARS for non-critical violations and/or {>2} CARs/948s for critical violations, or any unresolved CARs
Project Execution	Zero letters of reprimand, grievances, or formal complaints AND one or more unsolicited letters of commendation		Contractor met Acceptance Criteria	{One} letter of reprimand, grievance or formal complaint that was resolved through negotiation	More than {one} letter of reprimand, grievance or formal complaint that were resolved through negotiation
Task Completion			Contractor met Acceptance Criteria		Final data and QC documentation submitted but not accepted
PAR Category: Schedule					
Performance indicator: Timely completion of tasks					
Final Plans and Reports, project milestones, T.O. invoices	All document submittals and task order milestones and invoices	Project closed out/final invoice accepted ahead of schedule	Project closed out/final invoice accepted on T.O. date	Project closed out/final invoice accepted within 30 calendar days after T.O. date.	Project closed out/final invoice accepted more than 30

	Exceptional	Very Good	Satisfactory	Marginal	Unsatisfactory
	complete and accepted by T.O date, project closed out/final invoice approved ahead of schedule				calendar days after T.O. date.
Project status reports accurate			Yes		No
Performance indicator: Impacts to schedule					
Impacts caused by Contractor or other causes identified, in writing to HNC CO/ PM, in a timely manner to apply acceptable corrective actions.			Yes		No
PAR Category: Cost Control (Not Applicable for Firm Fixed Price)					
Performance indicator: No unauthorized cost overruns					
Unauthorized cost overruns			No		Yes
Total Project Costs	Total contract invoices less than 98% of T.O. authorized amount	Total contract invoices greater than 98% but less than 99.99%of T.O. authorized amount	Total contract invoices between 99.99% and 100% of T.O. authorized amount	Total contract invoices greater than 100% but less than 105% of T.O. authorized amount	Total contract invoices greater than or equal to 105% of T.O. authorized amount
Performance indicator: Monthly cost report					
Monthly cost reports accurate			Yes		No
Performance indicator: Impacts to cost					
Impacts caused by Contractor or other causes identified, in writing to HNC CO/PM, in a timely manner to apply acceptable corrective actions.			Yes		No
PAR Category: Business Relations					
Performance indicator: Met contractual obligations					
Corrective Actions taken were timely and effective (Refer to CARs issued to Contractor)			Yes		No
Performance indicator: Professional and Ethical Conduct					
Meetings and correspondences	Zero letters of reprimand,		Contractor met Acceptance	One letter of reprimand,	More than one letter of

	Exceptional	Very Good	Satisfactory	Marginal	Unsatisfactory
with Public, project delivery team and other stakeholders	grievances, or formal complaints AND one or more unsolicited letters of commendation		Criteria	grievance or formal complaint that was resolved through negotiation	reprimand, grievance or formal complaint that were resolved through negotiation OR removal of one or more project personnel as a results of a letter of reprimand, grievance or formal complaint.
Performance indicator: Customer has overall satisfaction with work performed					
Customer survey results for rating period	4.0-5.0	3.0-3.9	2.0-2.9	1.0-1.9	<1.0
Performance indicator: Personnel responsive and cooperative					
Key personnel responsive, and cooperative	Always		Most Times		Almost Never
PAR Category: Management of Key Personnel and Resources					
Performance indicator: Personnel knowledgeable and effective in their areas of responsibility					
Personnel assigned to tasks	All personnel proposed by Contractor were assigned to project, some personnel were substituted by higher qualified individuals.		All personnel proposed by Contractor were assigned to project, some personnel were substituted by equally qualified individuals.	All personnel proposed by Contractor were assigned to project, some personnel were substituted by equally qualified individuals, Letter of reprimand received for personnel conduct from HNC.	All personnel proposed by Contractor were assigned to project, some personnel were substituted by lesser qualified individuals or HNC requested, in writing, removal of assigned personnel for poor performance.
Performance indicator: Personnel able to manage resources efficiently					
Instances when resource management had negative impact on project execution	0	1-2	3-4	5-6	>6
PAR Category: Safety					
Performance indicator: Accidents and Violations					
*No Class A Accidents, Contractor at fault	0 No class A accidents IAW AR 385-40	No class A accidents IAW AR 385-40	Contractor met Acceptance Criteria	{<2} non-explosive related Class C accidents, or {1} non-explosive	{1} Any Class A accident IAW AR-385-10, or Any explosive

	Exceptional	Very Good	Satisfactory	Marginal	Unsatisfactory
				Class B accident, IAW AR 385-10	related accident.
*Major safety violations	0 accidents/injuries No safety violations	0 accidents/injuries No safety violations		{2} non-explosive safety violations.	{>1} any violation of procedures for handling, storage, transportation, or use of explosives IAW the WP, and all Federal, State and local laws/ordinances.
*Minor safety violations	No safety violations	1 safety violation		{3} safety violations	{>3} safety violations

Classes of Accidents:

- **Class A:** Fatality or permanent total disability (Government Civilian, Military Personnel, and/or Contractor), or >$2,000,000 property damage.

- **Class B:** Permanent partial disability or impatient hospitalization of 3 or more persons (Government Civilian, Military Personnel, and/or Contractor), $500,000< $2,000,000 property damage.

- **Class C:** Lost Workday (Contractor) or Lost Time (Government Civilians), $50,000< $500,000 property damage.

- **Class D:** $2000 < $50,000 property damage.

* From Section C of Solicitation Number W912DY-04-R-0003, Amendment 000 W912DY-08-R-0016, Amendment 0007 (may be included but are not limited to these).

The following guidelines are provided for issuing ratings that are subjective in nature, these ratings will be supported by the weight of evidence documented during the government's surveillance efforts:

Exceptional: Performance *meets* contractual requirements and *exceeds many* to the Government's benefit. The contractual performance of the element or sub-element being assessed was accomplished with *few minor problems* for which corrective actions taken by the Contractor were *highly effective*.

Very Good: Performance *meets* contractual requirements and *exceeds some* to the Government's benefit. The contractual performance of the element or sub-element being assessed was accomplished with *some minor problems* for which corrective actions taken by the Contractor were *effective*.

Satisfactory: Performance *meets* contractual requirements. The contractual performance of the element or sub-element contains *some minor problems* for which corrective actions taken by the Contractor *appear or were satisfactory*.

Marginal: Performance *does not meet all* contractual requirements. The contractual performance of the element or sub-element being assessed reflects a *serious problem* for which the Contractor has *not yet identified corrective actions*. The Contractor's proposed actions appear only *marginally effective or were not fully implemented.*

Unsatisfactory: Performance *does not meet most* contractual requirements and *recovery is not likely* in a timely manner. The contractual performance of the element or sub-element contains *serious problems* for which the Contractor's corrective actions *appear or were ineffective.*

Attachment C

1. REQUIREMENTS AND PROCEDURES:

a. This interim guidance provides specific requirements for MMRP Decision Documents.

b. Format and content of ALL MMRP decision documents and action memoranda, regardless of signature authority shall be in accordance with Section 2. Each document will contain:

(1) A title page,

(2) A table of contents,

(3) List of acronyms,

(4) Page numbers on each page indicating page number and total number of pages in the document, e.g., “1 of 25”.

(5) Header in the upper right-hand corner of each page including; document type (“Decision Document”, “Time Critical Removal Actions (TCRA) Action Memorandum”, or “Non-time Critical Removal Action (TCRA) Action Memorandum”), project name (“Sitka Naval Operating Base”), project location (“Sitka, Alaska”), and project number to include MRS number.

c. All decision documents or action memoranda, regardless of level of signature authority, will be accompanied by an Executive Summary that for Headquarters (HQ). USACE will forward to ACSIM-ISE and DASA (ESOH). The Executive Summary shall be kept to a single page, whenever possible, and will include:

(1) Title, including project name and project number, date DD (or AM) was signed and by whom,

(2) Brief description of the Munitions Response Sites (MRS), covered by the decision,

(3) Brief description of selected response action and its relationship to other cleanup actions,

(4) Degree of risk reduction,

(5) Present worth cost of selected response action, and the contribution to the cost-to-complete of all remedies for the FUDS Property,

(6) Amounts and fiscal year(s) that funds are required for remedial/removal action design and construction,

(7) Duration of any remedial action-operation (RA-O), removal action construction (RmA-C) and/or Long Term Monitoring (LTM) actions,

(8) Land use controls (LUC) required and means of maintaining them,

(9) Other potential response actions considered, and

(10) Expected result of the action.

APPENDIX B. SITE MAPS

This appendix contains the following project site maps:

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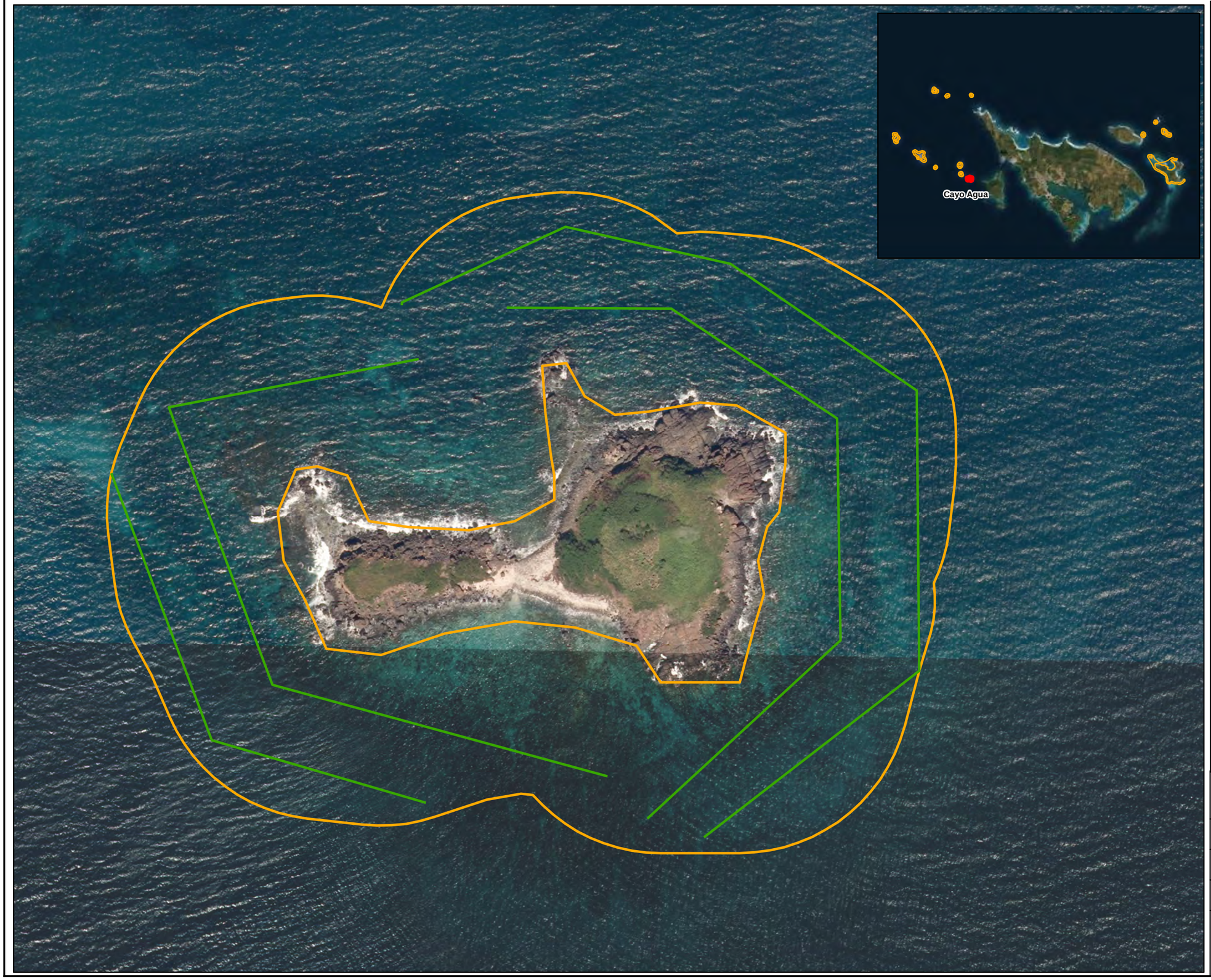

N

50 25 0 50

Meters

Data is projected to the UTM Coordinate System: Zone 20 North, NAD83, Units in Meters.

Remedial Investigation/ Feasibility Study

Figure B-1

MRS 02
Cayo Del Agua
EM Platform Map

Culebra Island Site, Puerto Rico

Legend

DGM Method

- EM ROV (15.03 mi)
- MRS 02 with 100yd Buffer (304.42 acres)

PARSONS

US Army Engineering And Support Center Huntsville, Alabama

Drawn By:	JAL	Scale: 1 in = 50 meters	Rev: 1
Checked By:		Date Drawn:	10-14-2013
Submitted By:	TB	Revision Date:	3-20-2014

Path: S:\Culebra1\Culebra MRS 2 and 7\MXD\Work Plan\B-1 MRS 2 Agua EM Platform.mxd

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40 20 0 40

Meters

Data is projected to the UTM Coordinate System: Zone 20 North, NAD83, Units in Meters.

Remedial Investigation/ Feasibility Study

Figure B-2

MRS 02
Cayo Raton
EM Platform Map

Culebra Island Site, Puerto Rico

Legend

DGM Method

- EM ROV (15.03 mi)
- MRS 02 with 100yd Buffer (304.42 acres)

PARSONS

US Army Engineering And Support Center Huntsville, Alabama

Drawn By:	JAL	Scale:	1 in = 40 meters	Rev:	1
Checked By:		Date Drawn:	10-14-2013		
Submitted By:	TB	Revision Date:	3-20-2014		

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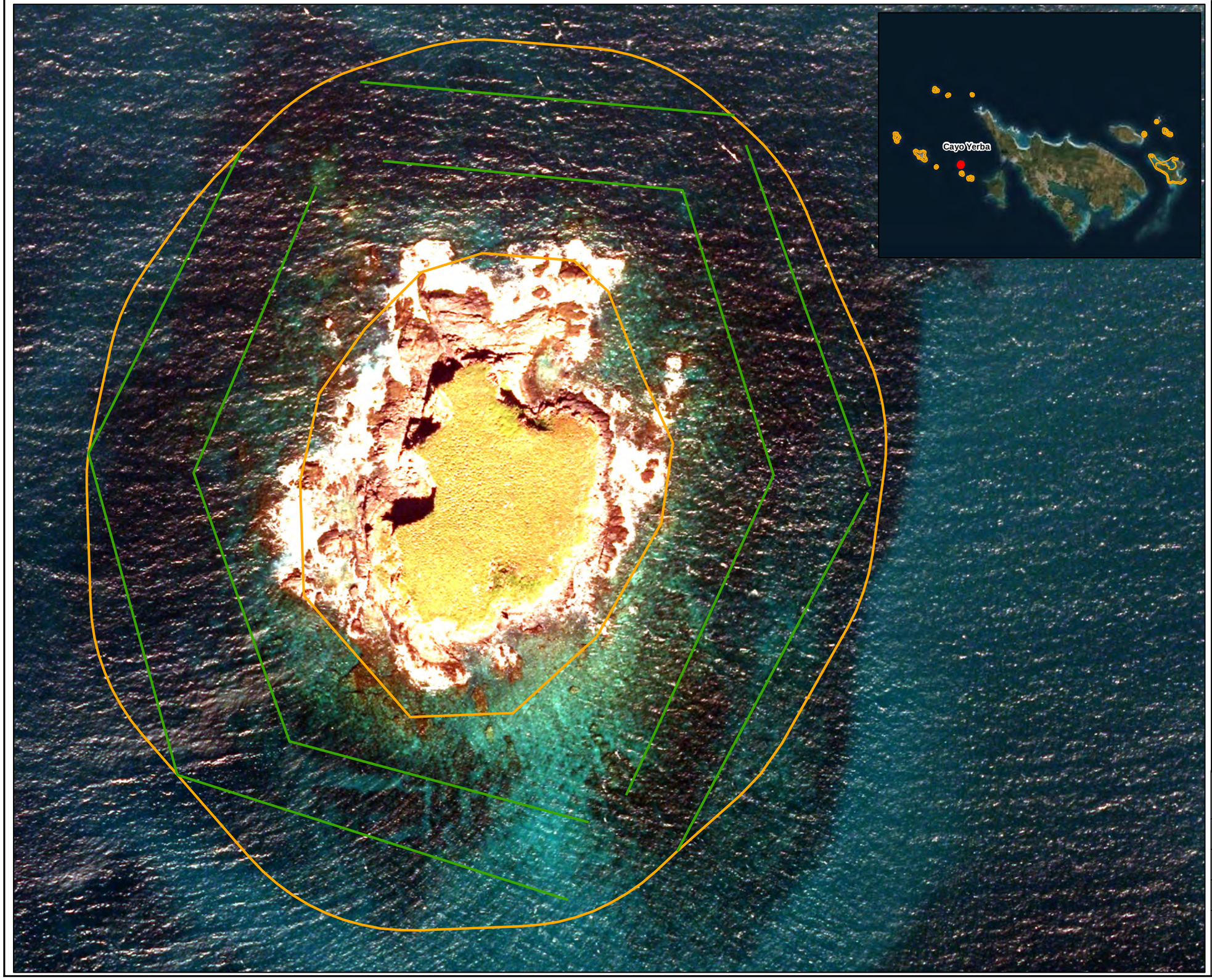

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40 20 0 40

Meters

Data is projected to the UTM Coordinate System: Zone 20 North, NAD83, Units in Meters.

Remedial Investigation/ Feasibility Study

Figure B-3

MRS 02
Cayo Yerba
EM Platform Map

Culebra Island Site, Puerto Rico

Legend

DGM Method

- EM ROV (15.03 mi)
- MRS 02 with 100yd Buffer (304.42 acres)

PARSONS

US Army Engineering And Support Center Huntsville, Alabama

Drawn By:	JAL	Scale: 1 in = 40 meters	Rev: 1
Checked By:		Date Drawn:	10-14-2013
Submitted By:	TB	Revision Date:	3-20-2014

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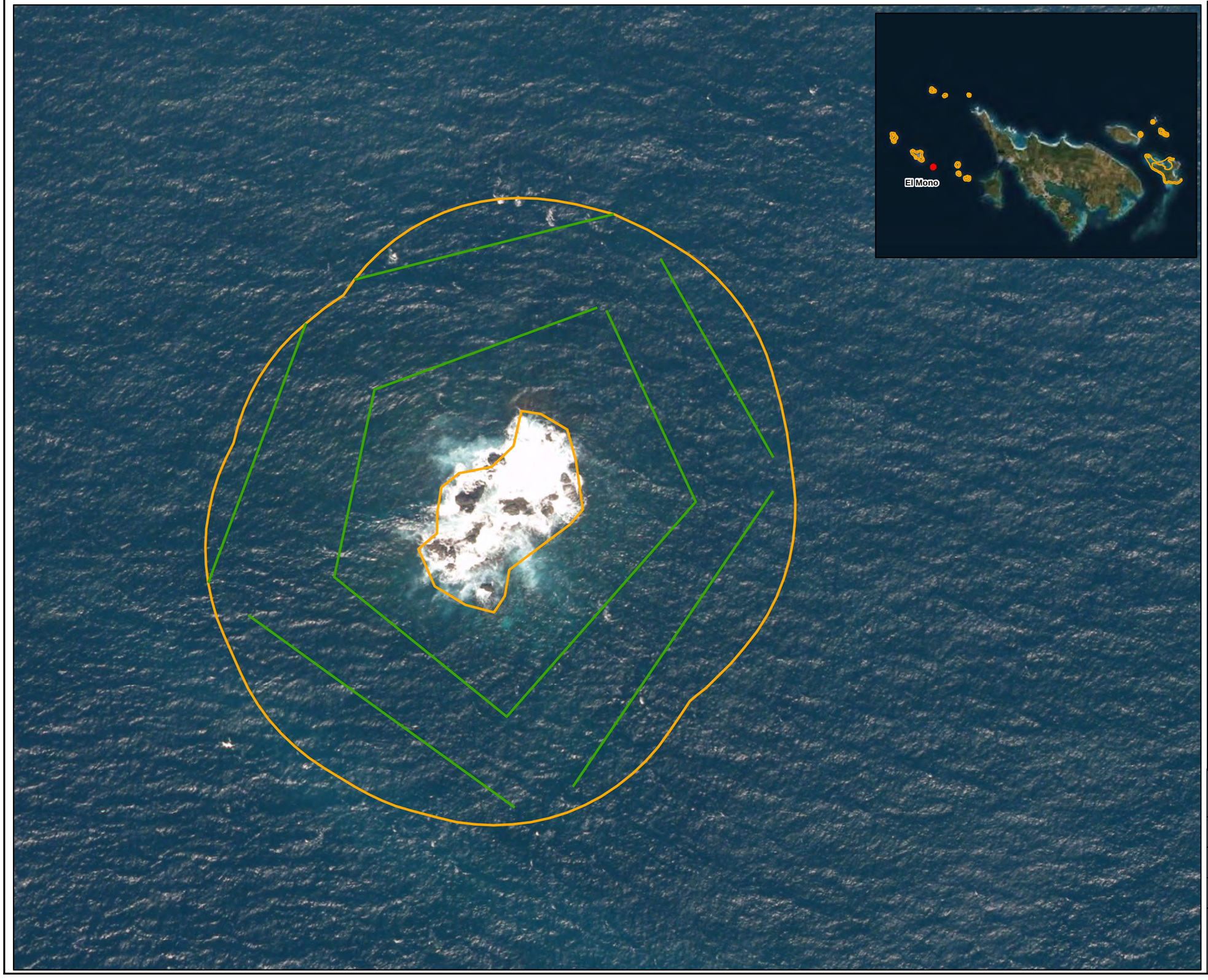

N

40 20 0 40

Meters

Data is projected to the UTM Coordinate System: Zone 20 North, NAD83, Units in Meters.

Remedial Investigation/ Feasibility Study

Figure B-4

MRS 02
El Mono
EM Platform Map

Culebra Island Site, Puerto Rico

Legend

DGM Method

- EM ROV (15.03 mi)
- MRS 02 with 100yd Buffer (304.42 acres)

PARSONS

US Army Engineering And Support Center Huntsville, Alabama

Drawn By:	JAL	Scale:	1 in = 40 meters	Rev:	1
Checked By:		Date Drawn:	10-14-2013		
Submitted By:	TB	Revision Date:	3-20-2014		

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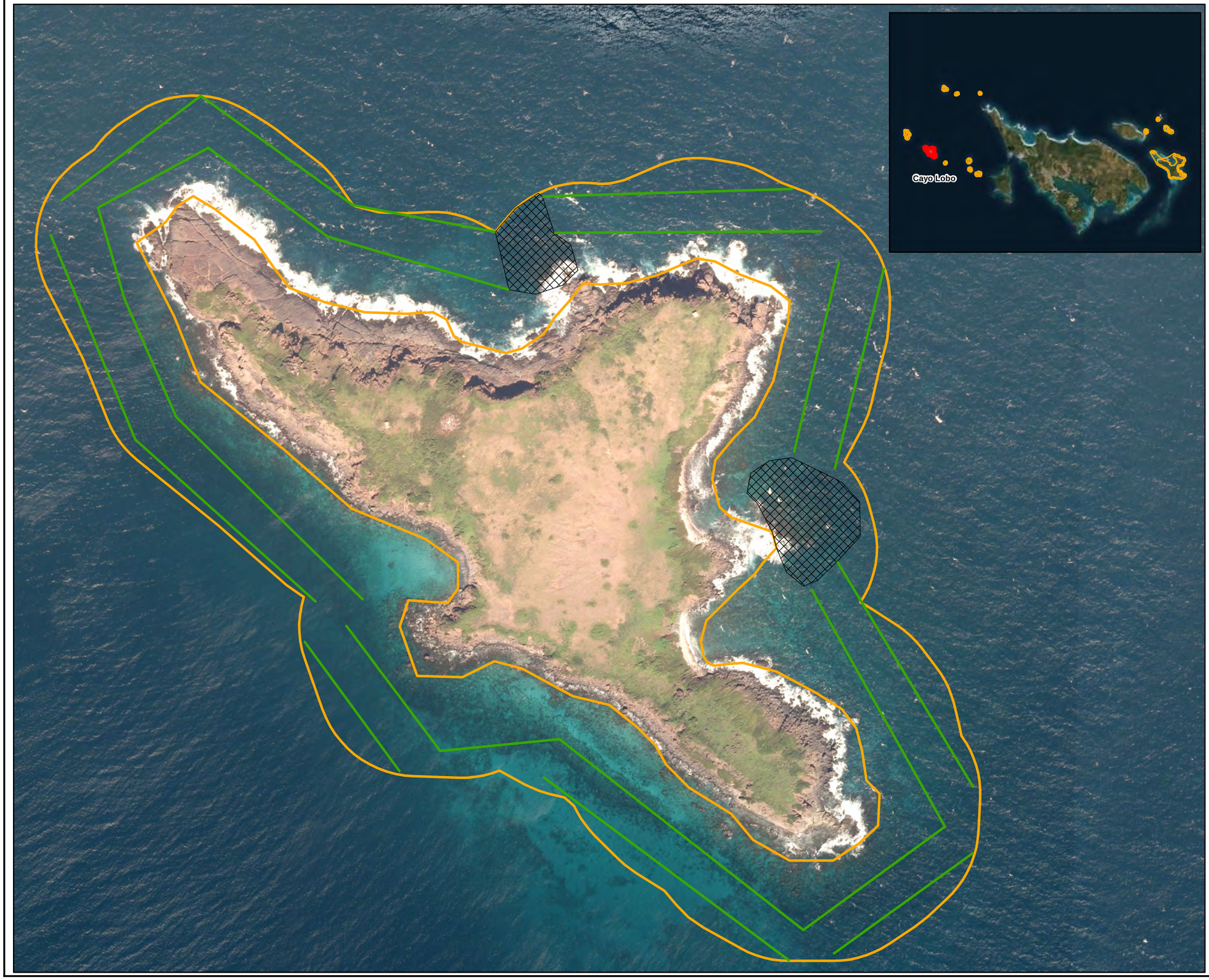

N

85 42.5 0 85

Meters

Data is projected to the UTM Coordinate System: Zone 20 North, NAD83, Units in Meters.

Remedial Investigation/ Feasibility Study

Figure B-5

MRS 02
Cayo Lobo
EM Platform Map

Culebra Island Site, Puerto Rico

Legend

DGM Method

- EM ROV (15.03 mi)
- Potential Unsurveyed Areas (shallow/rocky areas)
- MRS 02 with 100yd Buffer (304.42 acres)

PARSONS	US Army Engineering And Support Center Huntsville, Alabama	
Drawn By: JAL	Scale: 1 in = 85 meters	Rev: 2
Checked By:	Date Drawn: 10-14-2013	
Submitted By: TB	Revision Date: 3-26-2015	
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N

80 40 0 80

Meters

Data is projected to the UTM Coordinate System: Zone 20 North, NAD83, Units in Meters.

Remedial Investigation/ Feasibility Study

Figure B-6

MRS 02
Cayo Lobito
EM Platform Map

Culebra Island Site, Puerto Rico

Legend

DGM Method

- EM ROV (15.03 mi)
- Potential Unsurveyed Areas (shallow/rocky areas)
- MRS 02 with 100yd Buffer (304.42 acres)

PARSONS	US Army Engineering And Support Center Huntsville, Alabama	
Drawn By: JAL	Scale: 1 in = 80 meters	Rev: 2
Checked By:	Date Drawn: 10-14-2013	
Submitted By: TB	Revision Date: 3-26-2015	
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N

50 25 0 50

Meters

Data is projected to the UTM Coordinate System: Zone 20 North, NAD83, Units in Meters.

Remedial Investigation/ Feasibility Study

Figure B-7

MRS 02
Alcarraza
EM Platform Map

Culebra Island Site, Puerto Rico

Legend

DGM Method

- EM ROV (15.03 mi)
- MRS 02 with 100yd Buffer (304.42 acres)

PARSONS

US Army Engineering And Support Center Huntsville, Alabama

Drawn By:	JAL	Scale:	1 in = 50 meters	Rev:	1
Checked By:		Date Drawn:	10-14-2013		
Submitted By:	TB	Revision Date:	3-20-2014		

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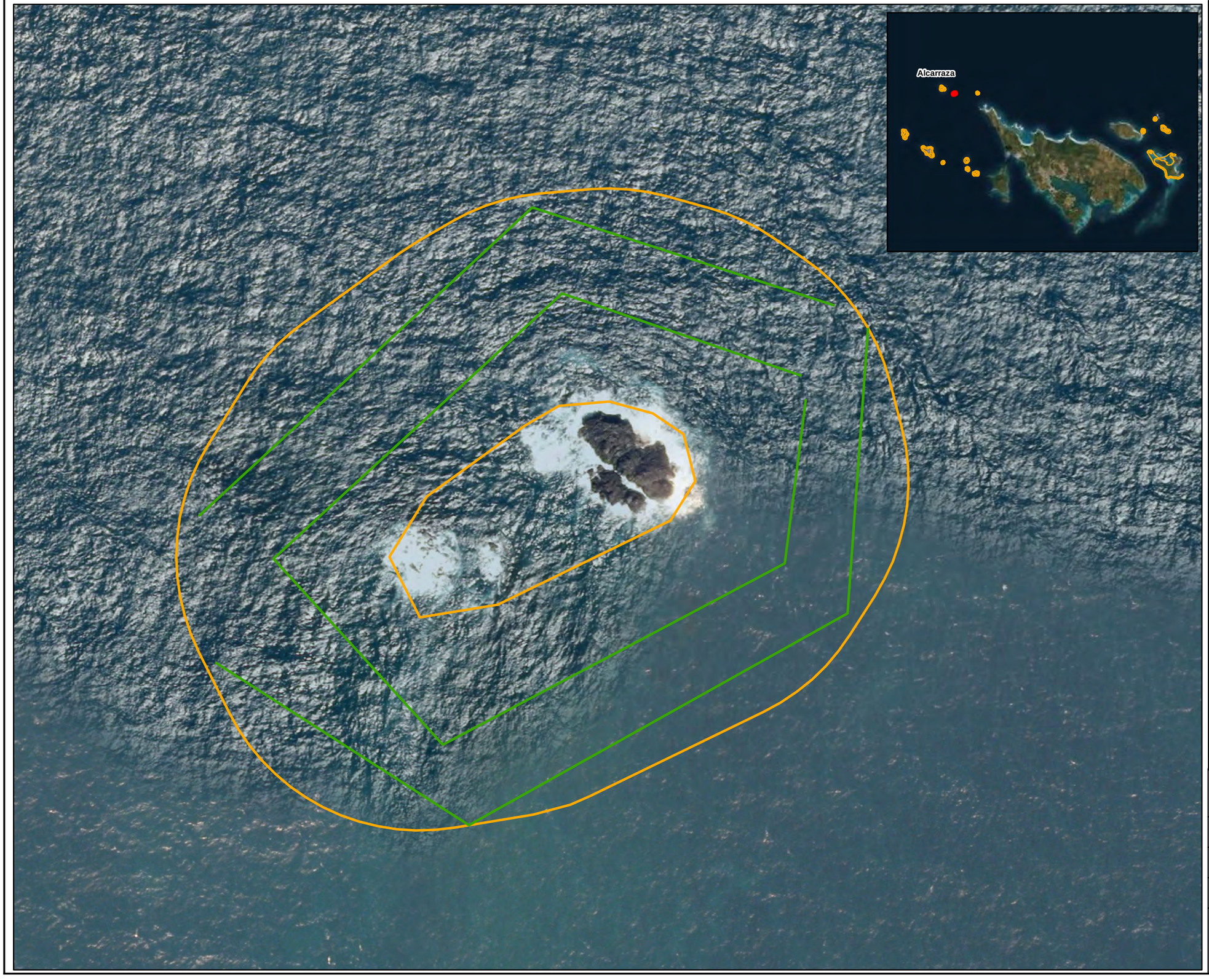

N

40 20 0 40

Meters

Data is projected to the UTM Coordinate System: Zone 20 North, NAD83, Units in Meters.

Remedial Investigation/ Feasibility Study

Figure B-8

MRS 02
Los Gemelos
EM Platform Map

Culebra Island Site, Puerto Rico

Legend

DGM Method

- EM ROV (15.03 mi)
- MRS 02 with 100yd Buffer (304.42 acres)

PARSONS

US Army Engineering And Support Center Huntsville, Alabama

Drawn By:	JAL	Scale:	1 in = 40 meters	Rev:	1
Checked By:		Date Drawn:	10-14-2013		
Submitted By:	TB	Revision Date:	3-20-2014		

Path:
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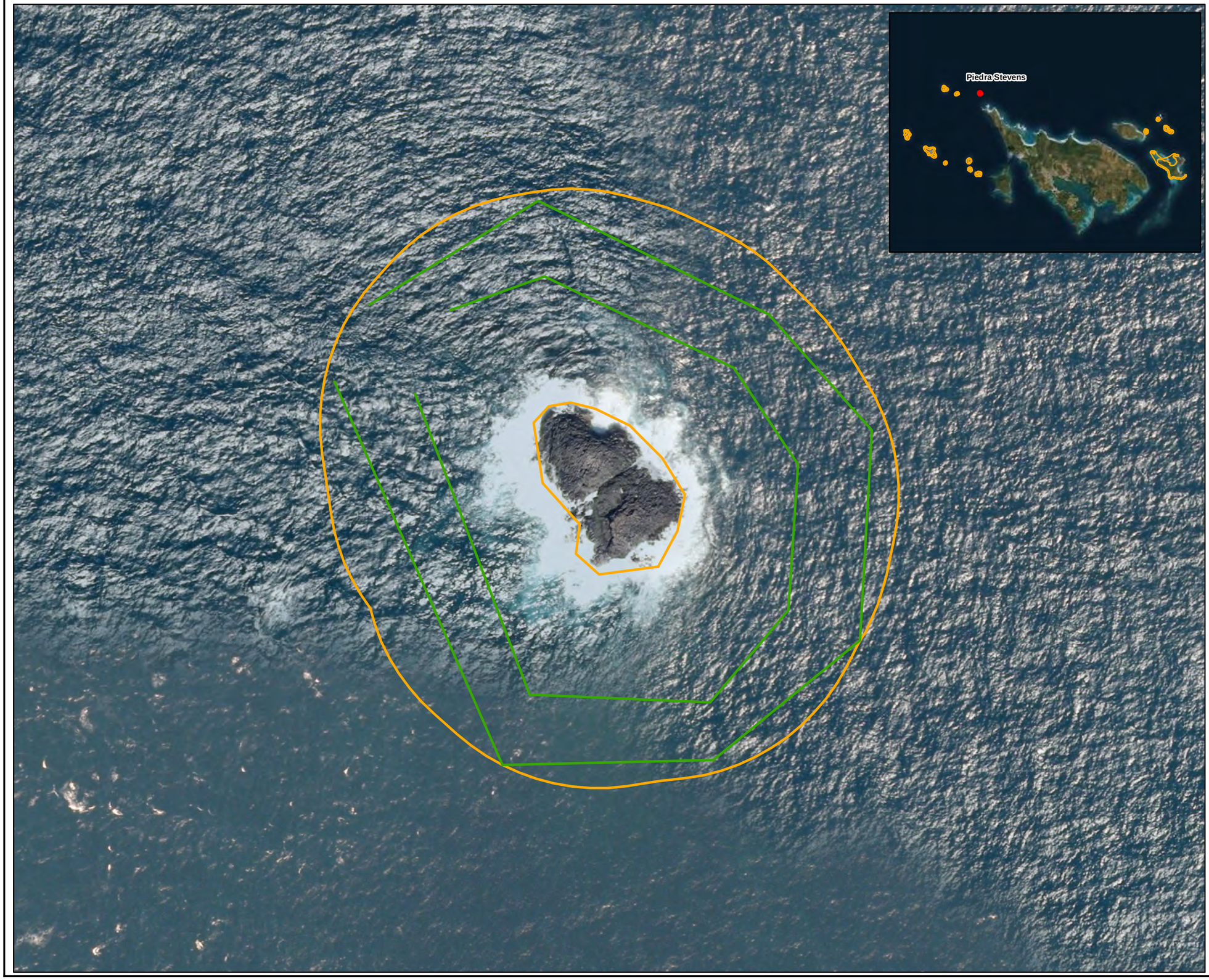

N

40 20 0 40

Meters

Data is projected to the UTM Coordinate System: Zone 20 North, NAD83, Units in Meters.

Remedial Investigation/ Feasibility Study

Figure B-9

MRS 02
Piedra Stevens
EM Platform Map

Culebra Island Site, Puerto Rico

Legend

DGM Method

- EM ROV (15.03 mi)
- MRS 02 with 100yd Buffer (304.42 acres)

PARSONS

US Army Engineering And Support Center Huntsville, Alabama

Drawn By:	JAL	Scale: 1 in = 40 meters	Rev: 1
Checked By:		Date Drawn:	10-14-2013
Submitted By:	TB	Revision Date:	3-20-2014

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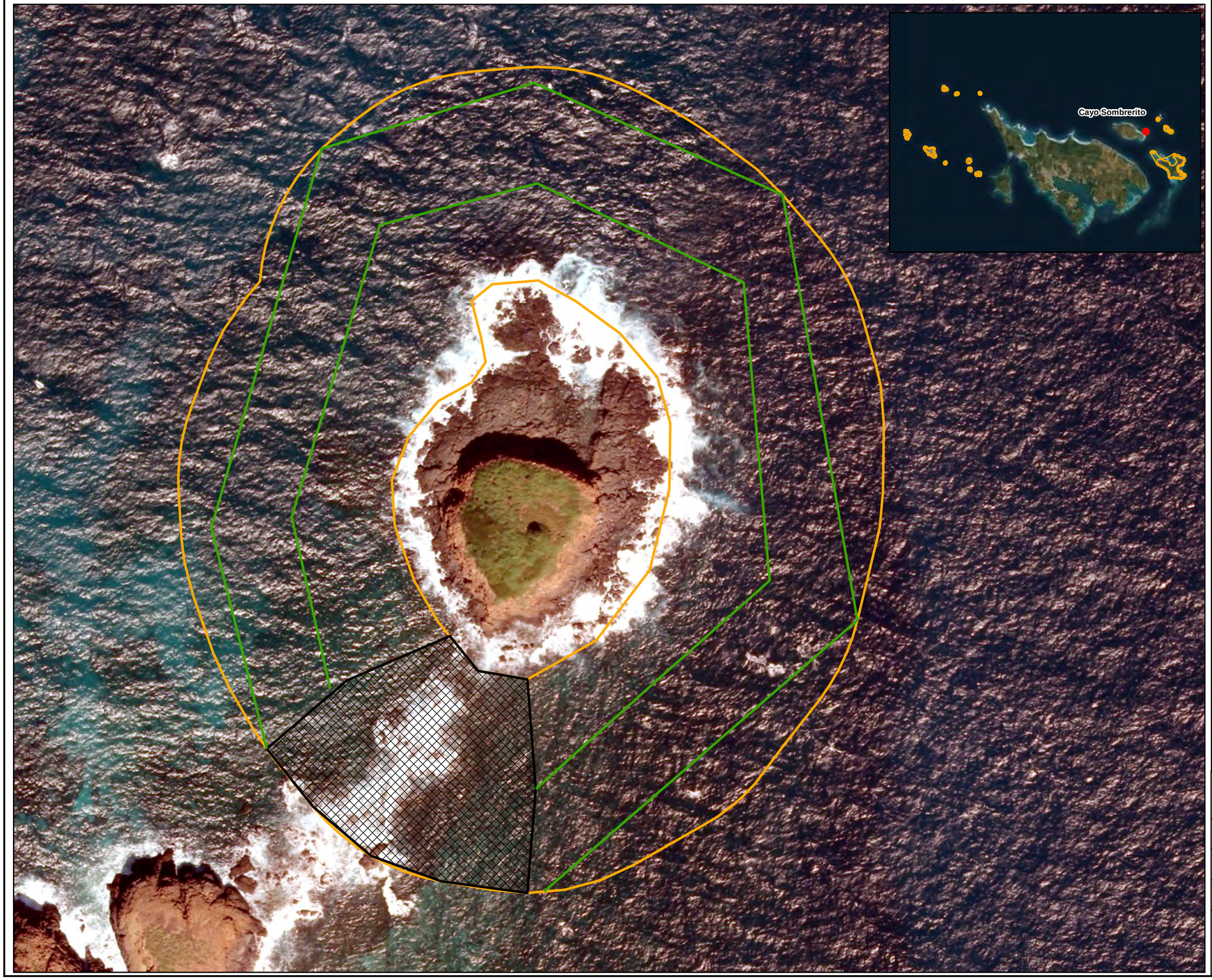

N

40 20 0 40

Meters

Data is projected to the UTM Coordinate System: Zone 20 North, NAD83, Units in Meters.

Remedial Investigation/ Feasibility Study

Figure B-10

MRS 02
Cayo Sombrerito
EM Platform Map

Culebra Island Site, Puerto Rico

Legend

DGM Method

- EM ROV (15.03 mi)
- Potential Unsurveyed Areas (shallow/rocky areas)
- MRS 02 with 100yd Buffer (304.42 acres)

PARSONS	US Army Engineering And Support Center Huntsville, Alabama	
Drawn By: JAL	Scale: 1 in = 40 meters	Rev: 2
Checked By:	Date Drawn: 10-14-2013	
Submitted By: TB	Revision Date: 3-26-2015	
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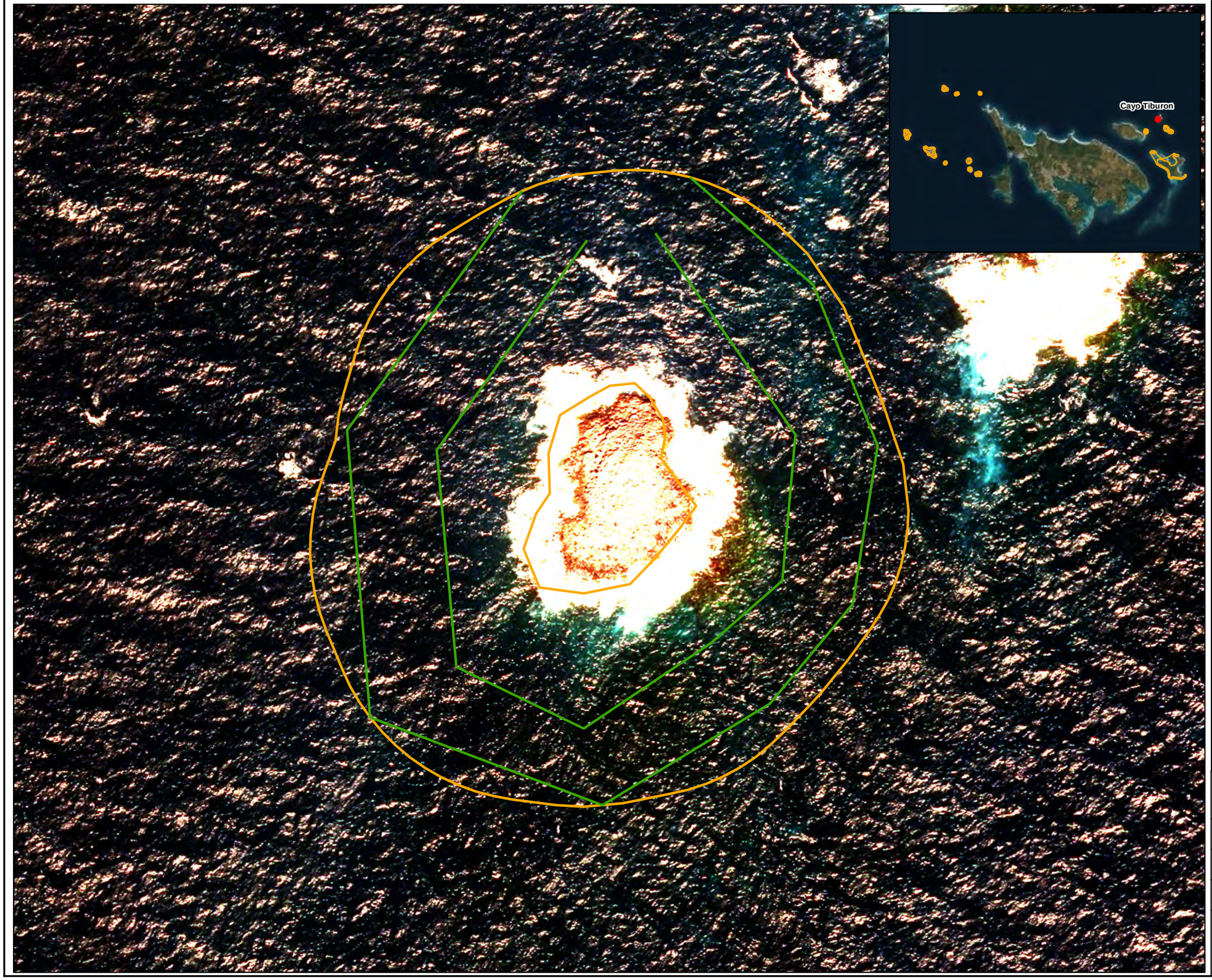

N

40 20 0 40

Meters

Data is projected to the UTM Coordinate System: Zone 20 North, NAD83, Units in Meters.

Remedial Investigation/ Feasibility Study

Figure B-11

MRS 02
Cayo Tiburon
EM Platform Map

Culebra Island Site, Puerto Rico

Legend

DGM Method

- EM ROV (15.03 mi)
- MRS 02 with 100yd Buffer (304.42 acres)

PARSONS

US Army Engineering And Support Center Huntsville, Alabama

Drawn By:	JAL	Scale: 1 in = 40 meters	Rev: 1
Checked By:		Date Drawn:	10-14-2013
Submitted By:	TB	Revision Date:	3-20-2014

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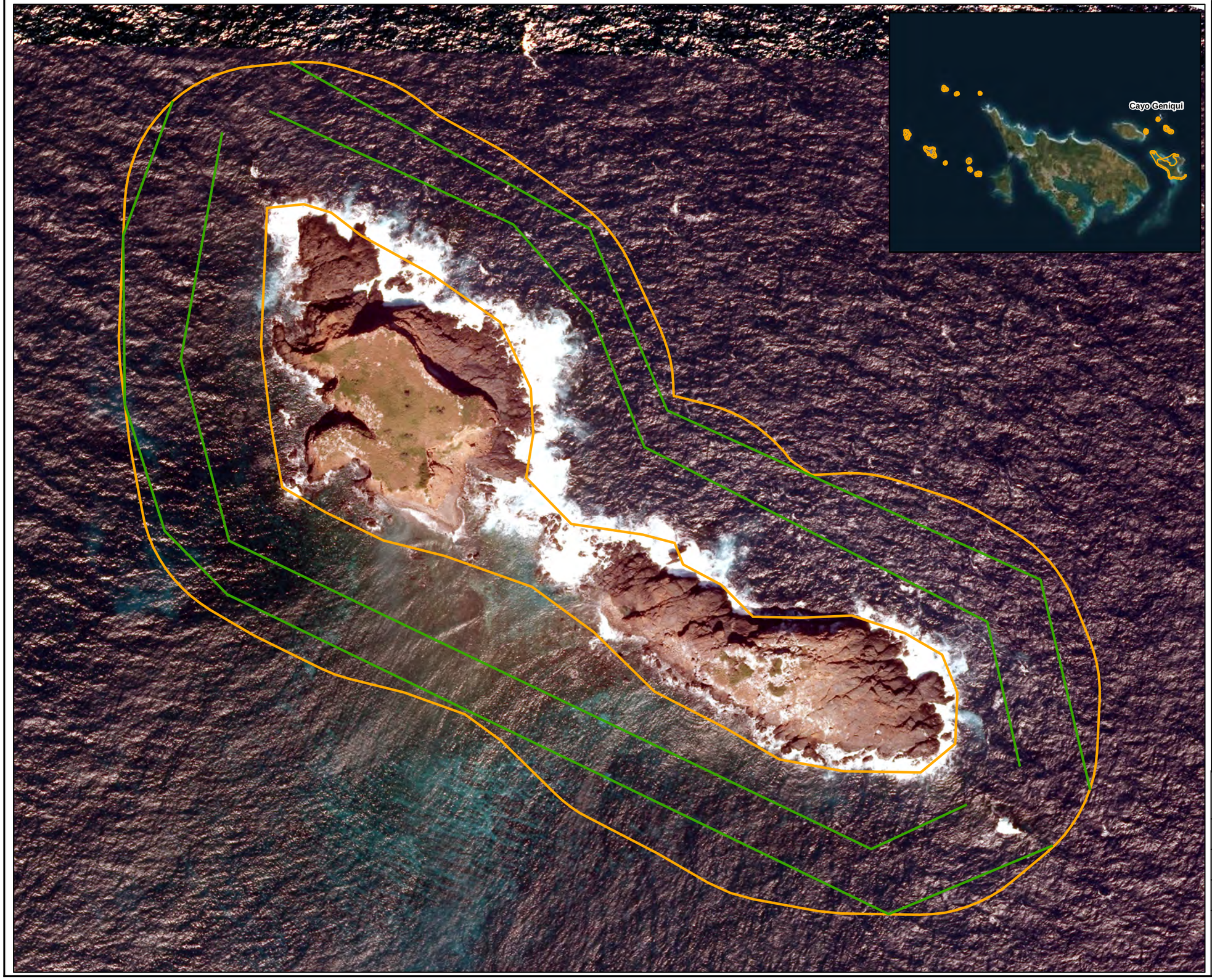

N

60 30 0 60

Meters

Data is projected to the UTM Coordinate System: Zone 20 North, NAD83, Units in Meters.

Remedial Investigation/ Feasibility Study

Figure B-12

MRS 02
Cayo Geniqui
EM Platform Map

Culebra Island Site, Puerto Rico

Legend

DGM Method

- EM ROV (15.03 mi)
- MRS 02 with 100yd Buffer (304.42 acres)

PARSONS

US Army Engineering And Support Center Huntsville, Alabama

Drawn By:	JAL	Scale:	1 in = 60 meters	Rev:	1
Checked By:		Date Drawn:	10-14-2013		
Submitted By:	TB	Revision Date:	3-20-2014		

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N

200 100 0 200

Meters

Data is projected to the UTM Coordinate System: Zone 20 North, NAD83, Units in Meters.

Remedial Investigation/ Feasibility Study

Figure B-13

MRS 07
Culebrita
EM Platform Map

Culebra Island Site, Puerto Rico

Legend

DGM Method

- EM Float or Analog Snorkel (6.67 mi)
- EM ROV (2.40 mi)
- Potential Unsurveyed Areas (shallow/rocky areas)
- MRS 07 with 100yd Buffer (213.48 acres)

PARSONS

US Army Engineering And Support Center Huntsville, Alabama

Drawn By:	JAL	Scale:	1 in = 200 meters	Rev:	3
Checked By:		Date Drawn:	10-14-2013		
Submitted By:	TB	Revision Date:	3-26-2015		

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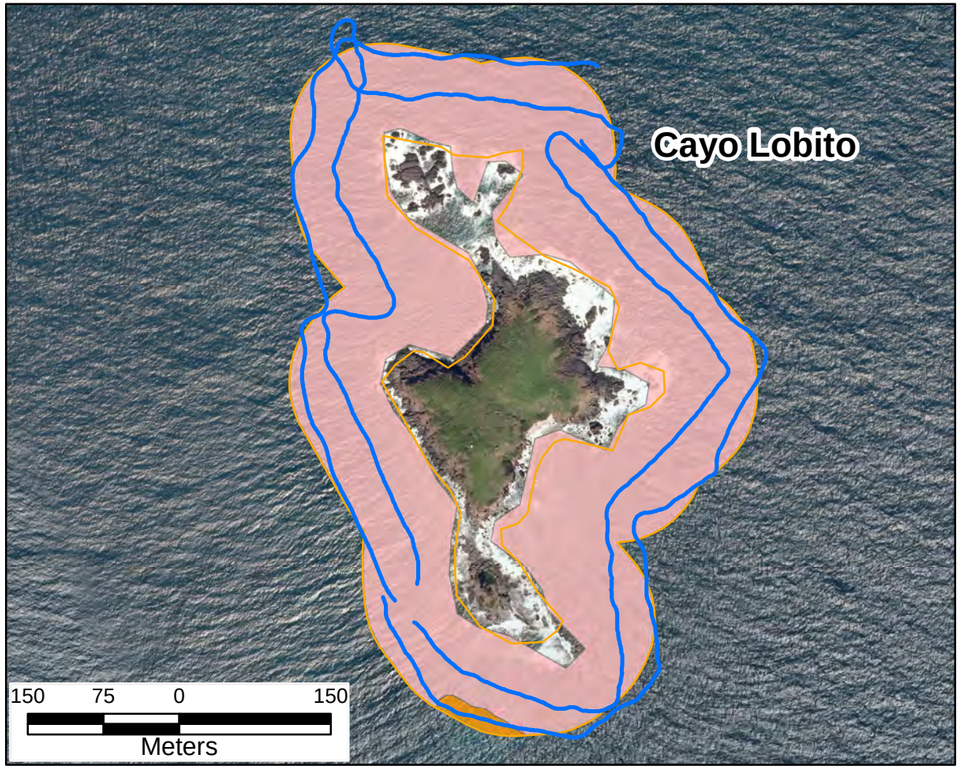
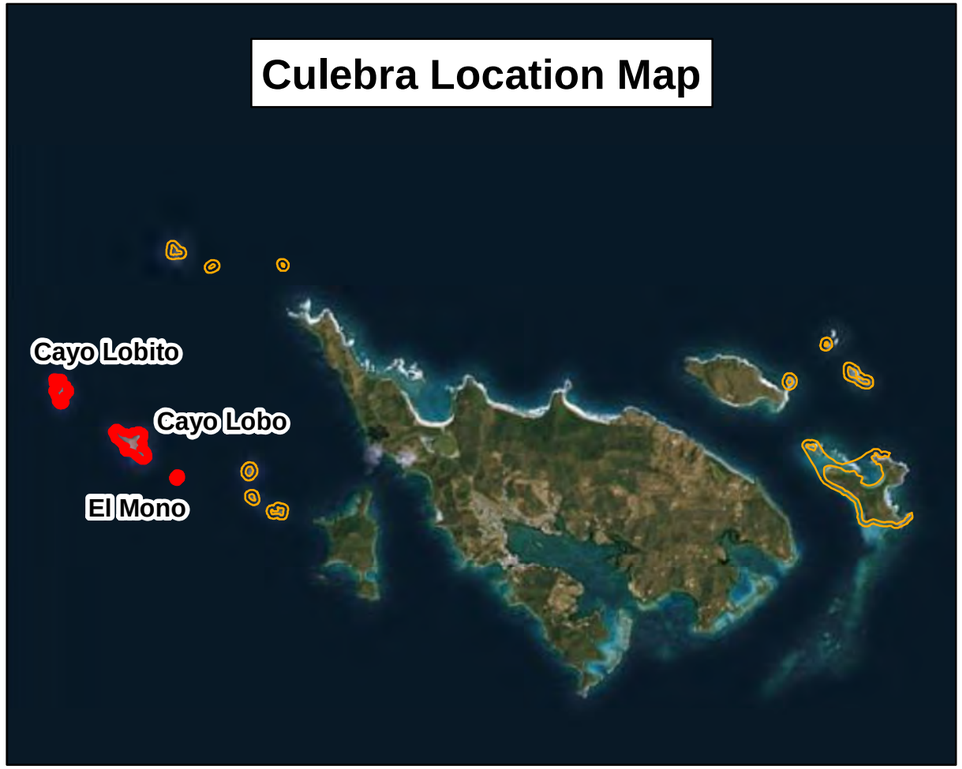




N

Scale Varies

Data is projected to the UTM Coordinate System: Zone 20 North, NAD83, Units in Meters.

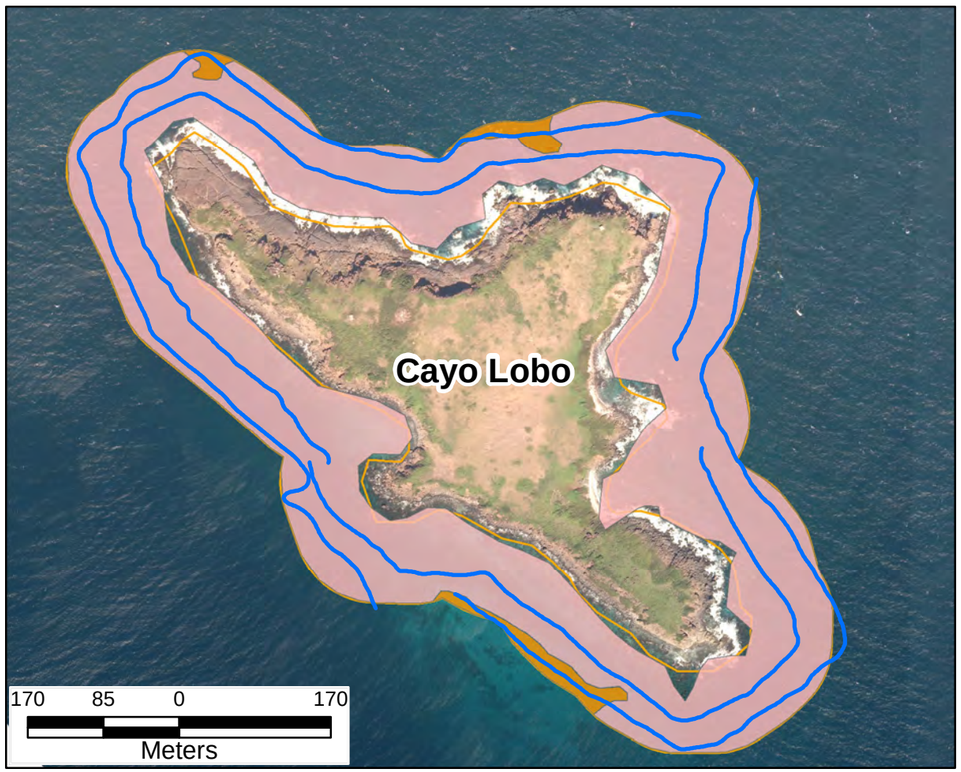
Remedial Investigation/ Feasibility Study

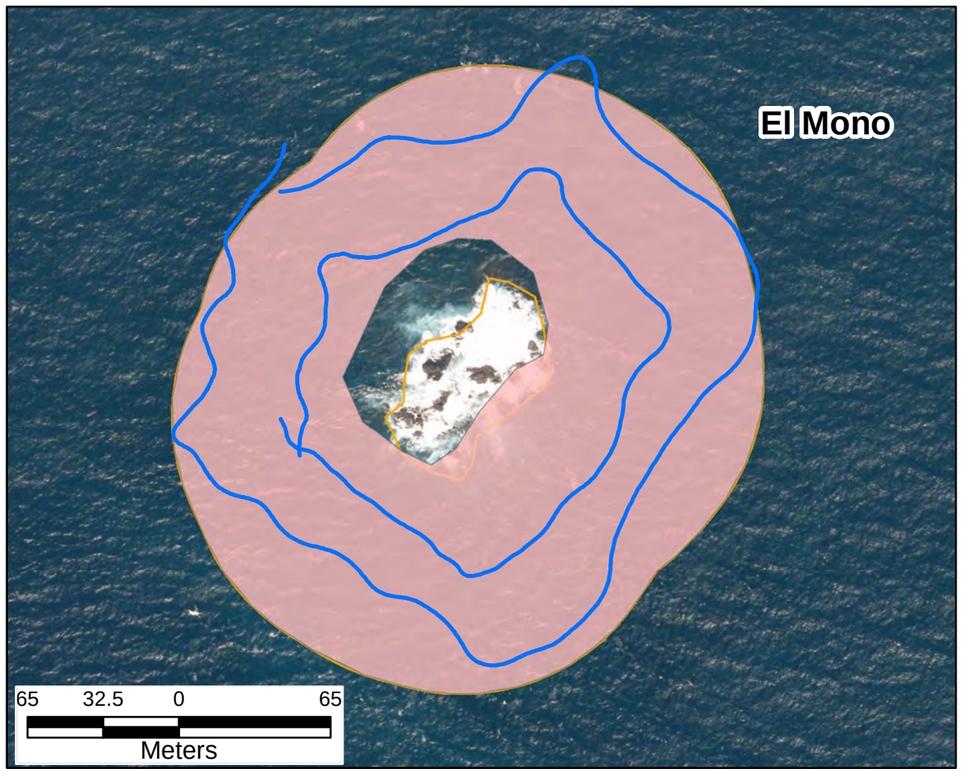
Figure B-14

MRS 02
Benthic Habitat

Map 1- SW

Culebra Island Site, Puerto Rico





Legend

- Actual Snorkel Video Transects
- Actual Underwater Video Transects
- MRS 02 with 100yd Buffer (304.42 acres)

Habitat

- Reef/Colonized Bedrock
- Reef/Scattered Coral-Rock
- Sand
- Seagrass/Continuous
- Seagrass/Patchy/30-50%

PARSONS

US Army Engineering And Support Center Huntsville, Alabama

Drawn By:	JAL	Scale:	Scale Varies	Rev:	1
Checked By:		Date Drawn:	10-14-2013		
Submitted By:	TB	Revision Date:	3-18-2014		

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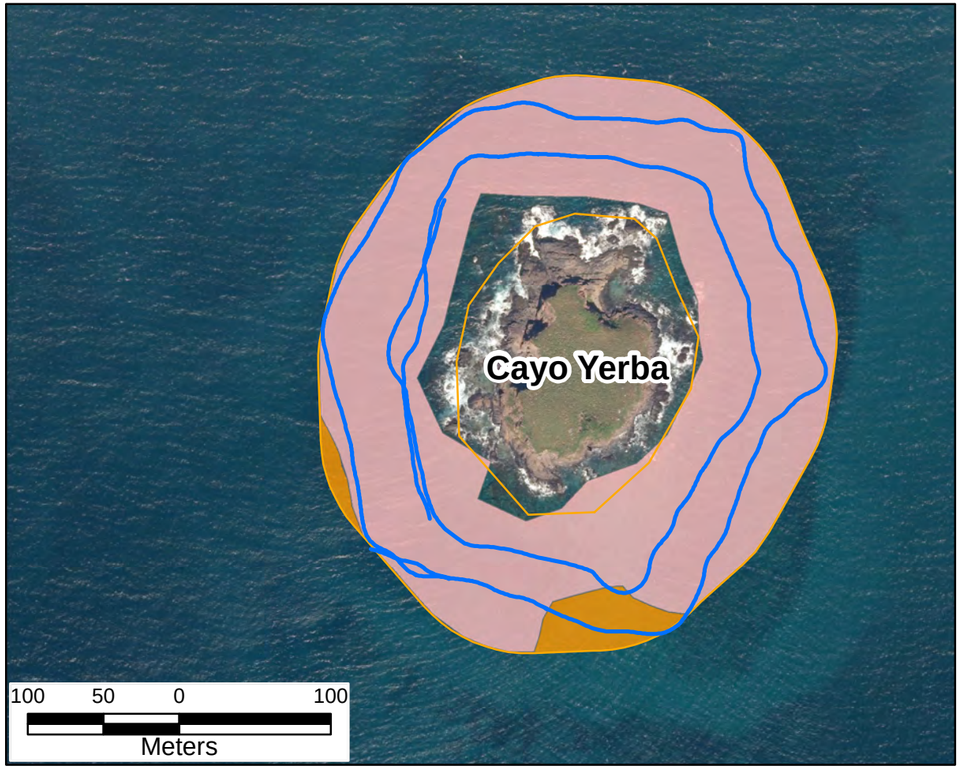
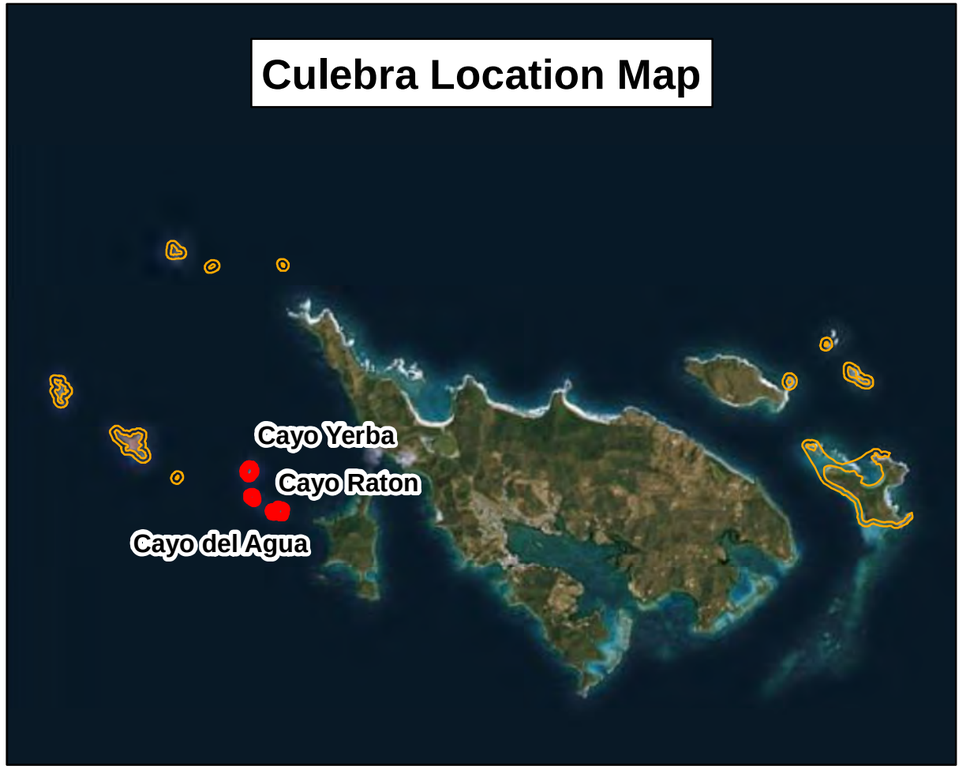




N

Scale Varies

Data is projected to the UTM Coordinate System: Zone 20 North, NAD83, Units in Meters.

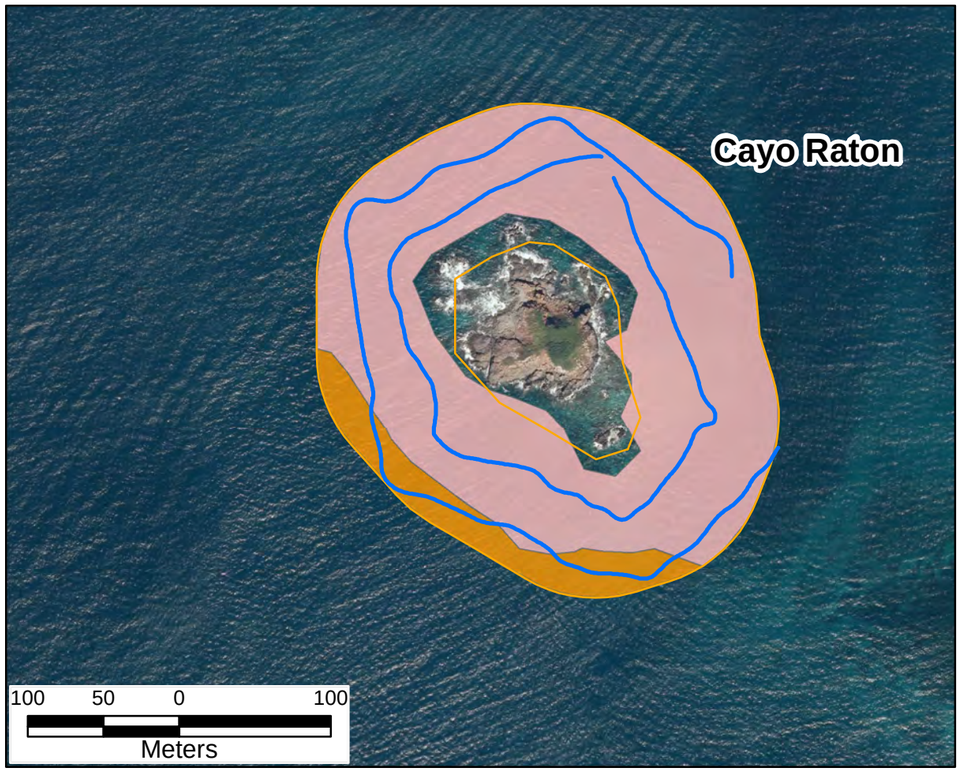
Remedial Investigation/ Feasibility Study

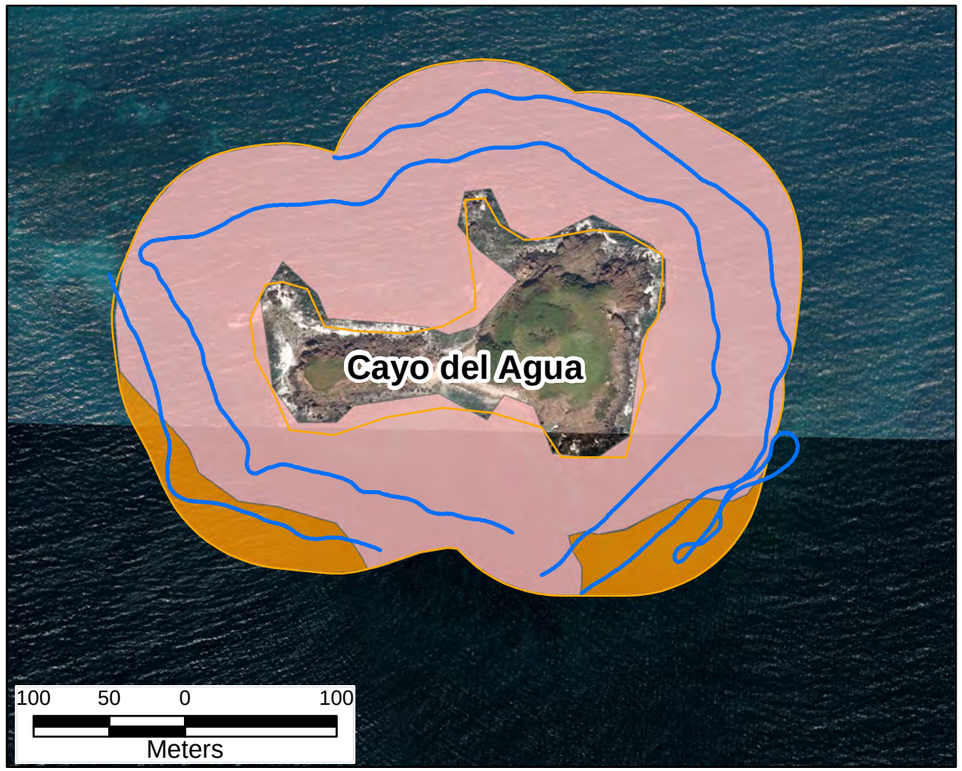
Figure B-15

MRS 02
Benthic Habitat

Map 2- W

Culebra Island Site, Puerto Rico





Legend

- Actual Snorkel Video Transects
- Actual Underwater Video Transects
- MRS 02 with 100yd Buffer (304.42 acres)

Habitat

- Reef/Colonized Bedrock
- Reef/Scattered Coral-Rock
- Sand
- Seagrass/Continuous
- Seagrass/Patchy/30-50%

PARSONS		US Army Engineering And Support Center Huntsville, Alabama	
Drawn By:	JAL	Scale: Scale Varies	Rev: 1
Checked By:		Date Drawn:	10-14-2013
Submitted By:	TB	Revision Date:	3-18-2014
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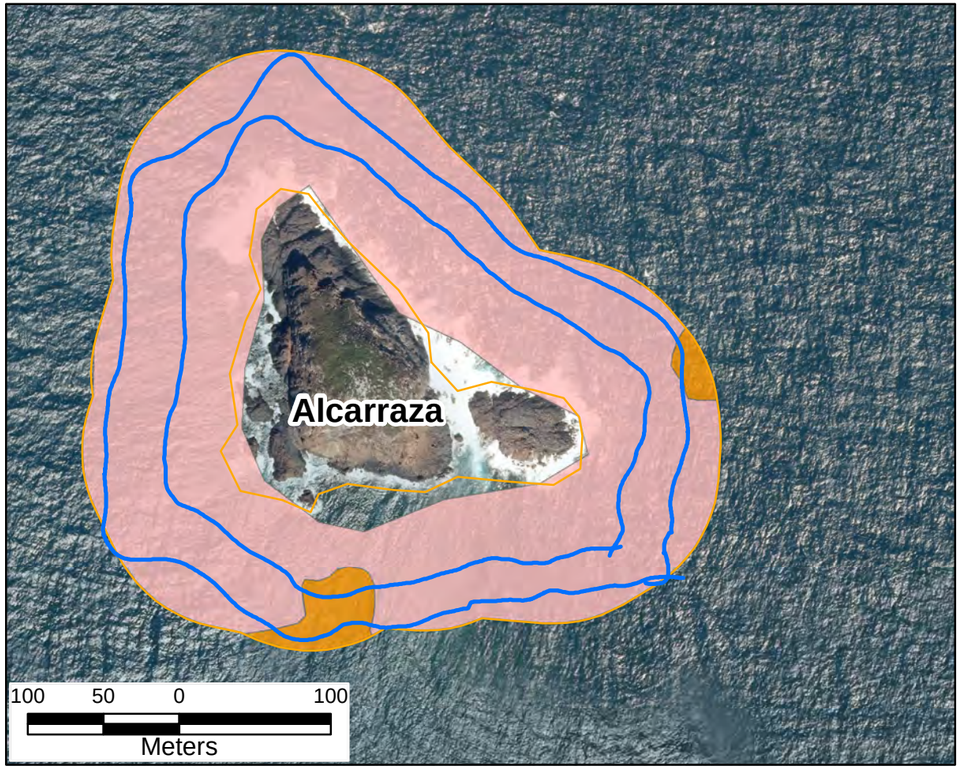
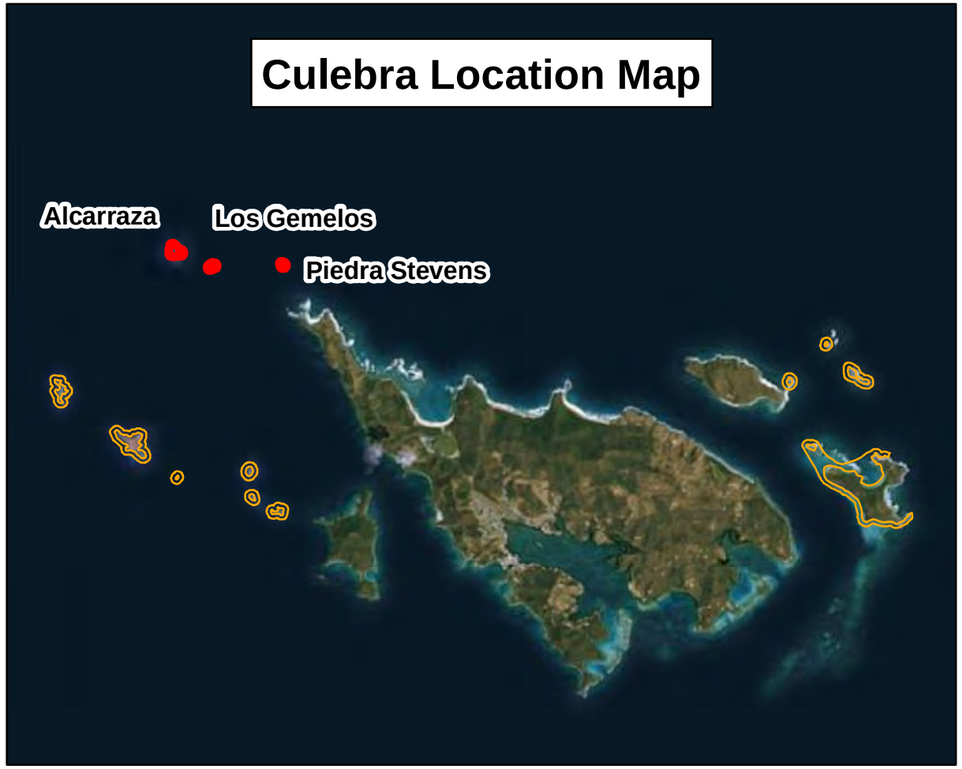




N

Scale Varies

Data is projected to the UTM Coordinate System: Zone 20 North, NAD83, Units in Meters.

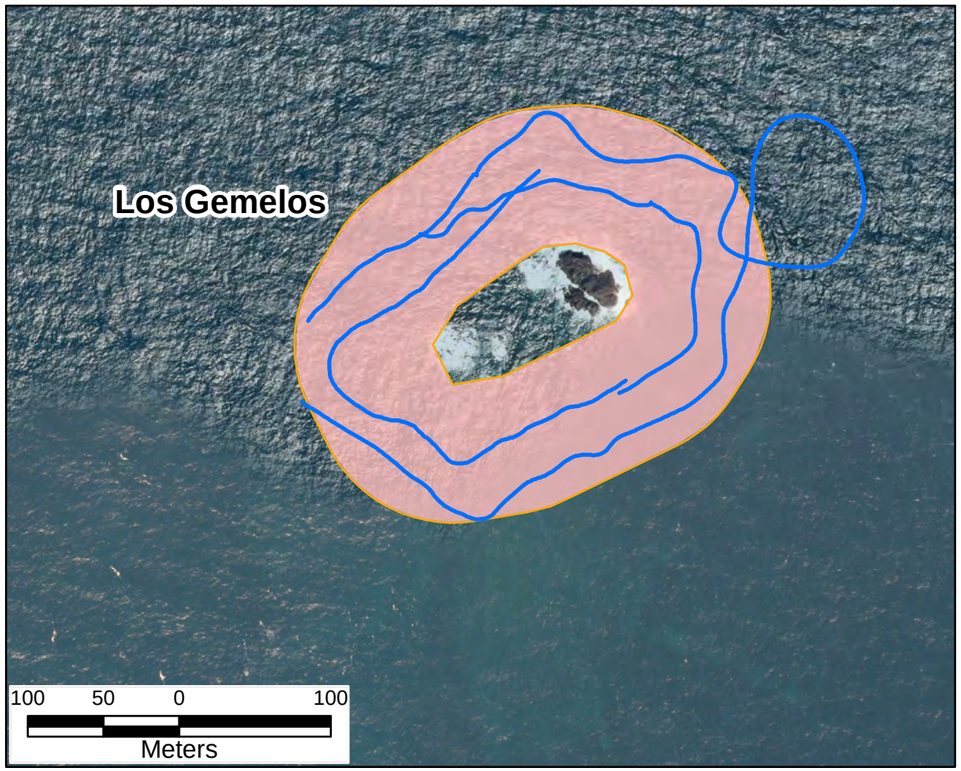
Remedial Investigation/ Feasibility Study

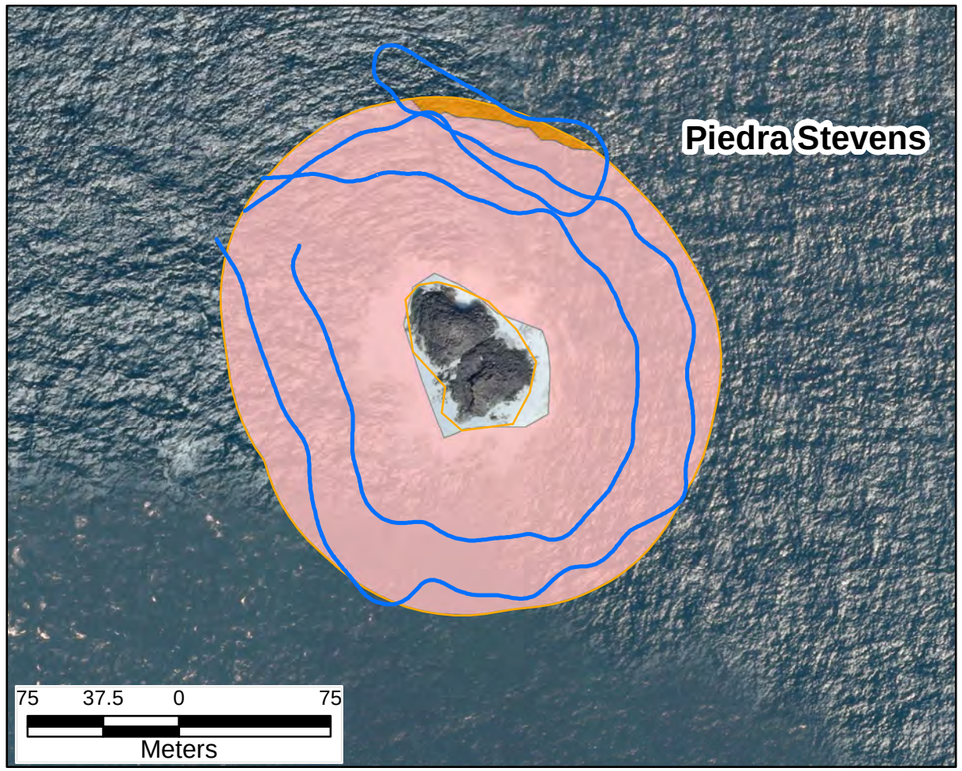
Figure B-16

MRS 02
Benthic Habitats

Map 3- NW

Culebra Island Site, Puerto Rico





Legend

- Actual Snorkel Video Transects
- Actual Underwater Video Transects
- MRS 02 with 100yd Buffer (304.42 acres)

Habitat

- Reef/Colonized Bedrock
- Reef/Scattered Coral-Rock
- Sand
- Seagrass/Continuous
- Seagrass/Patchy/30-50%

PARSONS	US Army Engineering And Support Center Huntsville, Alabama	
Drawn By: JAL	Scale: Scale Varies	Rev: 1
Checked By:	Date Drawn: 10-14-2013	
Submitted By: TB	Revision Date: 3-18-2014	
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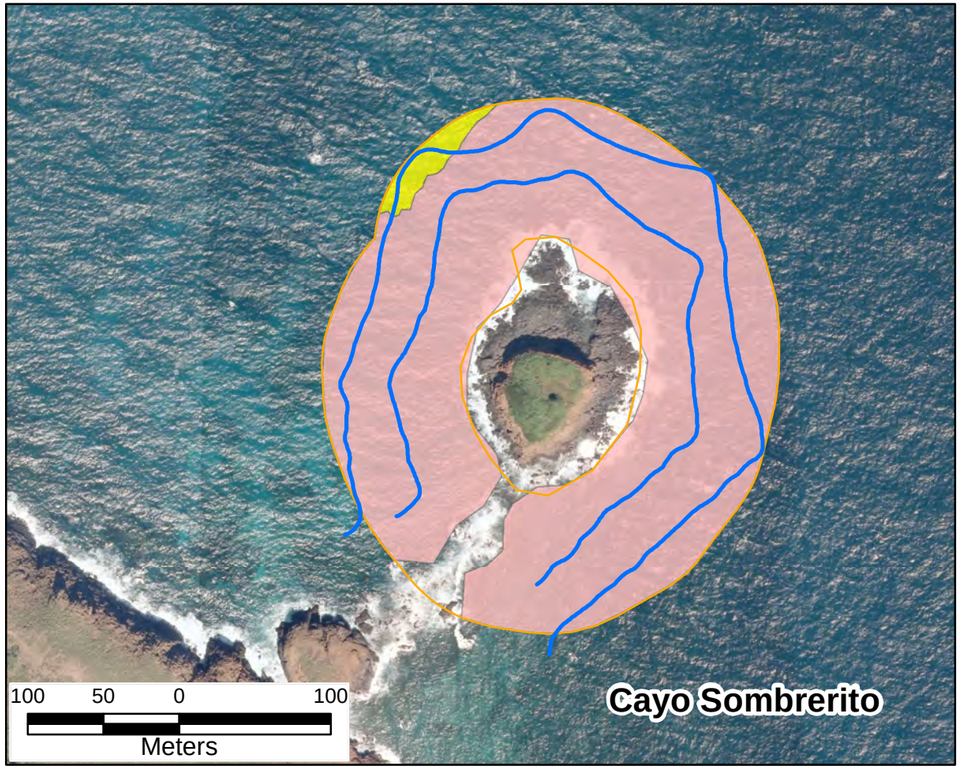

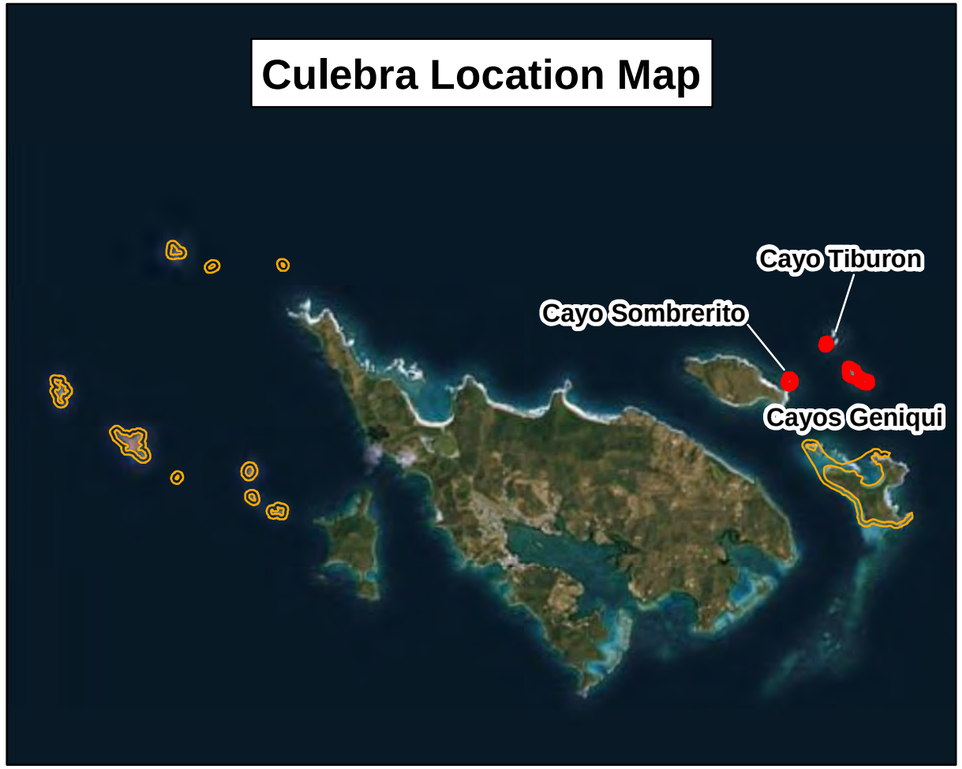

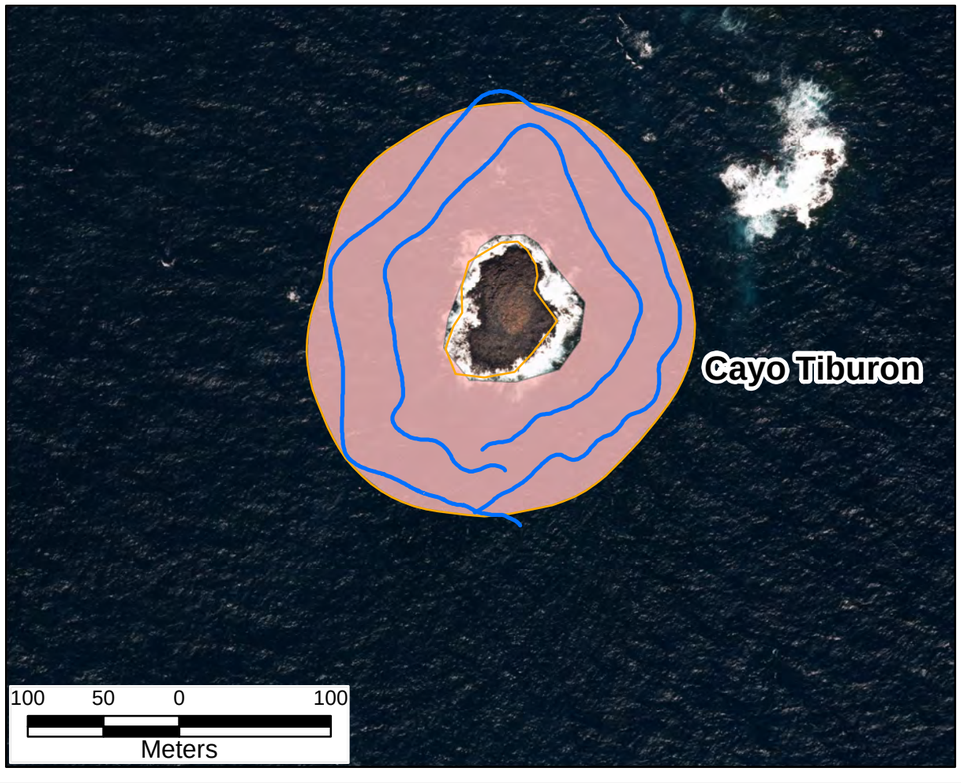

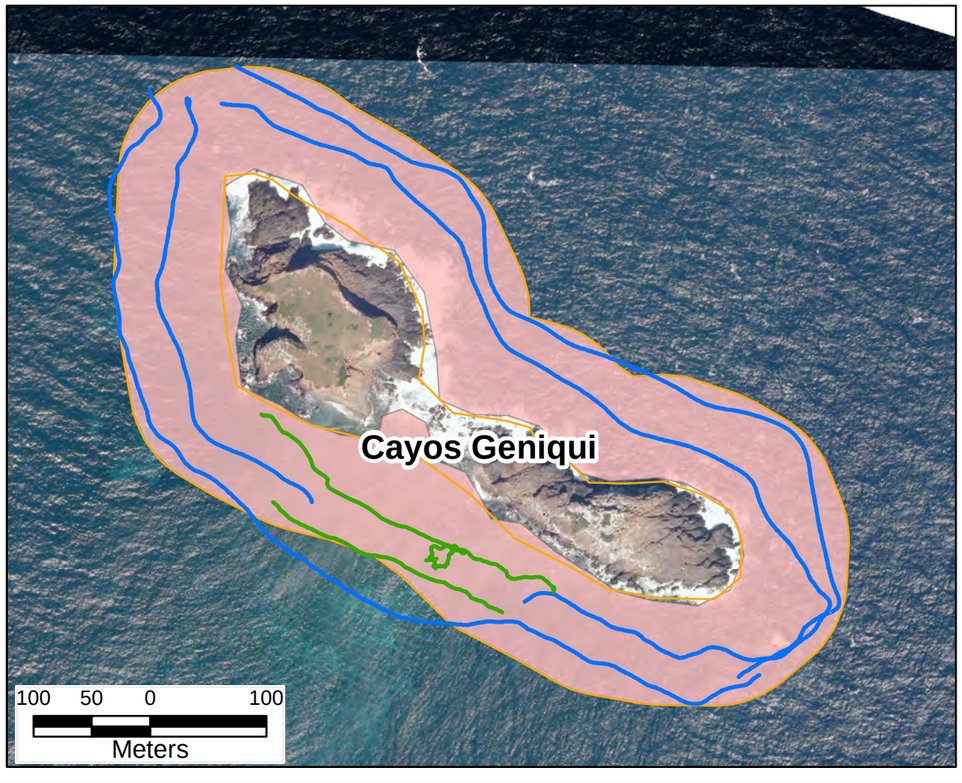

N

Scale Varies

Data is projected to the UTM Coordinate System: Zone 20 North, NAD83, Units in Meters.

Remedial Investigation/ Feasibility Study

Figure B-17

MRS 02
Benthic Habitat

Map 4- NE

Culebra Island Site, Puerto Rico

Legend

- Actual Snorkel Video Transects
- Actual Underwater Video Transects
- MRS 02 with 100yd Buffer (304.42 acres)

Habitat

- Reef/Colonized Bedrock
- Reef/Scattered Coral-Rock
- Sand
- Seagrass/Continuous
- Seagrass/Patchy/30-50%

PARSONS	US Army Engineering And Support Center Huntsville, Alabama	
Drawn By: JAL	Scale: Scale Varies	Rev: 1
Checked By:	Date Drawn: 10-14-2013	
Submitted By: TB	Revision Date: 3-18-2014	
	Path: S:\Culebra1\Culebra MRS 2 and 7\MXD\Work Plan\B-17 MRS 2 Benthic Habitat Map 4.mxd	

N

200 100 0 200

Meters

Data is projected to the UTM Coordinate System: NAD 1983 UTM Zone 20N

Remedial Investigation/ Feasibility Study

Figure B-18

MRS 07 Benthic Habitat

Culebra Island Site, Puerto Rico

Legend

- Actual Snorkel Video Transects
- Actual Underwater Video Transects
- MRS 07 with 100yd Buffer (213.48 acres)

Habitat

- Reef/Colonized Bedrock
- Reef/Scattered Coral-Rock
- Sand
- Seagrass/Continuous
- Seagrass/Patchy/30-50%

PARSONS

US Army Engineering And Support Center Huntsville, Alabama

Drawn By:	JAL	Scale: 1 inch = 200 meters	Rev: 1
Checked By:		Date Drawn: 10/11/2013	
Submitted By:	TB	Revision Date: 3/18/2014	

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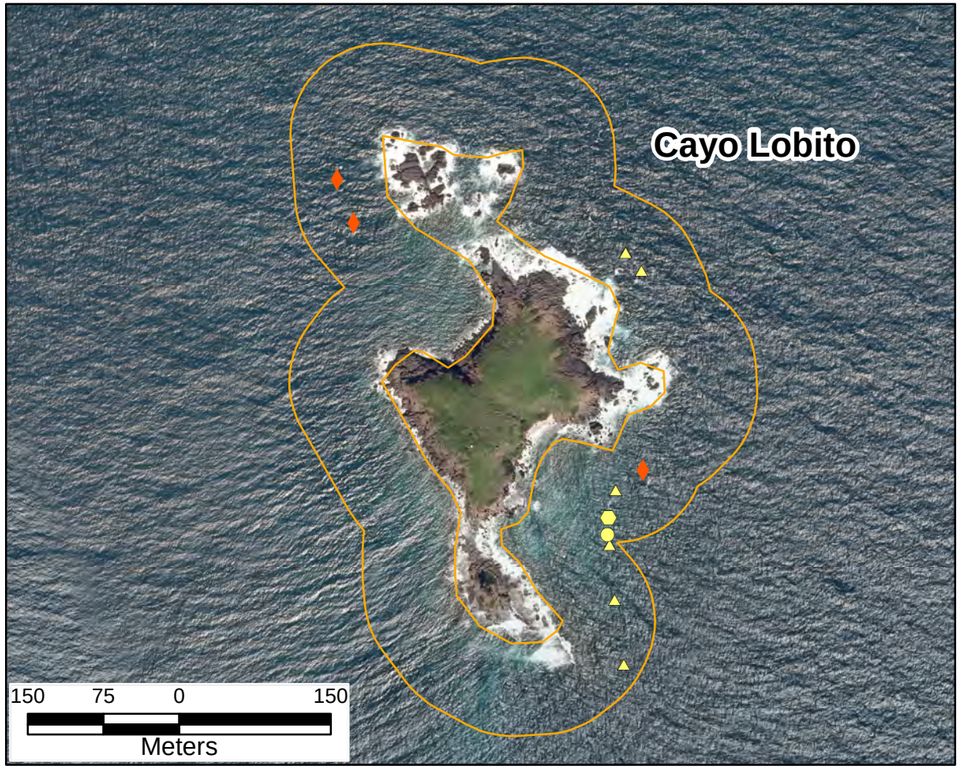

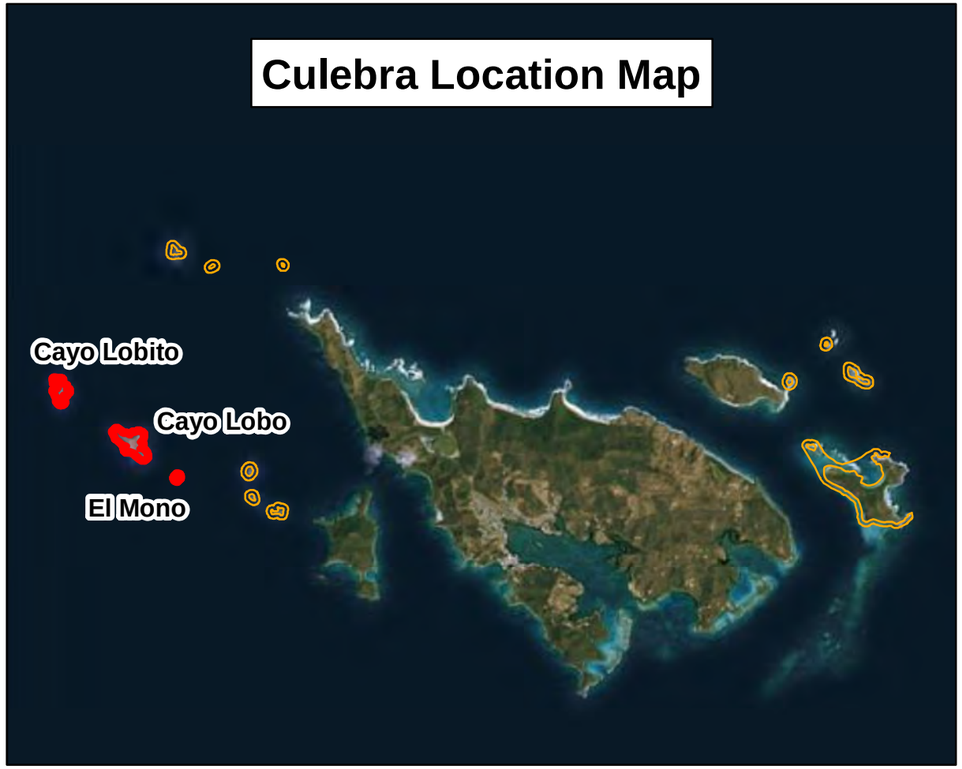

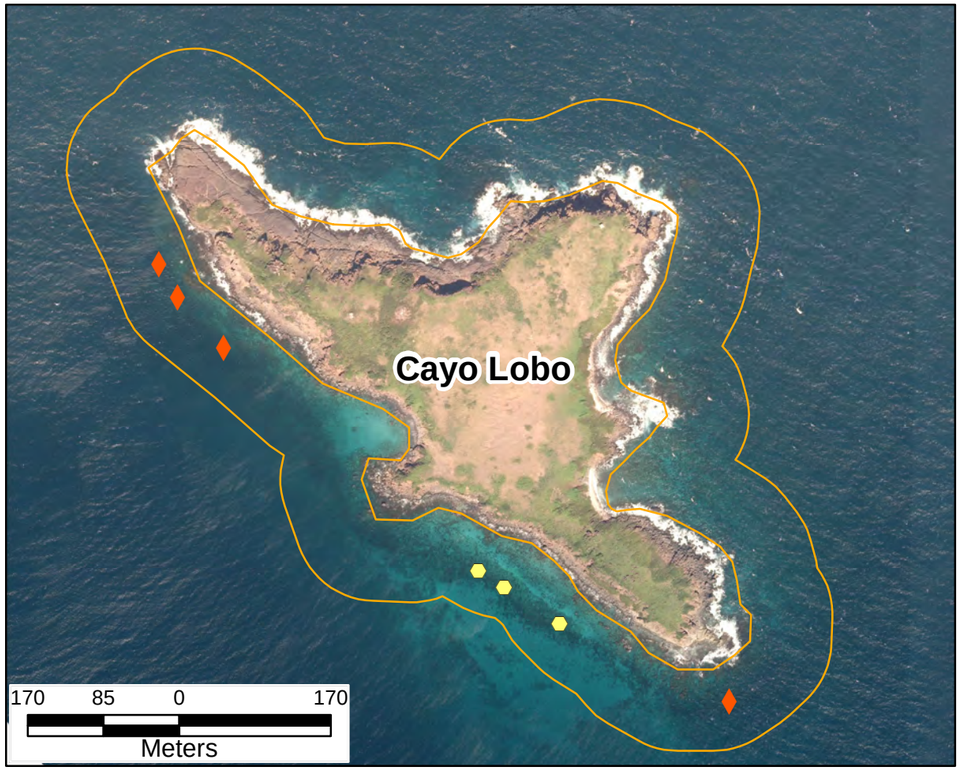

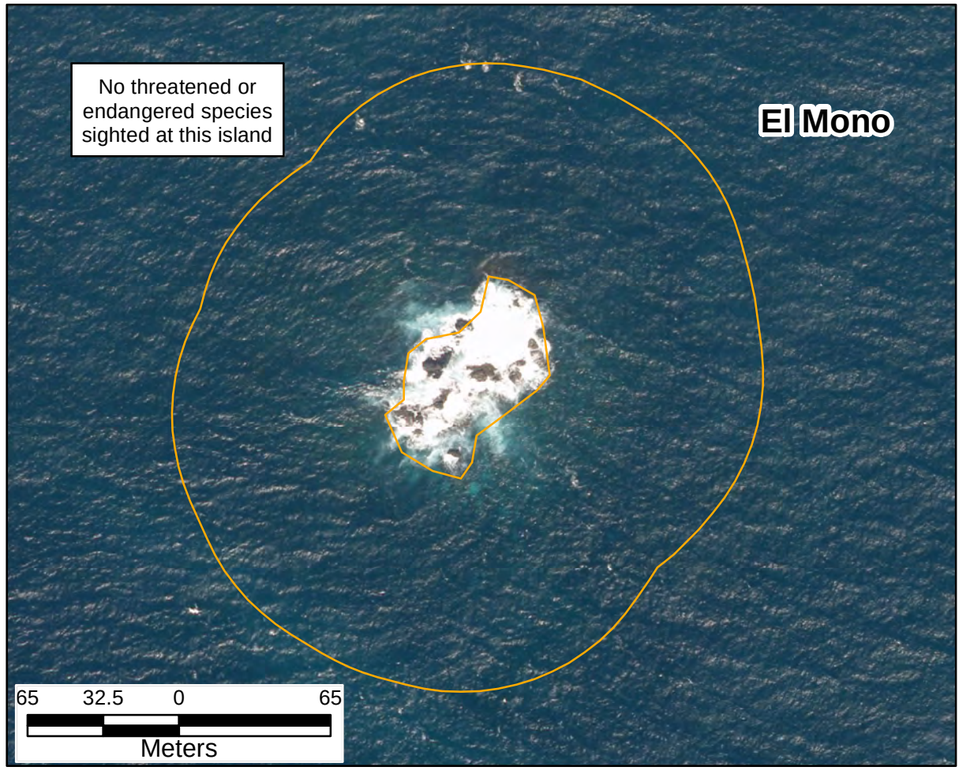

N

Scale Varies

Data is projected to the UTM Coordinate System: Zone 20 North, NAD83, Units in Meters.

Remedial Investigation/ Feasibility Study

Figure B-19

MRS 02 Threatened And Endangered Coral Species Sightings

Map 1- SW

Culebra Island Site, Puerto Rico

Legend

Threatened Species Sightings

- Elkhorn And Staghorn Coral
- Elkhorn Coral
- Staghorn Coral
- Pillar Coral
- MRS 02 with 100yd Buffer (304.42 acres)

PARSONS	US Army Engineering And Support Center Huntsville, Alabama	
Drawn By: JAL	Scale: Scale Varies	Rev: 2
Checked By:	Date Drawn: 10-14-2013	
Submitted By: TB	Revision Date: 10-2-2014	
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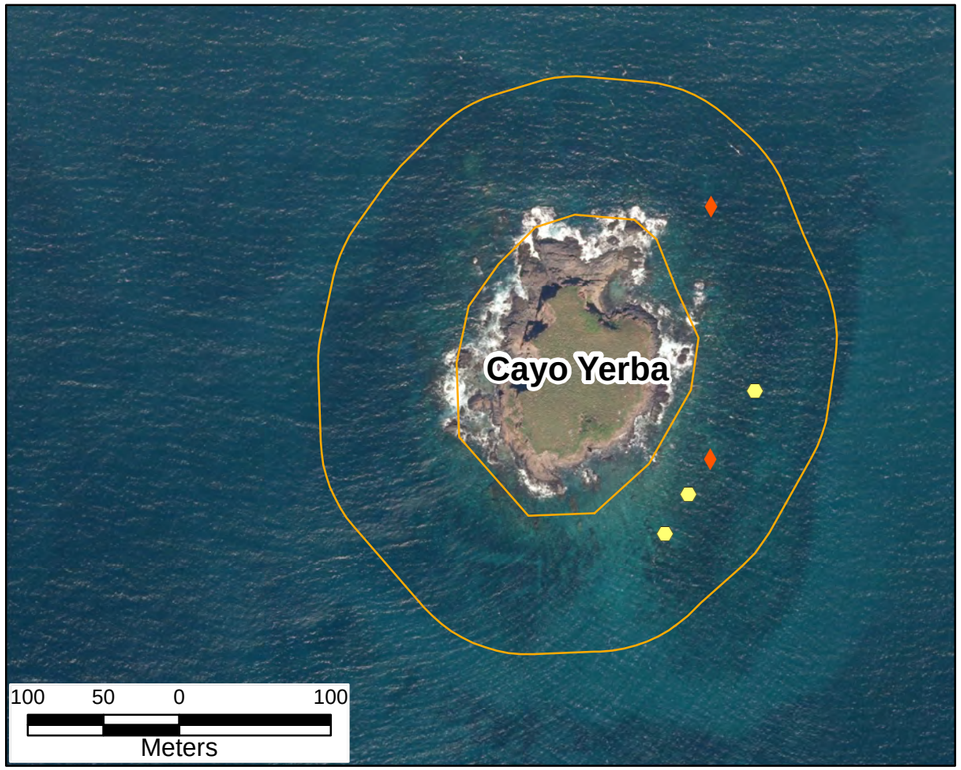

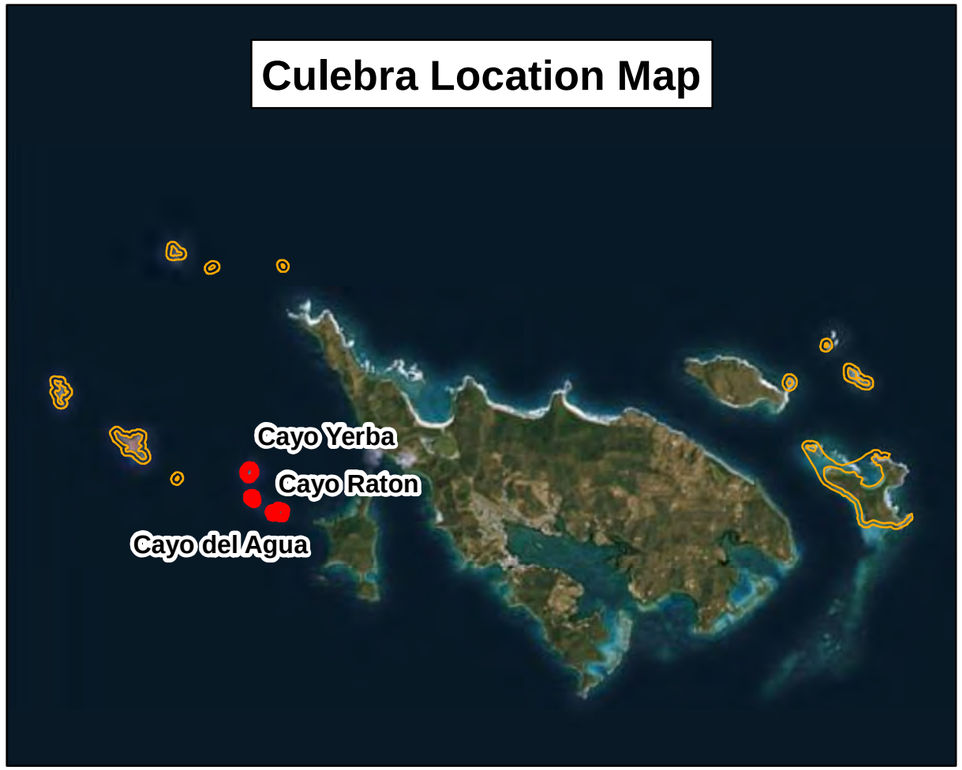

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Scale Varies

Data is projected to the UTM Coordinate System: Zone 20 North, NAD83, Units in Meters.

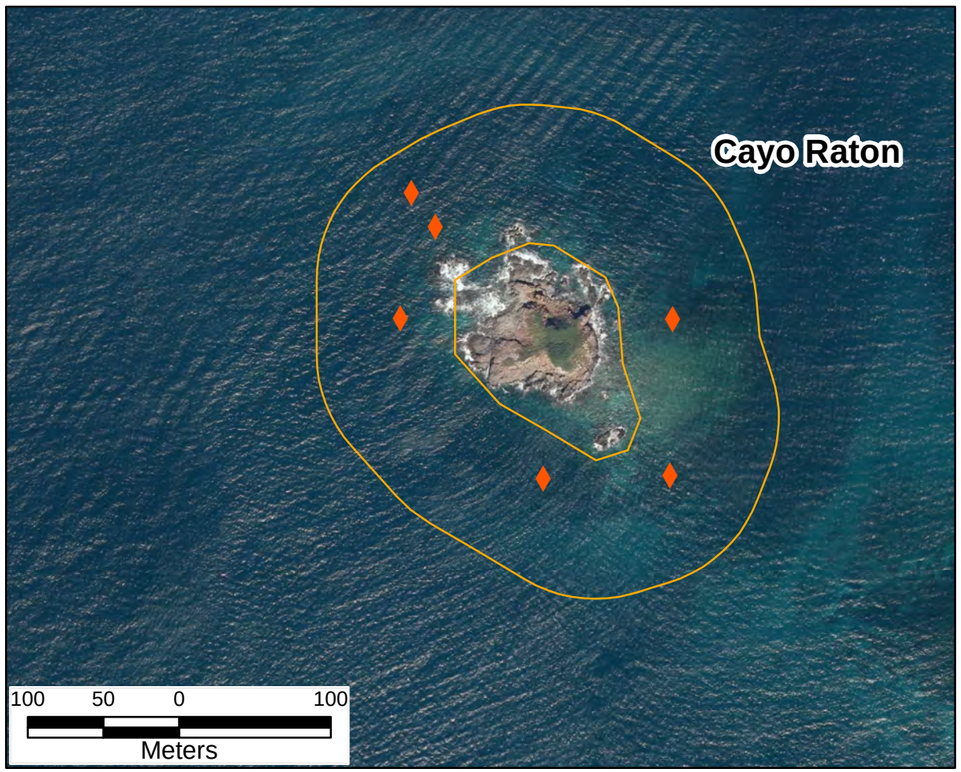
Remedial Investigation/ Feasibility Study

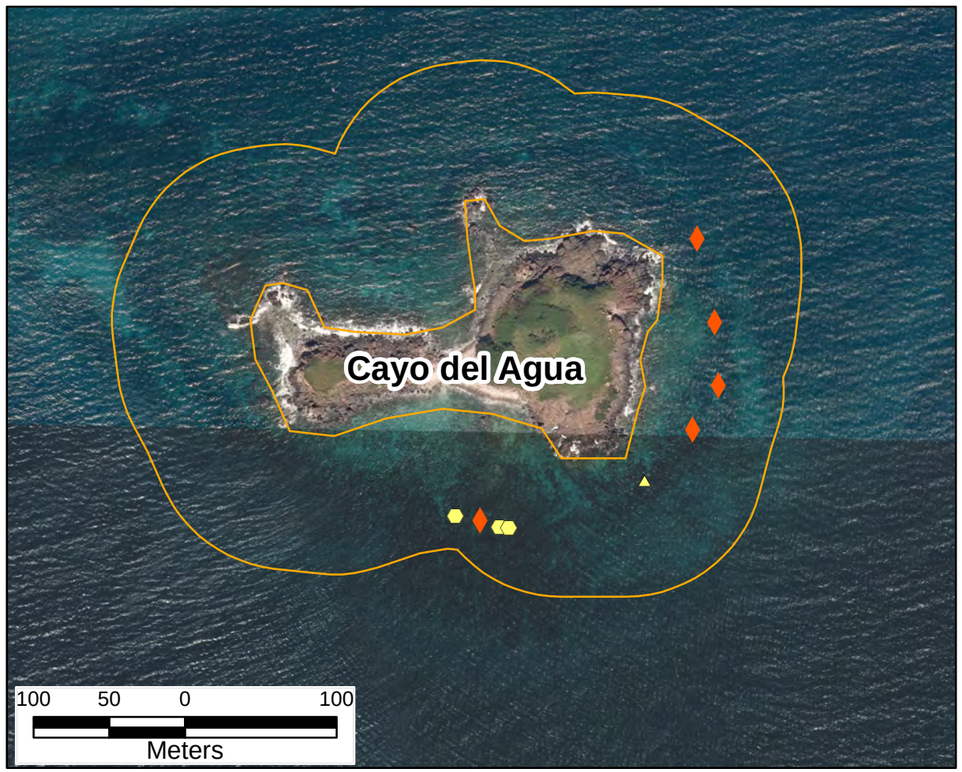
Figure B-20

MRS 02 Threatened And Endangered Coral Species Sightings

Map 2- W

Culebra Island Site, Puerto Rico





Legend

Threatened Species Sightings

- Elkhorn And Staghorn Coral
- Elkhorn Coral
- Staghorn Coral
- Pillar Coral
- MRS 02 with 100yd Buffer (304.42 acres)

PARSONS	US Army Engineering And Support Center Huntsville, Alabama	
Drawn By: JAL	Scale: Scale Varies	Rev: 2
Checked By:	Date Drawn: 10-14-2013	
Submitted By: TB	Revision Date: 10-2-2014	
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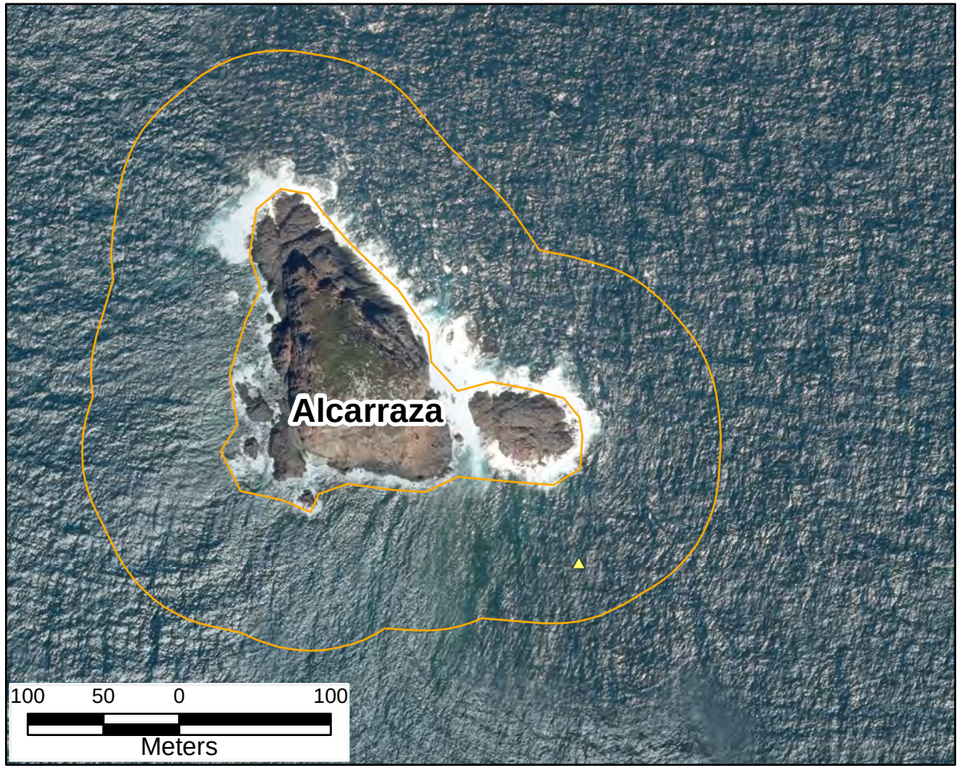

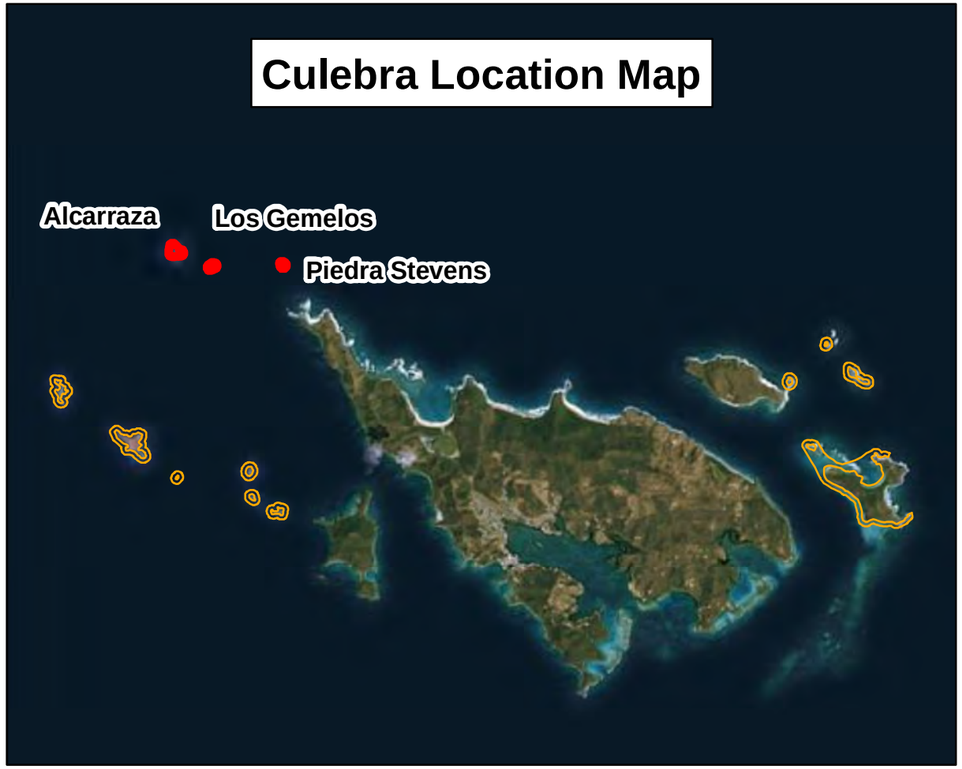

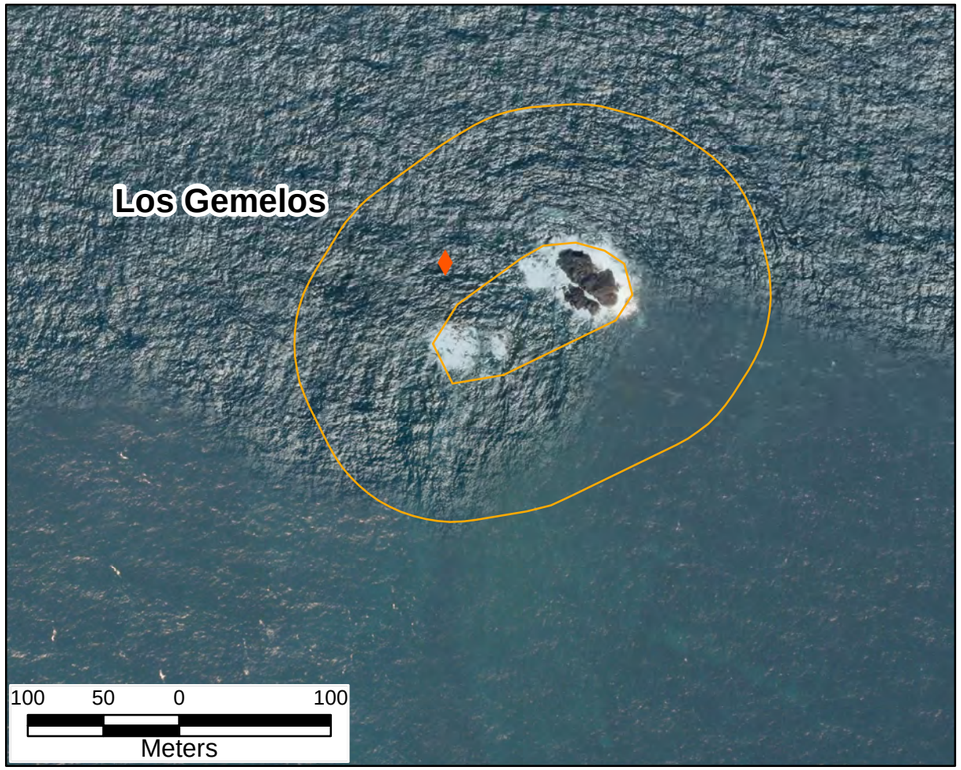

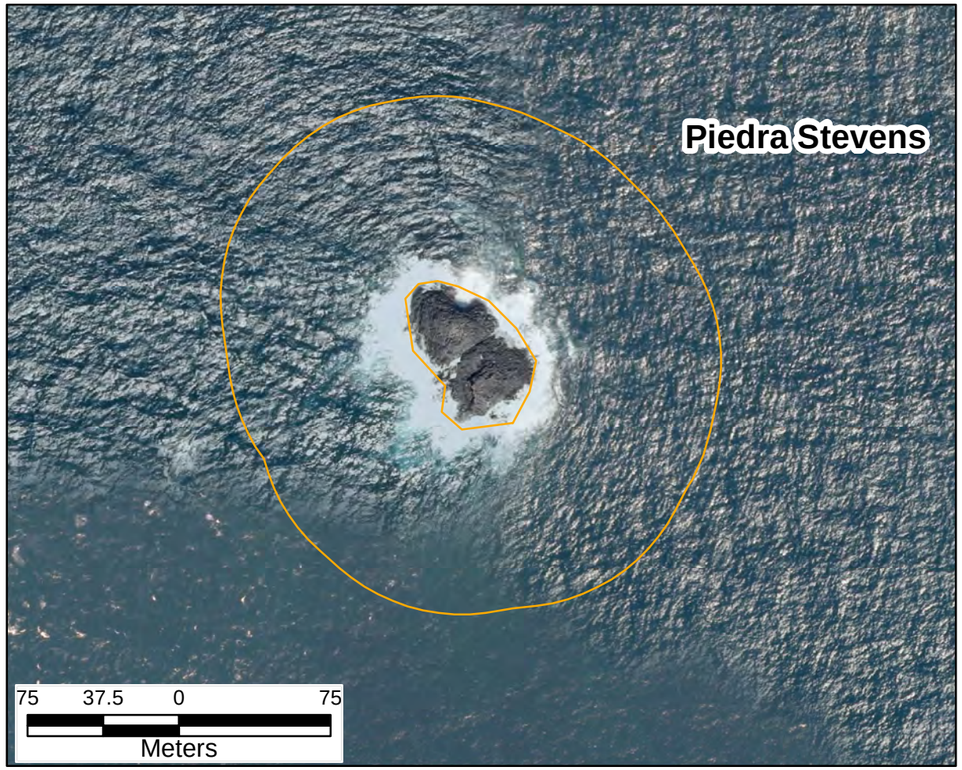

N

Scale Varies

Data is projected to the UTM Coordinate System: Zone 20 North, NAD83, Units in Meters.

Remedial Investigation/ Feasibility Study

Figure B-21

MRS 02 Threatened And Endangered Coral Species Sightings

Map 3- NW

Culebra Island Site, Puerto Rico

Legend

Threatened Species Sightings

- Elkhorn And Staghorn Coral
- Elkhorn Coral
- Staghorn Coral
- Pillar Coral
- MRS 02 with 100yd Buffer (304.42 acres)

PARSONS	US Army Engineering And Support Center Huntsville, Alabama	
Drawn By: JAL	Scale: Scale Varies	Rev: 1
Checked By:	Date Drawn: 10-14-2013	
Submitted By: TB	Revision Date: 3-20-2014	
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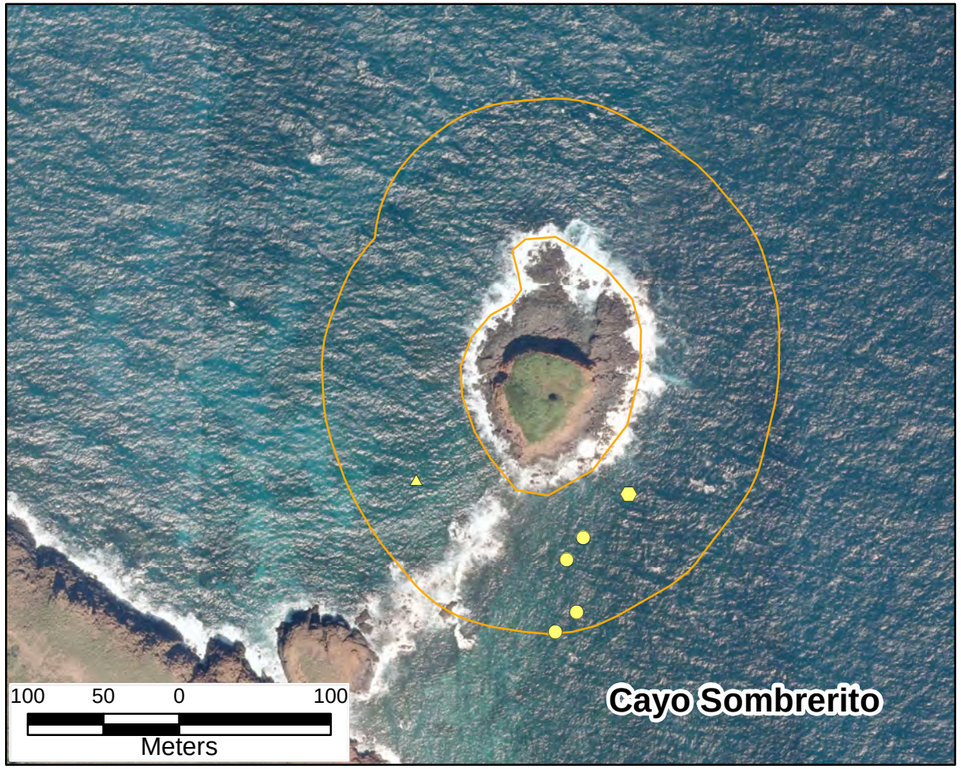

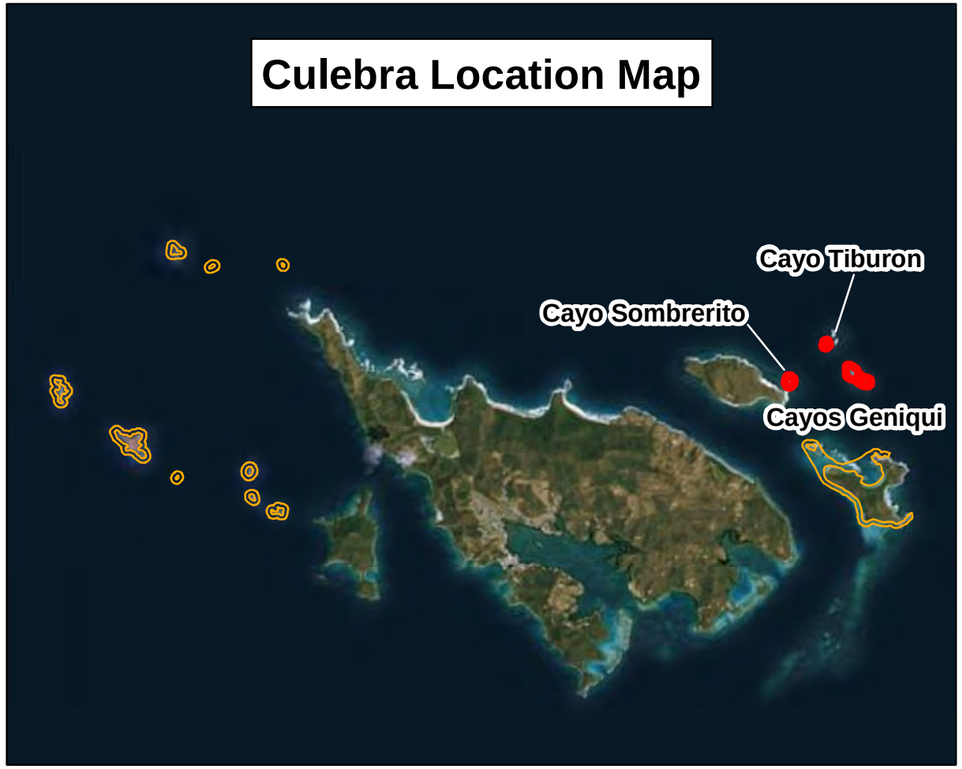

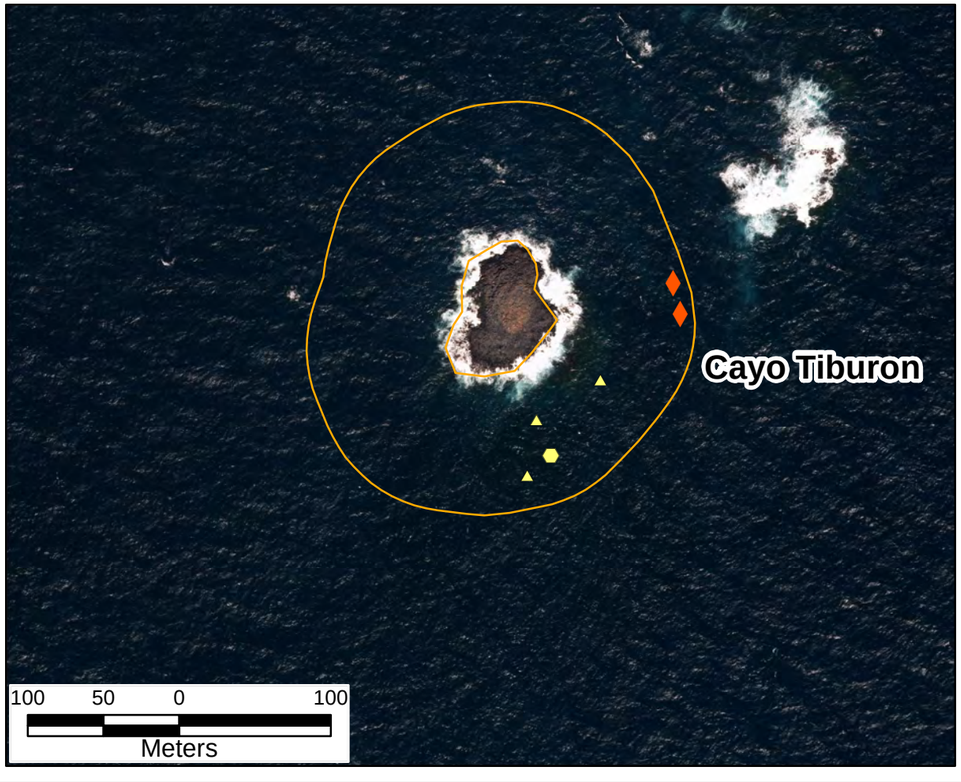

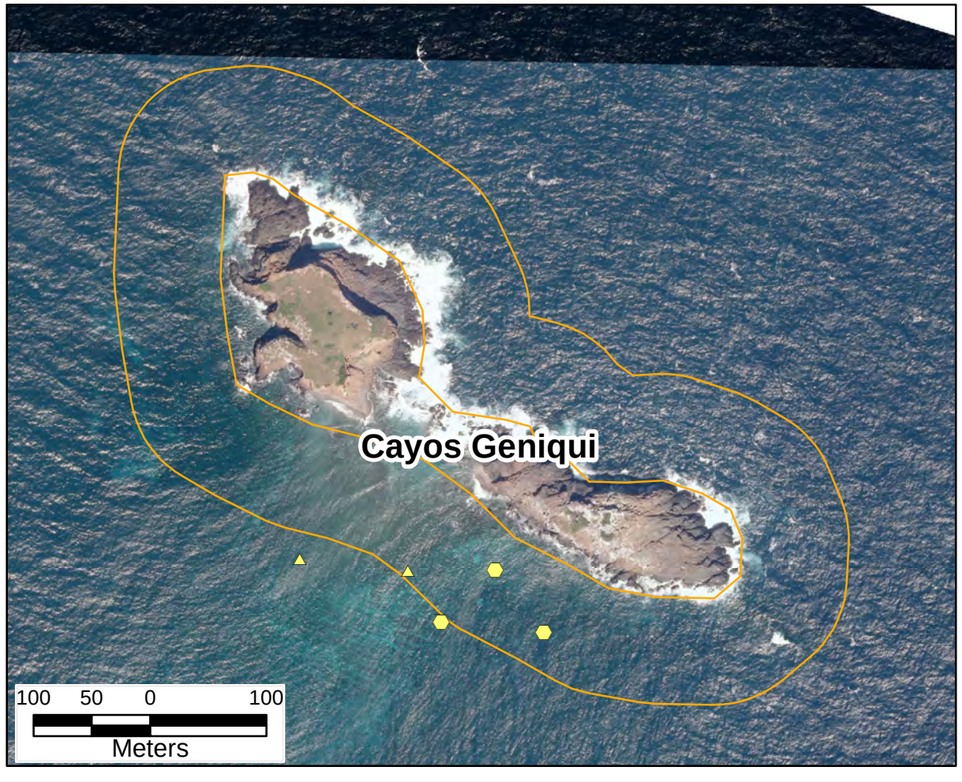

N

Scale Varies

Data is projected to the UTM Coordinate System: Zone 20 North, NAD83, Units in Meters.

Remedial Investigation/ Feasibility Study

Figure B-22

MRS 02 Threatened And Endangered Coral Species Sightings

Map 4- NE

Culebra Island Site, Puerto Rico

Legend

Threatened Species Sightings

- Elkhorn And Staghorn Coral
- Elkhorn Coral
- Staghorn Coral
- Pillar Coral
- MRS 02 with 100yd Buffer (304.42 acres)

PARSONS

US Army Engineering And Support Center Huntsville, Alabama

Drawn By:	JAL	Scale:	Scale Varies	Rev:	2
Checked By:		Date Drawn:	10-14-2013		
Submitted By:	TB	Revision Date:	10-2-2014		

Path: S:\Culebra1\Culebra MRS 2 and 7\MXD\Work Plan\B-22 MRS 2 T and E Map 4.mxd

N

200 100 0 200

Meters

Data is projected to the UTM Coordinate System: NAD 1983 UTM Zone 20N

Remedial Investigation/ Feasibility Study

Figure B-23

MRS 07 Threatened And Endangered Coral Species Sightings

Culebra Island Site, Puerto Rico

Legend

Threatened Species Sightings

- Elkhorn And Staghorn Coral
- Elkhorn Coral
- Staghorn Coral
- Pillar Coral
- MRS 07 with 100yd Buffer (213.48 acres)

PARSONS

US Army Engineering And Support Center Huntsville, Alabama

Drawn By:	JAL	Scale: 1 inch = 200 meters	Rev: 2
Checked By:		Date Drawn: 10-11-2013	
Submitted By:	TB	Revision Date: 10-2-2014	

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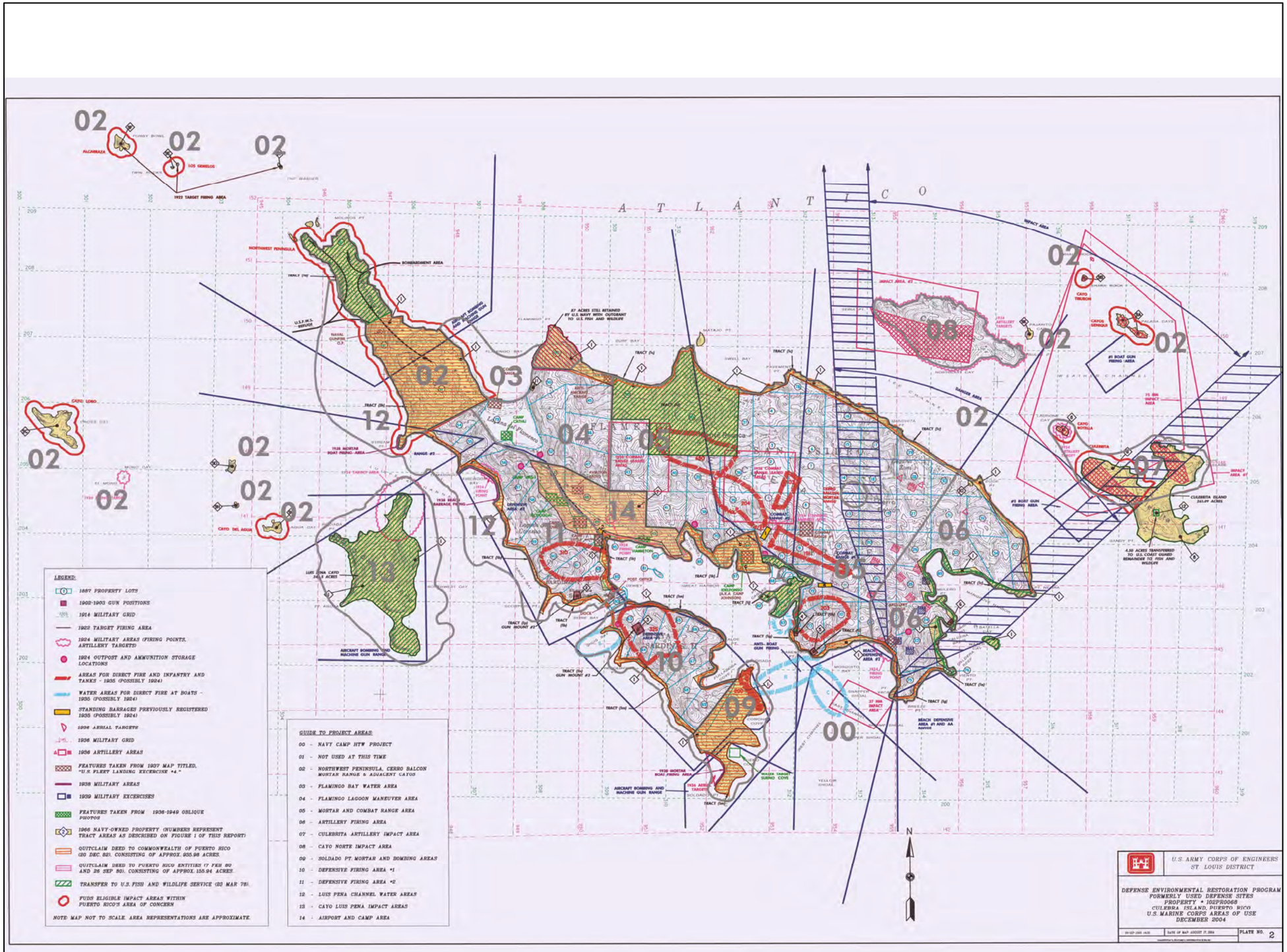

N

Not To Scale

Data is projected to the UTM Coordinate System: NAD 1983 UTM Zone 20N

Remedial Investigation/ Feasibility Study

Figure B-24

Plate 2 From Supplemental Archives Search Report

Culebra Island Site, Puerto Rico

USA Environmental, Inc.		US Army Engineering And Support Center Huntsville, Alabama
Drawn By: JAL	Scale: Not To Scale	Rev:
Checked By:	Date Drawn: 9-12-2014	
Submitted By:	Revision Date:	

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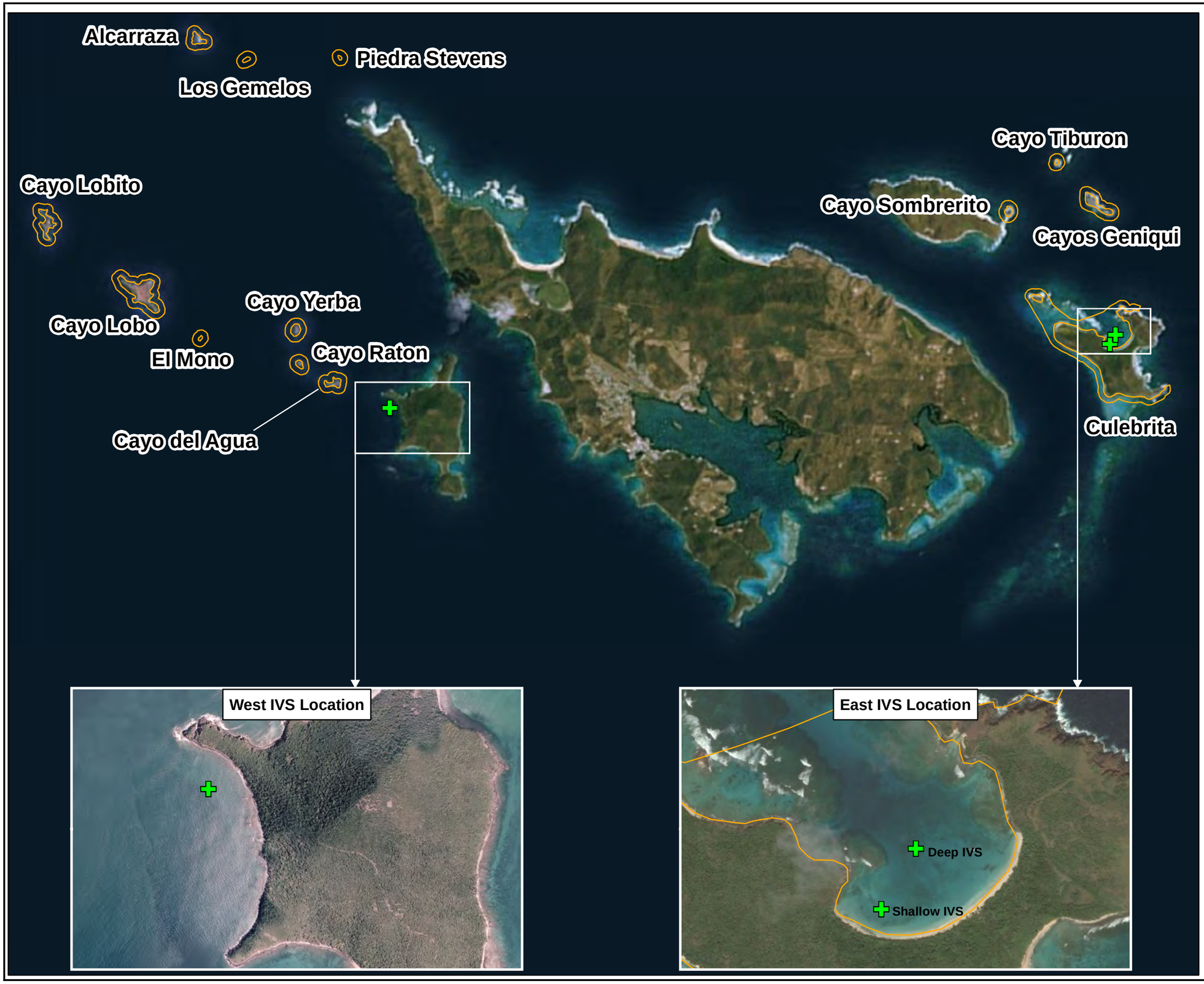

N

1,500 750 0 1,500

Meters

Data is projected to the UTM Coordinate System: NAD 1983 UTM Zone 20N

Remedial Investigation/ Feasibility Study

Figure B-25

IVS Location Map

Culebra Island Site, Puerto Rico

Legend

- IVS Locations
- MRS 02 and 07 with 100yd Buffer

PARSONS

US Army Engineering And Support Center Huntsville, Alabama

Drawn By:	JAL	Scale: 1 inch = 1,500 meters	Rev:
Checked By:		Date Drawn: 9/12/2014	
Submitted By:	TB	Revision Date:	

Path: S:\Culebra1\Culebra MRS 2 and 7\MXD\Work Plan\B-25 IVS Location Map.mxd

N

1,000 500 0 1,000

Meters

Data is projected to the UTM Coordinate System: Zone 20 North, NAD83, Units in Meters.

Remedial Investigation/ Feasibility Study

Figure B-26

Control Point Location Map

Culebra Island Site, Puerto Rico

Legend

Control Points

USA Environmental, Inc.		US Army Engineering And Support Center Huntsville, Alabama
Drawn By: JAL	Scale: 1 inch = 1,000 meters	Rev:
Checked By:	Date Drawn: 9/12/2014	
Submitted By:	Revision Date:	
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APPENDIX C. POINTS OF CONTACT

This appendix contains Point of Contact information for use on this project.

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POINTS OF CONTACT

POC	POSITION	ORGANIZATION	ADDRESS/ EMAIL	TELEPHONE
US ARMY ENGINEERING AND SUPPORT CENTER, HUNTSVILLE (CEHNC)				
Roland Belew	COR/Project Manager	USACESCH	4820 University Square Huntsville, AL 35816-1822	256-895-9525
Kelly Enriquez	Geophysicist	CEHNC-EDC-G	4820 University Square Huntsville, AL 35816-1822	256-895-1373
Sarah Dyer	Technical Manager	CEHNC-EDC-E	4820 University Square Huntsville, AL 35816-1822	256-895-5518
USACE JACKSONVILLE DISTRICT				
John Keiser	Program Manager	CESAJ-DP	US Army Corps of Engineers Jacksonville District 701 San Marco Blvd Jacksonville, FL 32207	904-232-1758
Jose Mendez	PM Forward	CESAJ-DP	U.S. Army Corps of Engineers Antilles Office 400 Fernandez Juncos, San Juan, Puerto Rico 00901-3299	787-729-6893, 6895, Ext 3099
Wilberto Cubero	Project Manager	CESAJ-DP	US Army Corps of Engineers Jacksonville District 701 San Marco Blvd Jacksonville, FL 32207	904-232-1426
Amanda Parker	Public Affairs	CESAJ-DP	U.S. Army Corps of Engineers Antilles Office 400 Fernandez Juncos, San Juan, Puerto Rico 00901-3299	904-232-1576

PARSONS/USA				
Patricia Berry	Project Manager	Parsons	3577 Parkway Lane, Suite 100 Norcross, GA 30092 Patricia.Berry@parsons.com	678-969-2410 404-673-9158 (cell)
Ed Grunwald	Certified Industrial Hygienist	Parsons	3577 Parkway Lane, Suite 100 Norcross, GA 30092 Ed.Grunwald@parsons.com	678-969-2394
Jae Yun	Site Geophysicist	Parsons	3577 Parkway Lane, Suite 100 Norcross, GA 30092 Jae.Yun@parsons.com	678-969-2463 678-209-7620 (cell)
Tom Bourque	Project Manager	USA	720 Brooker Creek Boulevard Suite 204 Oldsmar, FL 34677 tbourque@usatampa.com	941-746-5375 808-255-2320 (cell)
Brian Skubin	Project Engineer	USA	720 Brooker Creek Boulevard Suite 204 Oldsmar, FL 34677 bskubin@usatampa.com	813-343-6406 813-846-9138 (cell)
Al Crandall	Project Geophysicist	USA	720 Brooker Creek Boulevard Suite 204 Oldsmar, FL 34677 acrandall@usatampa.com	813-343-6362 813-927-2975 (cell)
Jeffery Lewis	GIS Manager	USA	720 Brooker Creek Boulevard Suite 204 Oldsmar, FL 34677 jlewis@usatampa.com	813-343-6376
Department of Public Safety, Stakeholders				
Mr. Mayor Ivan Solis	Mayor	Culebra	PO Box 7 Culebra, PR 00775-0189	787-742-3577 787-742-0487 787-742-0616 Fax
Fire Department			Calle Escudero 317 Culebra, PR 00775	787-742-3530
Marelisa Rivera	Deputy Field Supervisor, CESTO	U.S. Fish and Wildlife Service - CESTO	Road 301, Km5.1, Boquerón, PR 00622 marelisa.rivera@fws.gov	787-851-7297 X 206

Ana M. Roman	Deputy Project Leader Culebra Refuge Manager	U.S. Fish and Wildlife Service	Road 301, Km5.1, Boquerón, PR 00622 Ana.roman@fws.gov	787-396-7711
Richard Henry	National Technical Liaison ERT	US FWS	2890 Woodbridge Ave. Edison, NJ 08837 Richard_Henry@fws.gov	732-906-6987 973- 204-5825 (cell)
Dr. Lisamarie Carrubba, Ph.D.	NMFS PRD	National Marine Fisheries Service	Road 301, Km 5.1 P.O. Box 1310 Boquerón, PR 00622 Lisamarie.Carrubba@noaa.gov	787-857-3700 787-455-0007 (cell)
Jose Rivera	NOAA Fisheries	NOAA Fisheries	c/o U.S. Army Corps of Engineers Antilles Office 400 Fernandez Juncos, San Juan, Puerto Rico 00901-3299 jose.a.rivera@noaa.gov	787-405-3605
Wilmarie Rivera	Federal Facilities Coordinator Puerto Rico Environmental Quality Board	Puerto Rico Environmental Quality Board (PREQB)	P.O. Box 11488 San Juan, PR 00910 wilmarierivera@jca.gobierno.pr	787-767-8181 x 3529
Dr. Craig Lilyestrom	Director Marine Services Division	Puerto Rico Department National Environmental Resources (DNER)	1375 Ponce de Leon Avenue San Juan, PR 00926	
Diane Wehner	Regional Resource Coordinator	NOAA	85 Central Ave. New Providence, NJ 07974 diane.wehner@noaa.gov	240-338-3411
Julio Vasquez	EPA Region 2 – Regional Project Manager	USEPA	290 Broadway – 18th Floor New York, NY 10007-1866	212-637-4323

FAA				
Mr. Felipe Fraticelli	FAA Coordination Facility	FAA	www.nes.notams.faa.gov	787-253-8663 787-253-8664 FAA Coordination (NOTAM)
Mr. Hector Plaza	Alternate POC	FAA	www.nes.notams.faa.gov	787-525-6070
Mr. Hector Rivera	Alternate POC	FAA	www.nes.notams.faa.gov	404-520-4241
Police				
Ms. Veronica Melendez Mr. Benjamin Maldonado		Puerto Rico State Police Department	General Delivery Culebra, PR 00775	787-742-3501
Culebra Municipal Police			(787) 742-0106	
USCG				
RSC San Juan (Sub-Center of RCC Miami)		Commander, Sector San Juan, San Juan, Puerto Rico	Southeast portion of the Caribbean Sea	(787)289-2042/2041 VHF Channel 16
Mr. Efrain Lopez	Marine Information Specialist	USCG	San Juan, Puerto Rico efrain.lopez1@uscg.mil 24 hours notification requirement for Broadcast Notice to Mariners (BNM)	(787) 289-2097
CWO Anthony Cassisa	USCG Sector San Juan AtoN & WWM Officer	USCG	anthony.j.cassisa@uscg.mi This is for a Broadcast to Mariners of the scheduled demolition shot	(787) 289-2073

Medical				
Culebra Hospital and Local Ambulance			787-742-3511/ 0001	
Divers Alert Network (DAN) telephone number			919-684-9111	
DAN Medical Information Line			919-684-2948	
Puerto Rico Medical Center Centro Medico San Juan, PR Puerto Rico Medical Center PO Box 2129			787-777-3535/3827 (phone) ext: 6476/6475/6068 787-777-3702 (fax) hiperbarica@asempr.org Director: Juan Angel Nazario, M.D 24hr Phone: 787 390-3243 Chamber #: 787 777-3535 x6475 or 6481 Office #: 787 777.3700	
Explosive Supplier Control Demolition Austin Blasting Services Corp				
Paola Criado Jose Criado	Sales Representative	CDR Corp.	Rd #2 KM 24, 3 Espinosaward Borado Puerto Rico, 00646 orionjfc@aol.com prcriado@hotmail.com	(787) 883-3695 (787) 781-2055 (787) 883-7136 Fax
Information Repository				
Municipality of Culebra Office PO Box 189 Culebra, PR 00775-0189 Telephone (787) 742-3291 Sonia Arocho Administradora Isla Municipio de Culebra Hours: Monday through Friday 8 a.m. – 4:30 p.m.			Culebra Library – Biblioteca Omayra L. Albino PO Box 848 Culebra, PR 00775 Telephone (787) 742-3583 Fax (787) 742-0011 Library hours 9 a.m. – 3 p.m.	

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APPENDIX D. ACCIDENT PREVENTION PLAN

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ACCIDENT PREVENTION PLAN ACKNOWLEDGEMENT

Accident Prevention Plan Acknowledgement			
I have read, understand, and agree to abide by the provisions as detailed in this Accident Prevention Plan and Site Safety and Health Plan prepared by Parsons. Failure to comply with these provisions may lead to disciplinary action and/or my dismissal from the work site.			
Printed Name	**Company**	**Signature**	**Date**

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ATTACHMENTS

ACRONYMS AND ABBREVIATIONS

ACDE	Association of Commercial Diving Educators
ACGIH	American Conference of Governmental Industrial Hygienists
AHA	Activity Hazard Analysis
APP	Accident Prevention Plan
°C	Degrees Celsius
CDCP	Center for Disease Control and Prevention
CFR	Code of Federal Regulations
CPR	Cardiopulmonary Resuscitation
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CHSM	Corporate Health and Safety Manager
CSP	Certified Safety Professional
CWM	Chemical Warfare Materiel
EM	Engineer Manual
ERPCP	Emergency Response Plan and Contingency Procedures
°F	Degrees Fahrenheit
FUDS	Formerly Used Defense Site
GPS	Global Positioning System
HAZWOPER	Hazardous Waste Operations and Emergency Response
HFD	Hazardous Fragmentation Distance
HIV	Human Immunodeficiency Virus
IAW	In Accordance With
IDLH	Immediately Dangerous to Life or Health
IVS	Instrument Verification Strip
MC	Munitions Constituents
MEC	Munitions and Explosives of Concern
MMRP	Military Munitions Response Program
MPPEH	Material Potentially Presenting an Explosive Hazard
MRS	Munitions Response Site
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NWR	National Wildlife Refuge
OESS	Ordnance and Explosives Safety Specialist
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
PFD	Personal Flotation Device
PPE	Personal Protective Equipment
PR	Pulse Rate
PR DNER	Puerto Rico Department of Natural and Environmental Resources

PWS	Performance Work Statement
QAPP	Quality Assurance Project Plan
REL	Recommended Exposure Level
RI/FS	Remedial Investigation/Feasibility Study
RMSF	Rocky Mountain Spotted Fever
SDS	Safety Data Sheet
SSHP	Site Safety and Health Plan
SUXOS	Senior Unexploded Ordnance Supervisor
TLV	Threshold Limit Value
TWA	Time-Weighted Average
USA	USA Environmental, Inc.
USACE	Unites States Army Corps of Engineers
USCG	United States Coast Guard
USFWS	U.S. Fish and Wildlife Service
UXO	Unexploded Ordnance
UXOSO	Unexploded Ordnance Safety Officer
WBGT	Wet Bulb, Dry Globe Temperature
WNV	West Nile Virus

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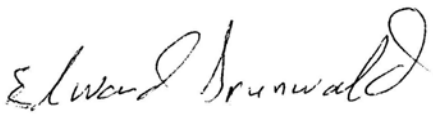
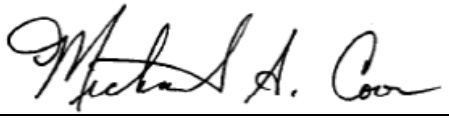
D.1 Signature Sheet

CONTRACTOR STATEMENT OF INDEPENDENT TECHNICAL REVIEW

This Accident Prevention Plan has been created as a joint effort between Parsons Government Services Inc. (Prime Contractor) and USA Environmental, Inc. (Subcontractor). Independent reviews from both companies have been conducted which are appropriate to the level of risk and complexity inherent in this project. This plan has been prepared and reviewed as denoted by the signatures below.

Plan Preparation	**Signature**	**Date**
Ed Grunwald, CIH 678-969-2394 Parsons Corporate Health and Safety Manager (CHSM)		4/24/15
Plan Approval		
Todd M. Heino, P.E. 617-449-1405 Parsons Corporate Vice President		4/29/2015
Plan Concurrence		
Mike Coon 425-457-1734 UXO Operations Manager		4/27/15
Patti Berry 678-969-2410 Parsons Project Manager		4/24/15

D.2 BACKGROUND INFORMATION

This Accident Prevention Plan (APP) has been prepared by Parsons with support from USA to cover the Underwater Remedial Investigation (RI) at Munitions Response Sites (MRS) 02 and 07 in the Municipality of Culebra, Puerto Rico. The purpose of the project is to perform a RI to characterize the nature and extent of Munitions and Explosives of Concern (MEC) and Munitions Constituents (MC) contamination in the underwater areas surrounding MRS 07 and the cayos (small islands surrounding Culebra) of MRS 02 and prepare a Feasibility Study (FS) to develop and evaluate effective remedial alternatives.

Culebra came under Navy control in 1901; the Navy built a small base that same year and an airfield approximately 20 years later. The Navy used the area for fleet exercises from 1902 until 1975. The Navy began surface and aerial bombing of the Flamenco Peninsula in 1935, and expanded the range to include eastern and western cayos in the early 1960s. Ordnance firing ended in September 1975.

D.2.1 PURPOSE

The purpose of this APP is to establish site-specific safety and health procedures, practices, and equipment to be implemented and used to protect affected personnel from the potential hazards associated with the field activities to be performed at the project sites. The APP assigns responsibilities, establishes standard operating procedures (SOPs), and provides for contingencies that may arise while operations are being conducted during the RI. The APP will interface with the Parsons Corporate Safety and Health Program.

D.2.2 PROJECT DETAILS

Contractor:

Parsons Government Services Inc.

3577 Parkway Lane, Suite 100

Norcross, GA 30092

Contract Number: W912DY-09-D-0062

Task Order Number: 0010

Project Name: Remedial Investigation/Feasibility Study, Munitions Response Site (MRS) 07 Culebrita Artillery Impact Area Water Acreage and All Cayos of MRS 02, Culebra, Puerto Rico.

D.3 PROJECT DESCRIPTION

MRS 07 Culebrita Artillery Impact Area: MRS 07 includes the northern portion of Culebrita as well as Cayo Botella. 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 included 20mm projectiles, Mk 44 and Mk 45 flares, live and practice bombs up to 500 pounds, and 2.75-inch rockets as well as British bombs and rockets. Culebrita beaches are used recreationally and many boats visit the island each year. Culebrita was originally part of the land designated for use by the U.S. Navy in 1900 and it was reported as excess in 1972. The water acreage surrounding MRS 07 experiences rough sea action that could cause changes in bottom conditions and this could contribute to the likelihood of MEC migration. MRS 07 covers the northern portion of Cayo Culebrita. The Cayo is managed by the USFWS (land portion) and PR DNER (shoreline areas that are within maritime terrestrial zone). Water areas are PR DNER jurisdiction; the USFWS and National Marine Fisheries Service (NMFS) only have jurisdiction in the water as it relates to Endangered Species Act resources. Residential areas do not exist on Culebrita; however, many people visit the beach and water areas frequently. The Culebrita Lighthouse is the only structure on Culebrita and it functions as a historical attraction and is not occupied

MRS 02 Surrounding Cayos: MRS 02 includes Cayo Lobo, Cayo Lobito, El Mono, Cayo Del Agua, Cayo Yerba, Cayo Raton, Cayo Alcarraza, Cayo Los Gemelos, Cayo Piedra Stevens, Cayo Tiburon, Cayos Geniqui, and Cayo Sombrerito. The total area encompasses approximately 660 acres. The U.S. Navy conducted fleet maneuvers and FLEXs on MRS 02 between 1923 and 1941. During these exercises, the surrounding cayos were heavily bombarded with high explosive (HE) 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 Los Gemelos and Alcarazza to most of the cayos on the east and west side of Culebra. Training continued until 1975. The water acreage surrounding most of the cayos experiences rough sea action that could cause changes in bottom conditions and this could contribute to the likelihood of MEC migration. MRS 02 cayos are managed by the USFWS as part of the Culebra Island NWR. Residential areas do not exist on any of these islands. Most of the cayos are inaccessible due to steep terrain from the water's edge. Scuba divers frequently access the water acreage surrounding these cayos. Figure D-1 provides a Map of MRSs 07 and 02 Boundaries. Table D-1 provides a synopsis of the MRS sites.

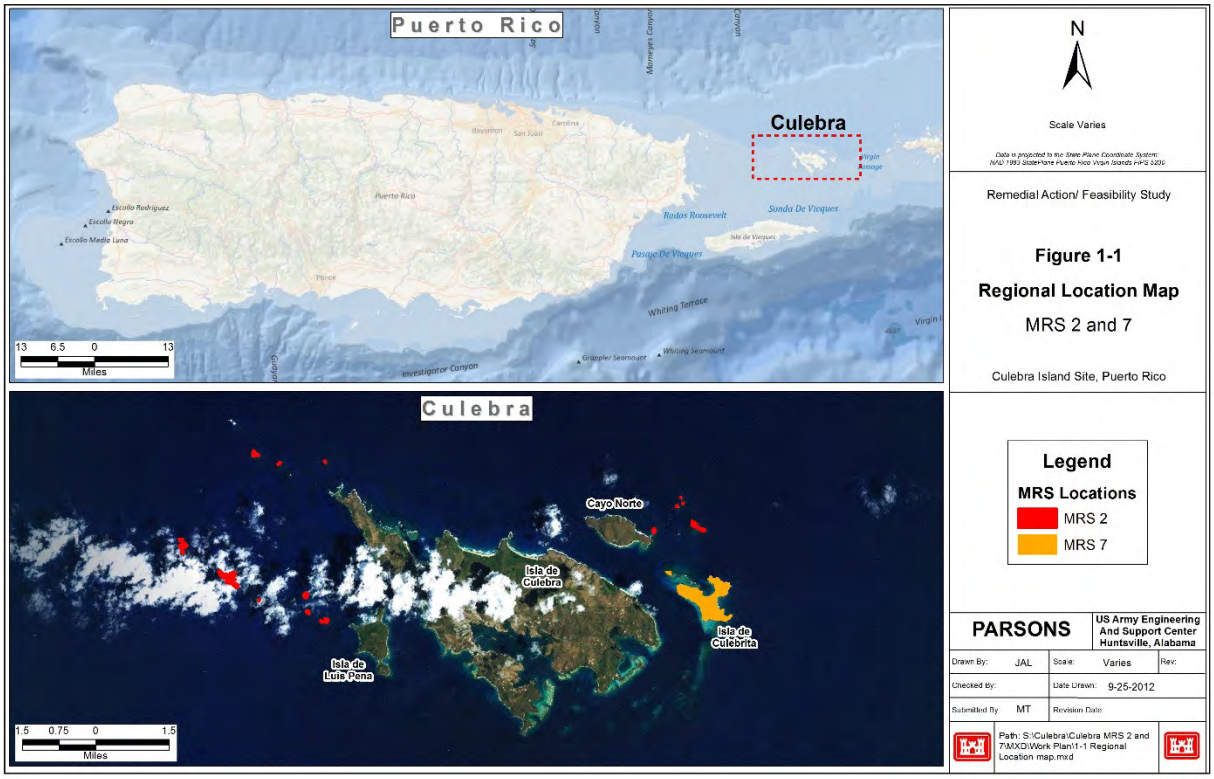


Figure D-1: MRS 07 and 02 Boundaries

Table D-1: Site Description

Site Location	Approximate Size (Acres)
Various former range areas on and around Culebra, Puerto Rico	MRS 02 is 660 water acres MRS 07 is 375 water acres
Topography	**Present Usage**
☐ Forested ☐ Tillage ☐ River/Creeks ☐ Grassland ☐ Flat land ☐ Open Terrain ☐ Wetland ☐ Arid ☒ Other: water sites	☐ Rural ☐ Commercial ☐ Urban ☒ Government ☐ Industrial ☐ Farming ☐ Ranching ☐ Residential ☒ Recreational ☐ Military ☒ Other – Various potential uses

D.4 DESCRIPTION OF WORK

Work required under this Performance Work Statement (PWS) falls under the Formerly Used Defense Sites (FUDS), Military Munitions Response Program (MMRP). Parsons/USA will perform a RI of the designated sites in a manner consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Section 104 and the National Contingency Plan (NCP), Sections 300.120(d) and 300.400(e). Work during Phase 2 will include an underwater digital geophysical mapping (DGM) survey. Investigation of anomalies will be conducted as part of Phase 3. During Phase 3, all MEC that does not impact Threatened and Endangered Species encountered during this munitions response shall be destroyed on-site either at a designated disposal location on land (for MEC that is acceptable to move) or an underwater disposal will occur (for MEC that is unacceptable to move), in coordination with the United States Coast Guard (USCG) and local environmental agencies. Removal or disposal of MEC items that could potentially harm Threatened and Endangered Species will not occur without a higher level of government approval.

D.5 CONTRACTOR ACCIDENT EXPERIENCE

Parsons Experience Modification Rate for the last 5 years is shown in Table D-2. A copy of the latest Occupational Safety and Health Administration (OSHA) Form 300 and OSHA Form 300A is provided in Attachment 1 of this APP.

Table D-2: Experience Modification Rate

Year	Interstate
2014	0.55
2013	0.56
2012	0.54
2011	0.58
2010	0.62

D.6 PHASES OF WORK REQUIRING ACTIVITY HAZARD ANALYSIS (AHA)

The following phases of work on this project require an Activity Hazard Analysis:

- Underwater Instrument Verification Strip (IVS)
- Underwater Geophysical Survey
- Underwater MEC Investigation
- MEC Disposal Operations on Land
- Underwater MEC Disposal Operations
- Underwater MC Sampling
- Diving Operations
- Snorkeling Operations
- MPPEH Inspection
- Quality Control
- Boat Transportation
- Boat Operations
- Vehicle Operations

The AHA forms are located in Attachment 2 of this APP. Table D-3 lists the hazards and action levels that may be associated with this project.

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Table D-3: Hazards Table

HAZARDS*	ACTION LEVELS**
Safety: include falling (slippery surfaces); underwater operations; boat operations; and MEC.	None/Awareness/Avoidance
Chemical: lubricants and fuels for equipment.	Per Safety Data Sheets (SDS)
Physical: include heat injuries and noise, drowning, diving related injuries (Air gas embolism, decompression sickness, etc.)	Per Monitoring Requirements
Radiological: none anticipated.	Not Applicable
Biological Hazards: may be present - biting and stinging insects; hazardous aquatic life.	None/Awareness/Avoidance
MEC: may be present on site; practice avoidance or use approved measures	Observe Safety Procedures

Notes to Hazards Table

*HAZARDS

Safety:

Falling: (e.g., Open pits, wells, shafts, rocks, crevices, steep inclines, slippery surfaces, etc.)

Walking or Debris: (e.g., Uneven terrain, animal burrows, surface indentations, exposed nails, broken timbers, sharp protruding objects, broken glass, metal fragments, etc.)

Water: [e.g., Moving waterways (Flash Floods), drowning/near drowning conditions or environments, etc.]

Eye Hazards: (e.g., Airborne dust/windy conditions, liquid splashes, etc.)

MEC/Other: (e.g., Explosives, combustible or flammable materials, etc.)

Chemical: Evaluate the chemical hazards that may be encountered during site activities for each task. For activities utilizing this plan, encounters with chemicals above the permissible exposure limit (PEL), or threshold limit value (TLV) are not expected. THIS PLAN WILL NOT BE USED IF OVEREXPOSURES OR IMMEDIATELY DANGEROUS TO LIFE OR HEALTH (IDLH) CONDITIONS ARE EXPECTED. [(List the chemical TLV/PEL/recommended exposure level (REL), OSHA/National Institutes for Occupational Safety and Health IDLH, odor threshold/warning levels, warning signs/symptoms of overexposure, concentrations expected on site.]

Physical: Evaluate the potential for injury from physical agents such as noise, electricity, moving parts/ machinery, and heat and cold stress that may be present (e.g., loud machinery, overhead or underground power lines, personal protective clothing, etc.).

Radiological: Evaluate the risk to human health caused by radioactive materials in the area where work is to be performed.

Biological: Evaluate the potential for illness or injury from biological agents (e.g., poisonous plants, animals, insects, microorganisms, etc.)

MEC: Evaluate exposure; minimize people, time, and amount of hazardous material. Age or condition of UXO DOES NOT decrease hazard. UXO exposed to fire is EXTREMELY hazardous: EVACUATE IMMEDIATELY.

**ACTION LEVELS: Action Levels will typically be defined as requiring site evacuation only, if significant hazards are encountered. Note: The activities for which this APP/Site Safety and Health Plan (SSHP) is designed will not typically encounter chemical contaminant or radioactive exposures above background. In the event that chemical or radioactive exposures, which are judged to be significant, are encountered (reasonable potential to exceed PELs or encounter IDLH conditions), this plan requires work stoppage at the site, reevaluation, and development of procedures designed by Safety Management that will address the potential exposure. Chemical exposures (releases) requiring evacuation will always be in an upwind direction to a safe distance. Personal protective equipment (PPE) per hazard assessment will be worn.

D.7 STATEMENT OF SAFETY AND HEALTH POLICY

As an industry-leading engineering, construction, and technical services firm, Parsons is firmly committed to maintaining a safe and healthy working environment at its offices and project facilities. We share the National Safety Council Safety and Health Code of Ethics as the principles guiding our commitment to safety.

1. We will hold safety and health as our highest core value.
2. Executive management will lead the safety improvement process.
3. Safety will be a responsibility shared by everyone in our organization.
4. Safety performance will be a key indicator of our organizational excellence and will be incorporated into our business processes.
5. We will communicate safety performance openly with employees.
6. Employees will be given the knowledge and skills necessary to safely perform their jobs.
7. We will extend our safety efforts beyond the workplace to include transportation, homes, and communities.
8. We will continually strive to improve our safety and health processes.

To meet its health and safety objectives, Parsons employees are expected to act proactively with regard to health and safety issues. This requires the combined efforts of a concerned management, responsible and knowledgeable supervision, and conscientious, well-trained employees.

Parsons will take reasonable action to meet or exceed the applicable occupational health and safety requirements, domestically and internationally, and will continuously monitor and improve operations, procedures, technologies, and programs that are conducive to maintaining a safe and healthy working environment.

D.8 RESPONSIBILITIES AND LINES OF AUTHORITY

All personnel are responsible for continuous adherence to this APP and safety and health procedures during the performance of their work.

D.8.1 LEVELS OF SAFETY RESPONSIBILITY AT PARSONS

D.8.1.1 Parsons Corporate Safety Personnel

Parsons corporate safety personnel are required to develop, communicate, and oversee Parsons health and safety programs at all Parsons business units. These employees will assist Parsons business unit managers regarding health and safety regulations, reporting requirements, safety training, and other related issues. Corporate safety personnel are responsible for monitoring the effectiveness of Parsons' health and safety programs, conducting audits, ensuring that all injuries and near misses are fully investigated, and developing Occupational Safety and Health Administration (OSHA) reporting and worker's compensation claim procedures. As part of corporate policy, safety information and statistics will be collected and maintained for all Parsons business units. Parsons corporate safety personnel also keep senior management informed of significant internal and external developments regarding health and safety.

D.8.1.2 Parsons Management and Supervisory Personnel

Supervisors and members of management, at all levels within Parsons, will comply with the Company's Health and Safety Policy and ensure that the applicable health and safety requirements at each domestic and international office and project facility are effectively implemented and monitored at all times. The supervisors and members of management will insure that the policies are effectively integrated with the preparation of proposals, project planning, and project execution. The safety performance of subcontractors will also be monitored in accordance with contract specifications as required by the contract with the client. Safety information and statistics will be reported to Parsons Corporate Safety Manager by personnel serving as supervisors or managers on a consistent and regular basis.

D.8.1.3 Parsons Employee Responsibility

Health and safety is the responsibility of everyone at Parsons. Parsons employees, to include subcontractors of Parsons, are required to exercise maximum appropriate care and good judgment at all times regarding health and safety, and adhere to safety procedures to prevent accidents and injuries. Any accidents or injuries either suffered by or witnessed by employees will be promptly reported to supervisory personnel. In order to better plan and avoid possible future accidents or injuries, the Parsons employee is required to promptly report any near misses or close calls. The employees are also required to promptly report any unsafe conditions, equipment, or practices to supervisory personnel in order to ensure a safe working environment.

D.8.2 LINES OF AUTHORITY REGARDING SAFETY

It is important for each employee involved with the project to know and understand the lines of authority. The organizational structure of supervisory personnel for this project is outlined in Chapter 2, Technical Management Plan, of this work plan. All personnel will be informed of this organizational structure during the training phase of the project. A copy of the project organization chart will be posted on the jobsite in order to provide quick references to anyone needing to report or make suggestions regarding safety issues. The résumés of key safety personnel in the organizational structure are provided in Appendix H of the work plan.

Table D-4 lists contact information for project personnel and Figure D-1 contains the project personnel, their involvement on the project, the organization these individuals represent, and lines of communication between these individuals.

Table D-4: Project Contacts

Name	Organization	Telephone	Mobile Number	E-mail
Roland Belew	USACE Project Manager	256-895-9525	256-503-0661	Roland.G.Belew@usace.army.mil
Patricia Berry	Parsons Project Manager	678-969-2410	256-520-1495	Patricia.Berry@parsons.com
Tom Bourque	USA Project Manager	941-746-5375	808-255-2320	tbourque@usatampa.com
Ed Grunwald	Parsons Corporate Health and Safety Manager (CHSM)	770-969-2394	678-429-6887	Ed.Grunwald@parsons.com
Jae Yun	Parsons Site Manager	678-969-2463	678-209-7620	Jae.Yun@parsons.com
Harry Craig	Parsons UXOQCS/UXOSO		630 740-7924	
N/A	SUXOS			

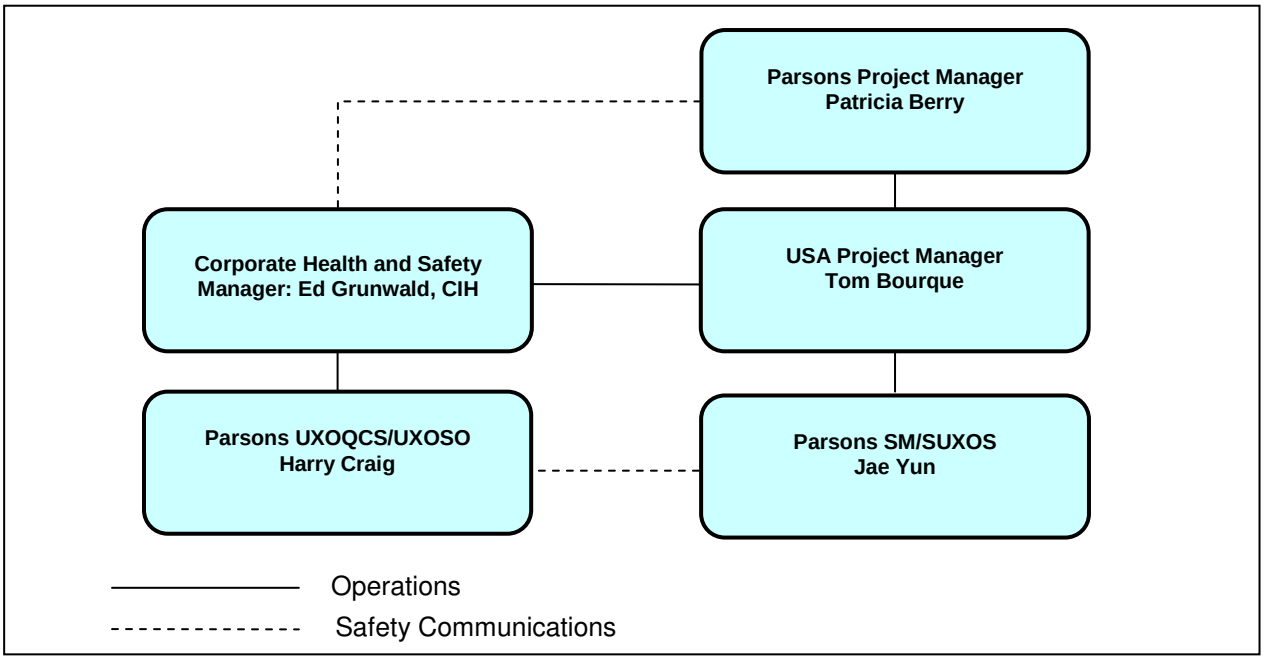

Figure D-2: Lines of Authority for Corporate and Site Activities

D.9 SUBCONTRACTORS AND SUPPLIERS

The Parsons subcontractors to be used on this project are USA and their subcontractors: Aqua Survey, Inc. (providing support for Work Plan and EM-61 equipment and underwater surveys); Caribbean Marine Services, Inc. (providing transportation via boats and logistical support, marine biologist); and Javier E. Bidot (Professional Land Surveyor).

D.9.1 MEASURES FOR CONTROLLING AND COORDINATING SUBCONTRACTORS

Before work is performed by the subcontractors, Parsons will negotiate and prepare an agreement that details all necessary and appropriate terms and conditions, including the PWS. Once the subcontract is executed, Parsons will perform periodic reviews to ensure that requirements are met. These reviews will cover technical requirements, and cost and schedule status. USA will do the same for their lower-tier subcontractors.

D.9.2 SAFETY RESPONSIBILITIES OF SUBCONTRACTORS

All service supplier personnel will receive training on ordnance recognition and UXO safety precautions prior to commencing activities on the project site. All personnel will be given a daily safety briefing and will be escorted by a UXO Technician at all times while on-site. All personnel will acknowledge that they have read, understand, and will abide by the APP and SSHP (Attachment 4) for this project by signing the acknowledgement page. In addition, personnel must abide by the guidance given by the SUXOS and/or UXOSO and UXO escort accompanying them at all times. Any deviations from the site plans could be used as the basis for termination of the subcontract agreement.

D.10 TRAINING

Prior to commencement of site activities, the CHSM and the UXOQCS/UXOSO will ensure that all field employees engaged in hazardous waste operations are informed of the nature and degree of exposure to

chemical and physical hazards that are likely to result from participation in site operations. Parsons will accomplish this by ensuring that all personnel entering the site have received the appropriate OSHA and site-specific training prior to participation in site activities. OSHA-required training will be conducted prior to site mobilization. Site-specific training will be held at the time of site mobilization, and will be reinforced during the daily safety briefings which all site workers will be required to attend.

D.10.1 SUBJECTS TO BE DISCUSSED WITH EMPLOYEES DURING SAFETY INDOCTRINATION

The UXOQCS/UXOSO will conduct the site-specific training. This training will include classroom type instruction covering the topics specified for site-specific training, and on-site participation in the following training:

- Performance Work Statement
- Details of the SSHP
- Employee rights and responsibilities
- Sequence of work events
- Identification of safety issues for the site
- Identification of Safety staff and lines of authority
- Safe work practices
- Proper lifting techniques
- Recognition of potential MEC and hazards associated with MEC
- Nature and extent of anticipated chemical, physical, and biological hazards
- Measures and procedures for controlling site hazards
- Emergency Response and Contingency Plan
- Location of medical services
- Site communication
- Evacuation routes
- Rules and regulations for vehicle use
- Safe use of field equipment
- Boat operations
- Underwater operations
- Handling, storage, and transportation of hazardous materials
- Use, care, and limitations of PPE
- Hazard communication per OSHA 29 CFR 1910.1200.

D.10.2 MANDATORY TRAINING AND CERTIFICATIONS THAT ARE APPLICABLE TO THIS PROJECT

D.10.2.1 General Training

All RI field employees who are involved in hazardous waste site activities receive 40 hours of OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) training in accordance with 29 CFR 1910.120 and 29 CFR 1926.65. If it has been more than a year since any worker has received the 40 Hour OSHA HAZWOPER training, he/she must also have a current HAZWOPER 8-Hour Refresher Training, in accordance with 29 CFR 1910.120 and 29 CFR 1926.65 prior to working on the site. A summary of site training requirements is provided in Table D-5.

All current certifications and training tables for RI field personnel will be maintained on-site for the duration of the project. Individuals without proper training records will not be permitted to work on-site.

Table D-5: Training Requirements

Training Content	Duration (If specified)	Frequency (If specified)	Personnel Categories				
			Site Safety & Health Officer	Field Team Leader	Work Team	Dive/Snorkel Team	Visitors
Health and Safety for Hazardous Waste Operations and Emergency Response – 29 CFR 1910.120	40-Hours	Once	☑	☑	☑	☑	
Supervised Field Experience– 29 CFR 1910.120	3-Days	Once	☑	☑	☑	☑	
Health and Safety for Hazardous Waste Operations and Emergency Response (Refresher) - 29 CFR 1910.120	8-Hours	Annually	☑	☑	☑	☑	
Supervisor's Health and Safety for Hazardous Waste Operations and Emergency Response – 29 CFR 1910.120	8-Hours	Once	☑	☑			
Dive Certification (Refer to Dive Operations Plan in App. L of the work plan)						☑	
Construction Safety Training (to comply with EM 385-1-1, 15 Sept 2008, paragraph 01.A.17 and 28.D.01)	30-Hours	Once. Maintain competency with 24 hours of formal safety and health course work every 4 years.	☑				
Formal Safety and Health Related Coursework	24-Hours	Every four years	☑				
Site-Specific Training	--	Once	☑	☑	☑	☑	
First Aid /CPR/ Bloodborne Pathogen	--	Bloodborne Pathogen (Annual), CPR (<2 years), First Aid (<2 years)	☑	☑	☑	☑	
Visitor Training	--	Per visit					☑
Daily Toolbox Safety Meeting	--	Daily, prior to operations	☑	☑	☑	☑	☑

D.10.2.2 Supervisory Training

On-site managers and supervisors who are responsible for directing others will receive the same training as the general site workers for whom they are responsible. They will also receive an additional 8 hours of OSHA-required supervisory training, in accordance with 29 CFR 1910.120 and 29 CFR 1926.65, to enhance their ability to provide guidance and make informed decisions. This additional training includes the following topics:

- Review of the Corporate Safety and Health Program
- Regulatory requirements
- Management of hazardous waste site cleanup operations
- Management of site work zones
- PPE selection and limitations
- Spill containment
- Monitoring site hazards.

The UXOQCS/UXOSO, with specific responsibilities for safety and health guidance on-site, will receive the training provided to general site workers and their supervisors. He/she will also receive advanced training in safety and health issues, policies and techniques. The UXOQCS/UXOSO will also receive the 30-hour OSHA Construction Safety class, in accordance with Engineer Manual (EM) 385-1-1, 01.A.17.

D.10.2.3 Requirements for Emergency Response Training

Prior to commencement of the project, all Parsons site personnel, as well as subcontractor personnel, will review and discuss the posted emergency telephone numbers, location of spill kit materials as applicable, directions to the hospital, the location of all site fire extinguishers, proper use of fire extinguishers, identification and location of first aid kits and blood-borne pathogen kits, and identification and location of the First Aid/Cardiopulmonary Resuscitation (CPR)-trained First Responders.

D.10.2.4 Fire Prevention

Smoking and lighters are prohibited in the work zone. No smoking is allowed on the site except in an approved and designated location, which is equipped with a 1-A:10-B:C fire extinguisher. Procedures will be reviewed with all site personnel.

D.10.2.5 MEC Training

All employees performing work involving the handling and destruction of MEC must be qualified IAW DDESB Technical Paper-18. A copy of their certificate of graduation will be kept on file at corporate headquarters. UXO qualified personnel will have knowledge and experience in military ordnance, ordnance components, and explosives location, identification, render safe, recovery/removal, transportation, and disposal safety precautions. UXO personnel will have the knowledge and experience to perform safe handling and transportation of ordnance items found. Copies of certificates of this training will be kept on the project site for the duration of site operations.

D.10.2.6 Hazard Communication

All Parsons employees and their subcontractors who will be performing work involving the handling of hazardous materials will receive Hazard Communication training detailing the hazards of the product, appropriate protective measures to prevent exposure to the product, procedures for safe storage and handling of the product, and response to emergencies. Personnel may request a Safety Data Sheet (SDS) for any hazardous material on the site at any time. Personnel will be informed that the location of the SDSs for this site will be in an SDS binder on the boat during operations and can be requested by contacting the UXOQCS/UXOSO. This training will occur as part of the initial mobilization training at the site.

D.10.2.7 Diving Training

All personnel performing SCUBA diving will be dive-certified through training at a commercial diving school, military school, Federal school, or an Association of Commercial Diving Educators (ACDE) accredited school. Training will be documented and available for inspection at the project site. Each diver will have current certification in CPR, first aid, and the use of emergency oxygen systems. These

certifications will also be maintained in project files for the duration of project site operations. See the Dive Operations Plan in Appendix L of the Work Plan for additional information.

D.10.2.8 Motorboat Operator Training

Boat Operators will meet EM 385 -1-1 (19.F.05). All boat operators for this project are USCG Licensed Captains which meet EM 385-1-1 (19.F.05) requirements.

D.10.3 REQUIREMENTS FOR SUPERVISORY AND EMPLOYEE SAFETY MEETINGS

D.10.3.1 Tailgate Safety Briefing

Tailgate Safety Briefings consist of providing short training sessions in various subjects that give the site worker knowledge and confidence in performing duties in a potentially hazardous environment. The Tailgate Safety Briefing will be given prior to commencing work each day and will include such items as:

- Expected weather conditions
- General site hazards
- Biological hazards on site
- MEC hazards
- Diving/snorkeling hazards
- Diving profiles
- Diving-related illnesses and their symptoms
- Location and contact information for the closest operational recompression chamber
- PPE required at each site
- Emergency evacuation procedures
- Heat stress precautions
- Buddy system procedures
- A review of any safety violations from the previous day
- Any other significant events involving safety.

Additional briefings will be provided, as needed, concerning the use of safety equipment, emergency medical procedures, emergency assistance notification procedures, accident prevention, the work plan, and site orientation, to ensure accomplishment of the project can be carried out in a safe and effective manner. All site workers are required to attend the Tailgate Safety Briefing daily.

D.10.3.2 Daily Debriefing

At the conclusion of each work day, a debriefing for all employees may be held, as appropriate, and the day's work will be discussed, to determine if changes are warranted before commencing activities the following day.

D.10.3.3 Periodic Site Training

On the first work day of each work week/period, when new employees arrive on site, or more frequently if needed, a pertinent topic will be selected and elaborated upon by the UXOQCS/UXOSO during the Tailgate Safety Briefing. These safety meetings will help ensure the safety and health of site personnel in the performance of regular work activities and in emergency situations. Safety meetings will be documented in the appropriate log and the Documentation of Training Form will be completed. Potential topics for discussion are as follows:

- Names and titles of key personnel responsible for site safety and health
- Components of the Site Safety and Health Program
- General site safety
- Hazards and symptoms of contaminant exposure (chemical), as applicable
- Routes of exposure from on-site contaminants (as applicable)
- Physical hazards (fall protection, noise, heat stress, etc.)
- Biological hazards
- Location and availability of written hazard communication program
- Site and activity PPE (including purpose, donning, doffing, and proper use)
- Work practices by which employees can minimize risks from hazards
- Safe use of engineering controls and equipment use
- Site control measures
- MEC suspected on-site
- MEC/UXO hazards and precautions
- Reporting requirements for UXO, spills, and emergencies
- Diving/Snorkeling safety
- Personnel decontamination procedures (as applicable)
- Contingency plans (communications, phone numbers, emergency exits, assembly points, etc.)
- Worker Right to Know/Hazard Communication
- Emergency equipment locations and use (fire extinguishers, spill kits, first aid kits, etc.)
- Equipment safety.

D.10.3.4 Visitors

Essential Personnel are defined as USACE and Parsons/USA project personnel necessary for the safe and efficient completion of field operations. This is limited to the Parsons/USA work team members, including the UXOQCS/UXOSO, SUXOS, Dive Supervisor, project site crew and a USACE Ordnance and Explosives Safety Specialist (OESS).

All visitors (persons other than Essential Personnel) to the site must receive at a minimum, a briefing on on-site conditions, hazards, and emergency response procedures. The UXOQCS/UXOSO will generally be the one providing the visitor briefing. All visitors will sign the Visitor's Log prior to participating in site activities. Persons participating in water operations will remain under the direct supervision of the SUXOS, and will be properly briefed on MEC hazards prior to boarding the boat to transport them to the site.

D.10.3.5 Safety Committee Meetings

During weekly progress meetings, the SUXOS, UXOQCS/UXOSO, and subcontractor supervisors (i.e., Site Safety Committee) will review and summarize upcoming work tasks, audits and inspections, competent person changes, and training. The Site Safety Committee will discuss and evaluate the risks of the upcoming work tasks and the planned mitigation measures for follow-on discussion during the daily tailgate safety meetings. Activities will be added to the summary at least two weeks in advance of the work. The Risk Mitigation Two-Week Look-Ahead Form, provided in Appendix F of this work plan, can be used to plan risk mitigation strategies at the weekly progress meetings.

D.10.4 TRAINING DOCUMENTATION

A training record will be kept in each employee's individual file on-site, to confirm that adequate training for assigned tasks is provided and that training is current. In addition, Documentation of Training Forms will be completed and kept on file at the work site for the duration of site activities, and made available for inspection upon request.

D.11 SAFETY AND HEALTH INSPECTIONS

General safety and health inspections are described throughout this APP. RI site personnel will conduct safety inspections on a daily basis, or more frequently if conditions warrant. The UXOQCS/UXOSO will be responsible for daily safety inspections of the project. During periods when the UXOQCS/UXOSO is not present, the SUXOS who is present will ensure that site personnel follow safety requirements and policy. The Safety Inspection Form will be used to record, track and provide follow-up, to ensure that safety deficiencies are corrected after they have been identified. A record of the safety inspection checklist will be maintained in the project file. Deficiencies will be identified, posted, and dated when the deficiencies are rectified.

D.11.1 EXTERNAL INSPECTIONS

External inspections are expected for this project. The USACE Project Manager will assign an on-site Safety Representative who will be responsible for conducting external inspections.

D.11.2 DAILY SITE INSPECTIONS

The UXOQCS/UXOSO will be responsible for daily inspections of the project. The CHSM may make random inspections, as warranted.

D.11.3 WEEKLY COMPLETION OF ONLINE OBSERVATION CHECKLIST

At least once a week, during the performance of field operations, the UXOQCS/UXOSO shall complete the Parsons' Environmental Services Sector observation safety checklist available online through the Parsons IndustrySafe system.

D.11.4 SCHEDULED AND PERIODIC EXERCISES

The following Training and Exercises will be conducted per the Emergency Management Plan, which is found as a sub-plan to the Dive Plan:

- Recovery of Injured Snorkeler or SCUBA diver: Methods for recovering an injured snorkeler or SCUBA diver will be established prior to work being conducted in the MRS for the phases of work requiring the deployment of these investigation methods. Once the UXOQCS/UXOSO has approved and documented the procedure, a weekly exercise demonstrating the recovery of an injured snorkeler or SCUBA diver will be conducted during the phases of work in which snorkeling or SCUBA is used.
- Recovery of Unconscious Snorkeler or SCUBA diver: Methods for recovering an unconscious snorkeler or SCUBA diver will be established prior to work being conducted in the MRS for the phases of work requiring the deployment of these investigation methods. Once the UXOQCS/UXOSO has approved and documented the procedure, a weekly exercise demonstrating the recovery of an injured snorkeler or SCUBA diver will be conducted during the phases of work in which snorkeling or SCUBA is used.
- Man overboard drill will be administered by the Captain of the Vessel and monitored by the UXOQCS/UXOSO once per week.

D.12 SAFETY AND HEALTH EXPECTATIONS, INCENTIVE PROGRAM, AND COMPLIANCE

D.12.1 GOALS AND OBJECTIVES

As stated in the company's Corporate Safety and Health Policy Statement, Parsons holds safety and health as our highest core value. It is Parsons' objective to maintain a safe working environment and complete every job with zero accidents.

Parsons' corporate safety program is designed to provide the safety training and tools required to ensure that Parsons is providing the safest work environment for its employees, other project personnel, and the general population in areas adjacent to our project sites.

The Parsons CHSM has reviewed the scope of the project and based on this review, has developed this APP designed to protect health and safety during the project.

As part of the job requirements employees are required to:

- Read and follow the APP and attached SSHP
- Attend health and safety meetings, courses and seminars, when available, to make them more informed and aware of potential hazards that exist at the site.

The goal for Parsons on this project is zero accidents. All managers and supervisors are responsible for implementing the provisions of this APP and attached SSHP and for answering team member questions about accident prevention. Management is responsible for ensuring that all safety and health policies and procedures are clearly communicated and understood by all team members. Managers and supervisors are expected to enforce the rules fairly and uniformly. This will be accomplished by:

- Informing team members of the provisions of the Safety and Health Program
- Evaluating the safety performance of all team members
- Recognizing team members who perform safe and healthful work practices
- Providing training to team members whose safety performance is deficient
- Disciplining team members for failure to comply with safe and healthful work practices.

All team members are responsible for using safe work practices, for following all directives, policies and procedures, and for assisting in maintaining a safe work environment. Parsons recognizes that open, two-way communication between management and all team members on health and safety issues is essential to an injury-free, productive workplace. To facilitate a continuous flow of safety and health information among all team members, the following will be accomplished:

- Training all new team members, during the site-specific training, on the site safety and health policies and procedures, which will include this APP and SSHP (Attachment 4)
- Training all new team members on the hazards associated with the job site
- Conducting daily Tailgate Safety Briefings for all team members
- Conducting quarterly refresher type training
- Posting and, if applicable, distributing safety information
- Encouraging open communications.

D.12.2 PARSONS' SAFETY INCENTIVE PROGRAM

Project management meets on a regular basis to maintain and support an incentive program based on the safety performance of Parsons and subcontractor employees.

It has been established that a necessary tie-in to a meaningful safety program is a program that rewards exemplary conduct. To any true professional, the monetary value of an award is transcended by the

recognition given. To present a plaque for demonstrating dedication to creating a safe and healthy environment; to dedicate a prime parking space for the use of the individual who has recognized a hazard and has eliminated it or devised a method of managing it; or to let an individual's or group's peers know, in some way, that individual or group has taken an extra step where safety is involved, is the type of award best appreciated by the professional.

With this in mind, the PM, or his/her designee (such as the Site Manager), may recognize the team's commitment to safety by giving them a gift certificate to the Parsons' Company Store for no recordable incidents during each of the major mobilization field efforts.

D.12.3 SAFETY PROGRAM NONCOMPLIANCE POLICIES AND PROCEDURES

In the event of a safety violation, the individual (supervisor, manager, employee) or company will be notified of the issue and the situation will be documented. After documentation is completed, the safety violator will be required to submit a written plan of action to correct the problem within 2 days of notification. Failure to comply will result in disciplinary action against the individual or the individual's company. If the violation is such that work on the site is deemed unsafe, work will be stopped until the problem is corrected and the UXOSO inspects the site for safety. Once the corrections are in place and the site has been inspected for compliance, the UXOSO will notify the Site Manager when work may resume. Subcontractor Safety Violation and Noncompliance forms are provided in Appendix F of the work plan.

Each member of the project team will play a part in keeping operations safe. A brief description of each employee's safety responsibility is listed below:

- Senior management is responsible for leadership and support of the safety program, for its effectiveness and improvement, and for providing all the safeguards necessary to assure a safe working environment.
- Supervisors are responsible for developing proper attitudes towards safety in themselves, and in those they supervise. Supervisors must ensure that all operations are performed with the highest regard for the safety of all personnel involved.
- Employees are responsible for genuine cooperation with all aspects of the safety program, including compliance with all policies and procedures. Employees need to continually practice safety while performing their work duties.

D.12.4 PARSONS' WRITTEN PROCEDURES FOR HOLDING MANAGERS AND SUPERVISORS ACCOUNTABLE FOR SAFETY

Parsons holds the SM/SUXOS, UXOSO, and PM accountable for maintaining project safety and health. All of these persons may be subject to safety inspections by Parsons senior management. These inspections are used to measure safety and health performance and to provide feedback.

D.13 ACCIDENT REPORTING

This section provides the requirements for implementing the accident reporting provisions of EM 385-1-1. This APP requirement applies to all work performed by Parsons for each project site.

The Parsons PM and the CHSM will be notified immediately by telephone of any accidents, and will follow up with Parsons' Accident Report Form (see Appendix F). Parsons' Site Manager will notify the USACE Contracting Officer and Project Manager immediately and initiate ENG Form 3394 for submittal to the USACE Safety Office or a designated representative for review, within 24 hours of the event. Parsons will thoroughly investigate all accidents.

Parsons has an online incident reporting tool for internal reporting. This system can be used to file the initial report and the incident detail report; however, it is necessary to have access to the Parsons PWeb

in order to use this tool. The incident reporting tool can be accessed at the following link: http://pwebtools.parsons.com/safety/IncidentSelect.aspx. All incidents (injuries, first aid cases, property damage cases, etc) must be entered into the online system within 4-hrs of occurrence.

Other lost-time or OSHA recordable accidents will be formally reported (i.e., using a written report) to USAESCH within five working days. The onsite USAESCH representative will be verbally notified within one day of any accident or injury that may require reporting. An OSHA 300 log of work-related injuries and illnesses will be maintained at the site. A copy of the OSHA 300 log is provided in Attachment 1 of this APP.

Person(s) who become ill or injured during work activities must immediately inform the SUXOS or UXOSO, regardless of the severity of the illness or injury. The victim(s) will be decontaminated if the injury occurred in contaminated areas. In the event that the medical emergency is severe enough, the SUXOS or UXOSO will order a cessation of work and notify off-site emergency personnel. All personnel at the work site will use the buddy system, staying within sight of their partner. If a partner becomes incapacitated or severely ill, an ambulance will be called. In the event that a cessation of work is ordered, all personnel should:

- Assist the UXOSO, if required, in decontaminating the victim and/or administering first aid
- Leave the contaminated area and undergo decontamination prior to entering the worker rest area
- Assist emergency response personnel when requested.

In the event of an accident that results in a lost work day or $2,000 or more in property damage, an accident report (ENG Form 3394), included in Appendix F, will be completed and submitted within 5 work days, and a copy will be provided to the client contact.

All workers receiving medical treatment, other than first aid, by a medical professional will obtain a medical release on the date of treatment stating one of the following: (1) the employee is not fit for duty; (2) the employee is fit for restricted duty; or (3) the employee is fit for duty. A copy of the release will be attached to the accident report and submitted to the client Project Manager.

D.13.1 EXPOSURE DATA

All work-related incidents occurring to Parsons or subcontractor employees will be reported for statistical purposes. Personnel man-hours are defined as hours worked by all persons assigned to the project, including subcontractor employees under direct supervision of Parsons' Site Manager. These man-hours will be annotated on the Daily Status Report form (see Appendix F of this Work Plan for forms) and transmitted to the Project Manager for monthly reporting. The Parsons' UXOSO will document and review with the CHSM, the potential exposure data versus the man-hours worked per day to evaluate the association to site accidents or injury. The most current OSHA 300 form will be posted on site and is presented in Attachment 1 of this APP.

D.13.2 ACCIDENT INVESTIGATIONS, REPORTS, AND LOGS

Investigation and documentation of emergency responses will be initiated by the UXOSO. This is important in all cases, but especially so when the incident has resulted in personal injury, property damage, or environmental impact. The documentation will be a written report and will include the following:

- Accurate, concise, and objectively recorded information
- Authentic Information: Each person making an entry must sign and date that entry. Nothing is to be removed or erased. If details are changed or revised, the person making the change should strike out the old material with a single line and initial and date the change.
- Titles and names of personnel involved

- Actions taken, decisions made, orders given, to whom, by whom, when, what, where, and how, as appropriate
- Summary of data available
- Possible exposure of personnel
- Copies of the Employer's Report of Occupational Injury or Illness (OSHA 300) or the USACE Accident Report (ENG Form 3394), as appropriate, will be completed and forwarded to the CHSM.

All accidents will be investigated and immediate steps will be taken to prevent recurrence. The client will be notified of any accidents occurring on this project site. Should an accident occur on the site, all reports and records will be documented. Copies will be maintained on site for the duration of site activities. A permanent copy will be maintained at the Parsons Corporate Office.

D.13.3 IMMEDIATE NOTIFICATION OF MAJOR ACCIDENTS

An accident that has, or appears to have, any of the following consequences will be immediately reported to the USACE Project Manager and/or Contracting Officer:

- A fatality.
- A permanent total disability.
- A permanent partial disability.
- The hospitalization of three or more people resulting from a single occurrence.
- Property damage in the amount of $200,000 or more.
- Three or more individuals become ill or have a medical condition which is suspected to be related to a site condition or a hazardous or toxic agent on the site.
- An arc flash injury
- USACE aircraft destroyed or missing.

Immediate notification will be made to the USACE Project Manager in person, telephonically, or by email. The reporting requirement of submitting ENG Form 3394 within five (5) working days applies.

Except for rescue and emergency measures, the accident scene will not be disturbed until it has been released by the investigating official.

The CHSM will report the incident to OSHA, if required.

D.14 MEDICAL SUPPORT

A minimum of two personnel per team have been trained in CPR and First Aid, and have current American Red Cross certification cards. These individuals will be on-site throughout the project, and they will act as First Responders to site emergencies.

Parsons has implemented a system of incident intervention through a partnership with WorkCare in the event of a non-life threatening, non-medical emergency work-related injury or illness. Through this process, Parsons can leverage clinical expert resources to coordinate appropriate treatment care. WorkCare serves as a "medical advocate" for the employee, the WorkCare clinician provides responsive evaluation of the incident, assists the employee/employer in determining the most appropriate course of action, and consults with the treating physician. To initiate this process, the following guidelines will be followed:

- If an emergency, call 911. If the injury or sickness is serious or life-threatening, summon medical response prior to contacting the CHSM, filing the incident report, or involving WorkCare.

- Workers will report all work-related injuries immediately to their supervisor or to the UXOSO. Work related injuries or illnesses which may require physician direction on appropriate attention should be reported to WorkCare (**888-449-7787**) before seeking medical care.
- If the injured employee requires medical care, an Order for Treatment of Work-Related Injury or Illness form (Appendix F) must be filled out and sent with the injured employee (or faxed to the clinic) at the time of initial evaluation.

For USA employees, the USA Occupational Physician will be available to provide patient specific information in case medical treatment is needed. Dr. James Vawter of Tierney-Vawter Medical Group can be reached at telephone number (831) 647-8700.

A first aid kit, emergency eyewash kit, and bloodborne pathogens kit will be kept in each site vehicle/boat and in the site office. Personnel who have any type of injury (including first aid injuries) will report to the UXOQCS/UXOSO so that he/she can replace used supplies in the first aid kit, and can investigate to determine the root cause(s) of the accident in order to prevent recurrences. The UXOQCS/UXOSO will also be responsible for making the determination as to whether professional medical assistance will be required. Maps displaying the route to the hospital will be maintained. In the case of an emergency during boat operations, the boat will head back to the nearest safe port, and the ambulance will be instructed to meet the boat at the pier to transport the injured person to the hospital.

D.15 PERSONAL PROTECTIVE EQUIPMENT

When feasible, engineering controls and work practices, or a combination thereof, will be used to protect site workers from safety and health hazards, and maintain personal exposures to hazardous substances below established exposure limits. The exposure limits used will be the lower of the OSHA PEL found in 29 CFR 1910 Subpart G, and 29 CFR 1910.1000, or the American Conference of Governmental Industrial Hygienists (ACGIH) TLVs. Other recognized published exposure levels, such as those found on SDSs, will be used if the substance is not listed by OSHA or the ACGIH. Parsons will not use a system of employee rotation as a means of complying with the PPE, PEL, TLV, or other published limits.

D.15.1 TYPES OF PPE

Requirements for task- and activity-specific levels of protective clothing are presented in the AHAs located in this APP. Personnel performing site tasks will use the appropriate level and type of PPE specified in this plan for each individual task. This APP makes provisions for use of the following levels of PPE, in accordance with the hazards and contamination level anticipated for each task or operation: Level A, Level B, Level C, and Level D. The following sections describe the PPE requirements for activities and locations on the site.

D.15.1.1 Level A Protection

Level A protection is not required.

D.15.1.2 Level B Protection

Level B protection is not required.

D.15.1.3 Level C Protection

Level C protection is not required.

D.15.1.4 Level D Protection

The minimal level of protection that will be required of RI field personnel and visitors at the site will be Level D. The UXOQCS/UXOSO may increase the level of protection as a result of changing requirements but may not decrease the level of protection without approval of corporate safety management. The following equipment will be used for Level D protection.

- Leather or canvas work gloves will be worn when performing lifting or rigging operations. Canvas or neoprene gloves will be worn while snorkeling.
- Tinted safety glasses with side shields or safety goggles
- Rubber soled shoes (on boat)
- While on dive station, Snorkelers may wear clothes which allow for easy swimming, such as swim shorts, but will wear cotton or other suitable clothes to protect the torso from abrasions and sun exposure.
- Cotton work clothes or coveralls when performing land operations. While on dive station, SCUBA Divers and Snorkelers may wear clothes which allow for easy swimming, such as swim shorts, but will wear cotton or other suitable clothes to protect the torso from abrasions and sun exposure.
- Chemical-resistant work gloves (when performing equipment fueling operations or any other types of operations presenting a potential for chemical exposure)
- Type III life jackets will be worn while transiting to and returning from dive station. Type III life jackets will also be worn during emergency procedures, towing and rigging operations, and any time it is prescribed by the vessels Captain. (Type I life jackets may be used if desired in place of Type III. Type V inflatable life jackets may be used on the vessel; however, if used they will be worn at all times while the vessel is underway.)

D.15.1.5 Snorkeling Operations

- Snorkel
- Fins
- Mask

See Dive Operations Plan in Appendix L of the Work Plan for additional information.

D.15.1.6 Diving Operations

- Snorkel
- Fins
- Buoyancy compensator
- Quick release weight belt or weight pouches
- Dive tank
- Regulator with octopus regulator and pressure/depth gauge, or dive computer providing the functions of the pressure and depth gauge
- Watch
- Knife
- Mask
- 30 cu/ft emergency air supply with independent regulator and pressure gauge

See Dive Operations Plan in Appendix L of the Work Plan for additional information.

D.15.1.7 Eye Protection

All personnel will use appropriate eye protection when exposed to eye hazards from flying particles, liquid chemicals, or other eye hazards. All personnel will use eye protection that provides side protection when there is a hazard from flying objects. Detachable side protectors (e.g., clip-on or slide-on side shields) meeting the pertinent requirements of this section are acceptable. Tinted safety glasses are recommended due to exposure to sun and reflection of sun's rays on water.

- All personnel who wear prescription lenses while engaged in operations that involve eye hazards will wear eye protection that incorporates the prescription in its design, or wear eye protection that can be worn over the prescription lenses without disturbing the proper position of the prescription lenses or the protective lenses.
- Eye protection will be distinctly marked to facilitate identification of the manufacturer.

Protective eye equipment, will comply with American National Standards Institute Z87.1-2010, "American National Standard Practice for Occupational and Educational Eye and Face Protection," which is incorporated by reference as specified in Section 1910.6.

D.15.1.8 Head Protection

Due to outdoor operations and exposure to sun, caps will be worn to protect the head from exposure to the sun. When snorkelers are actively performing water operations head protection is an option.

D.15.1.9 Body Protection

Special body protection is not expected to be required. While performing boat operations, personnel will wear Level D as prescribed above.

D.15.1.10 Foot Protection

Personnel working on boats will wear closed-toe footwear with rubber soles, to prevent slipping.

D.15.1.11 Hand Protection

Parsons requires employees to use appropriate hand protection when employees' hands are exposed to hazards such as those from skin absorption of harmful substances, severe cuts or lacerations, severe abrasions, punctures, thermal burns, and harmful temperature extremes. Chemical-resistant gloves will be required in fueling operations, or any other operations with a potential for chemical exposure. While on dive station, the boat crew will not be required to wear gloves, due to the need to set up and run the dive station. Snorkelers will wear either a canvas work glove or suitable dive glove to protect their hands from the underwater environment.

D.15.1.12 Hearing Protection

Hearing protectors will be made available to all employees exposed to an 8-hour time-weighted average (TWA) of 85 dB or greater (determined by using sound level meter or sound level Smartphone application). Hearing protectors will be replaced as necessary. Hearing protection will be required for all personnel working in and around any operations likely to produce high noise levels that reaches or exceeds the above mentioned levels.

D.15.1.13 Drowning Protection

All personnel participating in snorkeling operations as well as personnel performing support operations from the boat will be required to wear a Type II personal flotation device.

D.15.2 PROPER PPE SELECTION

Each task outlined in the PWS has been assessed to determine the risk of personnel exposure to safety and health hazards which may be encountered during its conduct. The hazard assessment is based on available information pertaining to the historical use of the site, site contaminant characterization data, and the anticipated operational hazards. This information has been provided by the client, or collected by site personnel. The PPE assigned as a result of the hazard assessment represents the minimum PPE to be used during initial site activities. Since hazard/risk assessment is a continuing process, changes in the initial types and levels of PPE will be made in accordance with information obtained from the actual

implementation of site operations and data derived from the site monitoring. As a general rule, the levels of PPE will need to be reassessed if any of the following occur:

- Commencement of a new work phase, or work that begins on a different portion of the site
- Change in job tasks during a work phase
- Change of season/weather
- When temperature extremes or individual medical considerations limit the effectiveness of PPE
- Contaminants other than those previously identified are encountered
- Change in ambient levels of contaminants
- Change in work scope, which affects the degree of contact with contaminants.

During the selection of PPE, the CHSM and UXOQCS/UXOSO will also take into consideration the following factors:

- Limitations of the equipment
- Duration of the work mission
- Temperature extremes
- Material flexibility
- Durability/integrity of the equipment.

D.15.3 UPGRADING/DOWNGRADING PPE

If work tasks are added or amended after completion and approval of the APP/SSHP, the UXOQCS/UXOSO will conduct the task hazard assessment and consult with the CHSM. The level and type of PPE to be used will be identified. The UXOQCS/UXOSO can increase the level of PPE when the situation warrants, as a result of an increase in hazardous exposure. Any decreases in the level of PPE must be approved by the CHSM, only after review of documentation demonstrating that the conditions and/or potential for hazardous exposure are reduced enough to justify the downgrade. Normally a week of data demonstrating a reduced hazard will be required to justify a downgrade in PPE.

D.15.4 GENERAL REQUIREMENTS

All PPE will be provided, used, and maintained in a sanitary and reliable condition where it is necessary. PPE is required because of hazards of processes or environment, chemical hazards, or mechanical irritants encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation, or physical contact. All PPE will be used in the manner for which it was designed. The assignment of PPE will be based upon hazard analysis, and the equipment will be selected based on its protection factor against site hazards.

D.15.5 INSPECTIONS

Each piece of PPE will be inspected daily prior to use. Defective or damaged PPE will not be used. It will be removed from service and turned in for repair, or removed from the site for disposal, and replaced with new PPE. During the work task, buddy teams should periodically inspect each other's PPE for evidence of chemical attack, such as discoloration, swelling, stiffening, or softening.

D.15.6 CLEANING AND DECONTAMINATION

The UXOQCS/UXOSO will be responsible for ensuring that PPE is in good, clean, working order prior to issuing the PPE the first time. Once issued, site personnel will ensure that reusable articles of PPE are maintained in a clean and sanitary fashion.

D.15.7 MAINTENANCE

Maintenance of PPE can vary greatly, based upon the complexity of the PPE and the intricacy of the repair involved. The UXOQCS/UXOSO will become familiar with the manufacturer's recommended maintenance and, when possible, repair defective PPE. If unable or unauthorized to conduct the repair, the UXOQCS/UXOSO will return the item to the manufacturer for repair, or procure a replacement.

D.15.8 STORAGE

PPE will be stored in a location that is protected from the harmful effects of sunlight, damaging chemicals, moisture, extreme temperatures, impact, or crushing. If needed, the UXOQCS/UXOSO will designate a specified area for the storage of PPE.

D.15.9 PPE PROGRAM EFFECTIVENESS

Based on the inhalation hazard and potential chemical exposures anticipated on these sites, Level D PPE is considered adequate for the work that is to be accomplished at the sites. If work tasks are added to the PWS after approval of this APP and SSHP, the SUXOS and/or UXOQCS/UXOSO (as applicable) will identify and assess the task hazards and relay that information to the CHSM. The CHSM will prepare an amendment to the SSHP, and submit the amendment for approval by the Corps of Engineers. The amendment will be added to the SSHP upon Corps of Engineers approval.

The UXOQCS/UXOSO will ensure PPE use complies with all applicable OSHA, USACE, Parsons, and USA requirements. It is the responsibility of each employee to report to work wearing proper attire and to assemble the necessary PPE prior to initiating donning procedures.

D.15.10 TRAINING

Parsons will provide training to each employee who is required by this section to use PPE. Each affected employee will demonstrate an understanding of the training, and the ability to use PPE properly, before being allowed to perform work requiring the use of PPE. Each such employee will be trained to know at least the following:

- The decisions and justifications used to select each piece of PPE
- The nature of the hazards and the consequences of not using PPE
- What PPE will be required for conducting each task
- When PPE will be required during the performance of each task
- How to properly don, doff, adjust, and wear each piece of PPE
- The proper inspection, cleaning, decontaminating, maintenance, and storage of each PPE item used
- The limitations of the PPE.

All personnel receiving PPE training will be required to demonstrate an understanding of the training topics and the ability to correctly use the PPE. This will be accomplished through the UXOQCS/UXOSO supervising and visually inspecting each individual's ability to properly don and use the PPE during initial use of the PPE.

When the UXOQCS/UXOSO has reason to believe that any employee, who has already been trained, does not have the understanding and skill required, he/she should retrain each such employee. Circumstances where retraining is required include, but are not limited to:

- Changes in the workplace that render previous training obsolete
- Changes in the types of PPE to be used that render previous training obsolete
- Inadequacies in an employee’s knowledge or use of assigned PPE indicating that the employee has not retained the requisite understanding or skill.

Upon completion of the training, and after each employee has successfully demonstrated the requisite understanding, the UXOQCS/UXOSO will complete the Training form (see Table D-6). This identifies: the employees who attended the training course, and successfully demonstrated the required knowledge; the date(s) of the training and demonstration session(s); and the PPE covered by the training session.

Table D-6: Certification of PPE Training

SITE INFORMATION			
Site Name:			
Location:		Instructor(s):	
Date of Classroom Instruction:		Date of Demonstration:	
PPE TRAINING COURSE ATTENDANTS			
The following personnel have attended the site PPE training course, and demonstrated, through use, an understanding of the donning/doffing procedures, inspection, cleaning, maintenance, storage, limitations, and proper disposal of the PPE listed on this certificate. These personnel are now qualified to use the site- and task-specific PPE, as required by the APP/SSHP.			
Name	**Organization**	**Name**	**Organization**
TYPES AND LEVELS OF PPE ADDRESSED DURING TRAINING			
Trainer's Initials	**Personal Protective Equipment Reviewed**	**Trainer's Initials**	**Personal Protective Equipment Reviewed**
CERTIFICATION			
I, the undersigned, do hereby certify that the above-listed personnel have received the requisite training and successfully demonstrated their ability to use the PPE listed above, in accordance with the USA Personal Protective Equipment Program.			
Name (printed):	Signature:	Date:	

D.16 PLANS, PROGRAMS, AND PROCEDURES

The following subsections describe the plans, programs, and procedures that will be used during site operations.

D.16.1 LAYOUT PLANS

Layout plans are not applicable for this project, as temporary structures will not be constructed.

D.16.2 EMERGENCY RESPONSE PLAN

The UXOQCS/UXOSO will perform pre-emergency planning before starting field activities, and during the mobilization and site-specific training phase of the project, and will coordinate emergency response with police/fire/emergency rescue personnel and the hospital. Pre-emergency planning meetings will be used to inform local authorities of the nature of site activities that will be performed under the PWS, and the potential hazards that activities may pose to site workers, the environment, and the public.

D.16.2.1 Procedures and Tests

The UXOQCS/UXOSO will verify all on-site emergency services information, to include procedures for requesting services. It will be the UXOQCS/UXOSO's responsibility to post these procedures and contact information in accordance with the requirements of this APP/SSHP. Pre-emergency planning tasks include:

- Post emergency instructions and telephone numbers in each site vehicle, in the boats, and beside each telephone or radio.
- Inspect all emergency equipment and supplies to ensure they are in proper working order.
- Provide a site map marked with planned evacuation routes, assembly points, and emergency equipment and supplies.
- Provide a map with the route to the medical clinic marked and highlighted, with copies of this map posted in all site vehicles and in each boat.
- Conduct an emergency response drill to test the effectiveness of the Emergency Response Plan and Contingency Procedures (ERPCP).
- Review and revise the ERPCP in the event of a failure of the plan in an actual or staged emergency, or when changes in site conditions or scope of work affect the ERPCP.
- Before normal activities are resumed, on-site personnel must be prepared and equipped to handle another emergency. These follow-up activities should be completed prior to actual work commencing.
- The CHSM will notify appropriate Government agencies as required. (Reminder: OSHA must be notified if there have been any fatalities or three or more hospitalizations.)
- Restock, service, and inspect all equipment and supplies.
- Review and revise all aspects of the SSHP as necessary to address and prevent future emergencies.

As part of mobilization training, prior to start of project work, all personnel will review the points of contact list and where it is posted, and the location of the nearest medical treatment facility. In the event of evacuation of the site, boats will transport project personnel to the closest safe port, and the responsibilities of all persons on-site will be reviewed.

- All personnel will review the locations of fire extinguishers and be competent to use one properly.
- All emergency telephone numbers will be posted next to the directions to the hospital map on-site, and with each telephone and radio.

D.16.2.2 Spill Plans

Parsons will conduct cleanup operations in the event of a spill of hazardous material (e.g., fuel or oil from UXO field operations). The UXOQCS/UXOSO will manage the collection of the spilled material with absorbent pads, and will containerize the pads or materials within Department of Transportation-approved drums for disposal as potentially contaminated hazardous waste. A complete spill kit will be maintained on-site when spills are a potential hazard.

In the event of a spill or leak of any potentially harmful material (regardless of quantity), on-site personnel will:

- Notify the UXOQCS/UXOSO immediately
- The UXOQCS/UXOSO will notify the Project Manager of the spill/leak with relevant information (location, time, chemical identity, quantity, hazards listed on the SDS), and any corrective actions/measures taken
- Locate the source and stop the leak/spill if it can be done safely (as dictated by the UXOQCS/UXOSO)
- Begin containment and recovery of spilled material (as directed by the UXOQCS/UXOSO), using appropriate PPE and spill cleanup equipment and materials
- Once notified, the Parsons Project Manager will, in turn, notify the USACE Project Manager and the Contracting Officer. The USACE Project Manager will advise Parsons if any additional actions are necessary.

D.16.2.3 Firefighting Plans

In the event of a fire or explosion, the UXOQCS/UXOSO will notify the police, fire department, and ambulance, as required. The UXOQCS/UXOSO will also contact the Corps of Engineers site Safety Representative and Project Manager. The decision on whether or not to try to extinguish a fire using available site personnel and equipment will be made by the UXOQCS/UXOSO, and will be based on whether the fire is small or large. Should a fire happen on the vessel, the vessel Captain has the responsibility of coordinating all fire-fighting efforts per US Coast Guard regulations. The Captain may jettison hazardous materials off the side of the vessel, if they create a higher risk to the vessel's crew and passengers. Global Positioning System (GPS) coordinates will be noted for any items jettisoned over the side. The vessel may also choose to drop anchor while fighting the fire on the vessel. The vessel Captain will either coordinate emergency assistance or delegate this duty to a crew member.

The vessel will be equipped with the Coast Guard-required safety equipment (Type IV life ring buoy, signaling devices, fire extinguishers, lights, working VHF radio, etc.) for the size vessel, but a minimum of two 1-A:10-B:C fire extinguishers should be used in the event of a fire while the boat operations are taking place. Parsons and USA personnel are trained in the use of fire extinguishers in order to respond quickly and effectively to any fire situation on board the vessel. The US Coast Guard will be called in the event of a large fire on the vessel.

D.16.2.3.1 Small Fires

A small fire is defined as a fire that can most likely be extinguished by site personnel using portable extinguishers. If a small fire occurs, the UXOQCS/UXOSO will direct site personnel to perform the following, if safe to do so:

- Evacuate unnecessary personnel to an upwind position
- Attempt to extinguish the fire using portable fire extinguishers or by smothering
- Remove any essential or flammable items from the path of the fire
- Notify emergency response services (Fire Department, US Coast Guard, police, ambulance, hospital, etc.), as needed.

If a fire extinguisher is used, this must be immediately reported to the UXOQCS/UXOSO (and if on the boat, the vessel's Captain). The fire extinguisher must be immediately removed from service until it can be recharged. Another fire extinguisher must be made available to the operating area. The area around where the fire occurred must be watched for a minimum of one hour after the fire has been extinguished, to ensure re-ignition does not occur. If personnel are not working in the area, the UXOQCS/UXOSO will check the area of the fire periodically to ensure re-ignition does not occur.

D.16.2.3.2 Large Fires

A large fire is defined as a fire that cannot be extinguished or that, because of its size, cannot be extinguished using portable fire extinguishers. In the event that a large fire occurs, the UXOQCS/UXOSO will direct personnel to conduct the following, if safe to do so:

- Evacuate all non-essential personnel to an upwind location
- Notify the fire department and other emergency response services (US Coast Guard, police, ambulance, hospital, etc.), as needed
- Order the appropriate level of protective equipment to be worn by personnel responding to the fire
- Attempt to control the fire to the extent possible
- Remove any essential or flammable items from the path of the fire.

D.16.2.3.3 Fires Involving Explosive Materials

If a fire occurs that involves explosive materials such as chemicals, fuels, or MEC (such as during the MEC disposal operations on land), the UXOQCS/UXOSO will order the immediate evacuation of all site personnel to an upwind assembly point at least fragmentation distance from the fire site. The UXOQCS/UXOSO will then notify the fire department and any other emergency services (Coast Guard, police, ambulance, hospital, etc.), as needed. At no time will personnel fight a fire involving explosive materials, nor will they allow outside emergency personnel to do so. The fire department personnel may not enter any closer than fragmentation distance from the fire and they may spray water to prevent the spread of fire.

After the fire has burned itself out, the site must be barricaded and entry prohibited until adequate cooling time has passed (at least 24 hours for a large fire). Explosive materials that may not have discharged during the fire may still be liable to function in the presence of extreme heat. After the site has cooled down, the UXOQCS/UXOSO and SUXOS will inspect the site and the condition of any MEC involved in the fire, and make a determination as to whether or not the site is safe for others to enter.

If MEC is still intact, the UXOQCS/UXOSO will determine whether or not it is considered to be hazardous. If it is MDAS, it will be moved to a secured collection point, and will be sold to a qualified recycler at the end of the project. If it is considered hazardous, a UXO team will destroy it in place. All MEC must be either removed or destroyed in place before non-UXO qualified personnel are permitted to enter the area.

If non-UXO-qualified personnel must enter the site for purposes of fire investigation, they must receive a briefing on the potential hazards of MEC on the site. They must be accompanied at all times by a UXO-qualified employee. NO OUTSIDE PERSONNEL WILL BE PERMITTED ONTO THE SITE WHILE THERE IS A KNOWN MEC HAZARD PRESENT. If during the course of the investigation MEC is observed, the site will be evacuated of all non-UXO-qualified personnel until the site can be rendered safe for re-entry.

D.16.2.4 Posting of Emergency Telephone Numbers

Emergency resources are listed in Attachment 3 and Table D-7.

Table D-7: Emergency Contact Numbers

Contact	Phone Number
Fire	787-742-3530
Police	787-742-3501
Hospital: Culebra Medical Clinic	787-742-3511
AERO Med Medical Evacuation Flight	787-756-3480
Emergency Management Office - Culebra	787-742-3849
Poison Control Hotline	1-800-222-1222
USEPA National Response Center	1-800-424-8802
WorkCare Incident Intervention Team	888-449-7787
CHEMTREC	1-800-424-9300
Federal OSHA Emergency Hotline	1-800-321-OSHA (6742)
Project Manager, Patricia Berry	678-969-2410
Parsons CHSM, Ed Grunwald	678-969-2394

D.16.2.5 Wild Land Fire Prevention Plan

The only land operations will be MEC disposal of MEC that is considered acceptable to move. In order to prevent grass fires from starting in the area, Parsons will control employee smoking. Smoking will be permitted only in designated areas. These areas will be equipped with a fire extinguisher, as well as a can containing sand, where cigarette butts can be safety discarded without concern for the spread of fire. All lighters and matches will remain in the designated smoking area and will not be permitted into the site.

In the event that a grass fire does start in the area, all personnel will be trained in the use of fire extinguishers, and fire extinguishers will be available to all site operations. Fire extinguishers are designed for the incipient stages of a fire, which is when they are most effective. If a large fire starts, employees will be instructed to evacuate the area to at least the hazardous fragment distance from the site and to contact the fire department. The fire department will remain at least fragmentation distance from the fire and implement applicable procedures to prevent the fire from spreading outside of the fragmentation distance.

D.16.2.6 Man Overboard/Abandon Ship Plan

Parsons is contracting with USA, whose subcontractor Caribbean Marine Services, Inc., will provide transportation back and forth between Culebra and the offshore operations sites. All personnel on the boat will be required to wear a Type III personal flotation device (PFD) for transit to and from the site. The buddy system will be in effect for the ride back and forth to the site. Employees will watch out for each other. In the event that somebody falls overboard, co-workers will immediately alert the boat's Captain, who will immediately turn the boat around and go back to retrieve the missing individual. The rehearsed man overboard procedures will be activated and all personnel will participate in the recovery per the Captain's directions. The boat is equipped with rescue equipment (a ring buoy) and diving ladder, to assist in getting the individual back on board.

Visitors to the site will also be required to wear a Type III PFD during transportation by boat to and from the remote water sites. Visitors will receive a safety briefing by the UXOQCS/UXOSO. Should a visitor fall overboard, the same rescue procedures will apply.

D.16.3 HAZARD COMMUNICATION PROGRAM

The program establishes procedures for employees who handle and store chemical products at the work site. It ensures that hazards of all chemicals purchased are evaluated and the information concerning their hazards is transmitted to employees. The delivery of information is to be accomplished by employee training, container labeling, and other forms of warning, and SDSs. All SDSs are requested from the suppliers at the time of order. If not available, then a recent SDS will be downloaded from the Internet.

As part of the Hazard Communication Program, an SDS binder will be maintained on-site, which includes copies of SDSs for all hazardous materials brought onto the site. All RI field personnel will be made aware of that fact. This SDS binder will be available on request to all site personnel during all working hours of the site. If site workers have further questions about any of the hazardous materials they come into contact with, the CHSM, or the safety staff, will locate the required information and pass it on to the employee.

All RI field employees who will be performing work involving the handling of hazardous materials will receive Hazard Communication training detailing the hazards of the product, appropriate protective measures to prevent exposure to the product, as well as safe procedures for storage and handling of the product, and response to emergencies. Personnel may request an SDS for any hazardous material on the site at any time. This training will occur as part of the initial mobilization training at the site and will be documented on the Documentation of Training Form.

The UXOQCS/UXOSO must ensure that project personnel can immediately obtain the required information about chemicals of concern during an emergency.

D.16.4 RESPIRATORY PROTECTION PLAN

Because of the type of work taking place, respirators are not expected to be required on these sites.

D.16.5 HEALTH HAZARD CONTROL PROGRAM

Because of the type of work that will be taking place on this project site, toxic environments are not anticipated; therefore, the Health Hazard Control Program is not required.

D.16.6 LEAD ABATEMENT PLAN

Lead abatement will not be required.

D.16.7 ASBESTOS ABATEMENT PLAN

As asbestos is not expected to be encountered on these outdoor water sites, an Asbestos Abatement Plan is not required.

D.16.8 ABRASIVE BLASTING

Abrasive blasting is not required on this project.

D.16.9 CONFINED SPACE

Excavation work requiring a confined space plan will not be required for work taking place on this site.

D.16.10 HAZARDOUS ENERGY CONTROL PLAN

The work on these project sites should not require the use of equipment that would require a Hazardous Energy Control Plan.

D.16.11 CRITICAL LIFT PROCEDURES

Because Parsons will not be performing any crane operations on this project, critical lift procedures will not be required.

D.16.12 CONTINGENCY PLAN FOR SEVERE WEATHER

No water operations or MEC operations will take place if an electrical storm is within 10 miles of the site. The UXOQCS/UXOSO and/or SUXOS will use electrical storm monitoring equipment to determine if an electrical storm is approaching. Water operations and MEC operations will cease when an electrical storm is within 10 miles of the site, and will not resume again until the UXOQCS/UXOSO determines that the electrical storm is at least 10 miles past the site. If an electrical storm is approaching, the boat will return to shore until the storm has passed, or if applicable, move the vessel to another work site, or move the vessel out of the path of the storm and allow it to pass by. Culebra often has small thunderstorms that pass quickly through the area.

Daily weather conditions will be a part of the daily briefing. Many people incur injuries or are killed as a result of misinformation and inappropriate behavior during severe weather. During severe weather, project personnel will seek shelter in an appropriate location (e.g., building or vehicle).

The individual is ultimately responsible for his/her personal safety and has the right to take appropriate action when threatened by severe weather.

D.16.12.1 Safe Locations during Severe Weather and Locations to Avoid

No place is absolutely safe from severe weather; however, some places are safer than others.

- Large enclosed structures (substantially constructed buildings) tend to be much safer than smaller or open structures
- The risk for lightning injury depends on whether the structure incorporates lightning protection, the construction materials used, and the size of the structure
- In general, fully enclosed metal vehicles such as cars, trucks, buses, or vans with the windows rolled up provide good shelter from many weather conditions.
- AVOID being in or near high places and open fields, light poles, metal fences, water (ocean, bay, lakes, streams, rivers, or wet surfaces).
- When inside a building, AVOID use of the telephone, washing your hands, or any contact with conductive surfaces with exposure to the outside, such as metal door or window frames, electrical wiring, telephone wiring, cable TV wiring, or plumbing, if lightning is a factor.

D.16.12.2 Safety Guidelines for Individuals

Generally speaking, identify and seek shelter that is appropriate for the type of severe weather you are encountering. Proper shelter will always include a sound structure, and removes you from the elements.

When available, pay attention to weather warning devices such as a National Oceanic and Atmospheric Administration (NOAA) weather radio and/or credible weather detection systems. However, do not let this information override good common sense.

D.16.12.3 Hurricane Evacuation Plan

Hurricanes are a potential threat to the area during hurricane season, which runs from May to November. Due to advanced hurricane tracking systems, there will normally be warning of an impending hurricane several days in advance of the event. During the hurricane season, it will be a duty of the UXOQCS/UXOSO to closely monitor the weather forecasts. If a hurricane is forecast to hit Puerto Rico on a specific day, the crew should cancel operations for that day and remain on Culebra, and seek shelter

until the storm passes. In advance of a hurricane the waters could become treacherous and operations would be considerably more hazardous.

Personnel should seek shelter in a substantial building. The UXOQCS/UXOSO will determine in advance the location of the established emergency hurricane shelter on Culebra. This shelter is in the high school gymnasium. The high school is on Route 251 between the airport and the city of Dewey. (The UXOQCS/UXOSO can obtain additional emergency information from the Culebra Emergency Management Office at (787) 742-3849).

The crew will report to the shelter as the storm approaches and remain there until the storm passes. If the police call for an evacuation of the island in advance of a hurricane, the crew will follow their directions and evacuate to the main island via available ferry and/or air transportation. Evacuations of this type normally occur a day or more in advance of the storm. Once on the main island, the crew will locate the established emergency hurricane shelter. Personnel will report to the established hurricane shelter and report to the UXOQCS/UXOSO, who will ensure all RI field personnel have been accounted for. Personnel will remain in the hurricane shelter until the storm has passed and the evacuation order has been lifted.

D.16.13 ACCESS AND HAUL ROAD PLAN

As work will be underwater operations, an Access and Haul Road Plan will not be required.

D.16.14 DEMOLITION PLAN (ENGINEERING AND ASBESTOS SURVEYS)

As work on this plan does not involve demolition of buildings containing asbestos material, the Demolition Plan is not required.

D.16.15 EMERGENCY RESCUE (TUNNELING) PLAN

As work on this project does not involve tunneling operations, this Emergency Rescue Plan is not required.

D.16.16 UNDERGROUND CONSTRUCTION FIRE PREVENTION AND PROTECTION PLAN

As underground construction is not required on this project, the Underground Construction Fire Prevention and Protection Plan is not required.

D.16.17 COMPRESSED AIR PLAN

As there are no plans to use compressed air on this project, a Compressed Air Plan is not required.

D.16.18 FORMWORK AND SHORING ERECTION AND REMOVAL PLANS

As this project will not involve formwork and shoring erection and removal, this plan will not be required.

D.16.19 JACKING PLAN (LIFT) SLAB PLANS

As there will be no Lift Slab work on this project, this plan will not be required.

D.16.20 BLASTING PLAN

During Phase 3 (intrusive investigation) explosive materials will be brought onto the site and used for disposal operations. Explosive operations on this project site will be spelled out in "Demolition, Explosive Storage, and MPPEH Disposal," "MEC Disposal," and "Explosive Management Plan" in the Phase 3 Work Plan which will cover the RI Underwater Intrusive Operations. MEC items that are acceptable to move will be transported to shore and disposal will occur in a designated location. MEC that is not safe to move will undergo an underwater MEC disposal operation.

D.16.21 DIVING PLAN

A Dive Operations Plan is located in Appendix L.

D.16.22 PLAN FOR PREVENTION OF ALCOHOL AND DRUG ABUSE

Parsons will institute and maintain a program for achieving the objective of drug free workspace. Parsons ensures consistent and uniform application of this policy and, when required, interfaces with supervisor and employee to evaluate performance and behavior.

D.16.22.1 Parsons Corporate Statement of Policy

Parsons expects all employees to report to work in a fit condition in order to perform their duties at the utmost levels of safety and efficiency. To that end, Parsons expressly prohibits the unlawful manufacture, distribution, dispensing, possession, use, or sale of a controlled substance or alcohol on its premises at any time. Employees are prohibited from being at work under the influence of these substances. Parsons will reasonably accommodate the efforts of an employee to obtain medical treatment for substance abuse and to return to employment thereafter. However, no provisions of this policy will contravene the provision of the Employee Personal Conduct Policy or preclude the corporation from terminating an employee in accordance with this policy.

Parsons has an obligation to safeguard the privacy rights of all employees; however, it is also committed to provide a healthy and safe work environment for all employees and to take reasonable steps to safeguard the health and safety of others and protect the environment in conducting its business.

D.16.22.2 Safety and Environmental Provisions

In some instances employees may be required to undergo random toxicological tests to ensure their continuing fitness for duty to comply with contract mandated requirements or government regulations, or if performing work at locations where the nature of their duties is such that there is the potential for serious physical injury to themselves, to others, or the general public, or potential for significant damage to property or the environment.

Assignment of employees to such job sites will be done on a voluntary basis. Employees who refuse to participate in the random testing program and whose job duties would normally expose them to random testing, will be considered for placement in other positions not requiring random testing. Every reasonable effort will be made to accommodate such transfers; however if suitable work for which the employee is qualified is not available, the employee will be subject to termination. A positive test result will lead to immediate removal from the site, in addition to either corrective action in accordance with this policy or the employee's termination in accordance with the Employee Personal Conduct Policy.

Searches are another means of protecting the safety of individuals and property at those locations where the nature of the work has the potential for serious injury or damage. Reasonable searches may be conducted of individuals, their personal vehicles, effects, and other areas under the individual's control while at such work sites, or engaged in Parsons business at such sites.

Employees will not be detained or searched without their consent. An employee's cooperation in a search at such work sites is a condition of employment. The employee will be required to sign an Acknowledgment and Consent for Random Toxicological Tests and Searches form. Such testing will be performed by the company using qualified contracted agents, or trained employees.

D.16.22.3 Substance Abuse Testing – Employment Offer

No candidate for employment will be subjected to substance abuse testing prior to the receipt of an offer of employment. Offers of employment, regardless of employment category, must contain a contingency regarding satisfactory completion of substance abuse testing. Failure to submit to or pass an examination will result in immediate disqualification from consideration for placement.

D.16.22.4 Employee Personal Conduct

Employees bear the primary responsibility for their own job performance and for taking any action or undergoing treatment necessary to maintain performance at a satisfactory level.

In addition, the Corporation may require an employee to submit to a test for alcohol or illegal drugs, based upon reasonable suspicion that the employee's performance or behavior is being adversely affected by use of such substance(s). Reasonable suspicion will be based upon physical manifestations of impairment, or unsatisfactory behavior or job performance (including on-the-job accident or injury) which causes the supervisor and Human Resources Representative to reasonably believe that alcohol or drug abuse may be a contributing factor. Refusal by an employee to take such a test will be viewed as an admission of such use by the employee.

D.16.22.5 Confidentiality of Records

All information concerning an applicant's or employee's medical condition or test results will be kept strictly confidential, with information released only upon a legitimate need-to-know basis.

D.16.23 FALL PROTECTION PLAN

As these operations will occur underwater, a Fall Protection Plan is not required.

D.16.24 STEEL ERECTION PLAN

As no steel erection will be taking place on this project, this plan is not required.

D.16.25 NIGHT OPERATIONS LIGHTING PLAN

As there are no plans to operate during hours of darkness, there is no requirement for a Night Operations Lighting Plan.

D.16.26 SITE SANITATION PLAN

Adequate sanitation facilities will be provided on the boat to ensure proper personal hygiene. Site sanitation will be established and maintained in accordance with OSHA 29 CFR 1910.120(n).

An adequate supply of potable (drinkable) water will be provided on-site at all times, and will be supplied in accordance with the following provisions:

- Containers used for potable water will be capable of being tightly closed, equipped with a tap, and maintained in a clean and sanitary condition.
- A container used for distribution of drinking water will be clearly labeled as to its contents and not used for any other purpose.
- Water will not be dipped from the container, and use of a common cup will not be allowed.
- Where single-service cups are provided, separate sanitary containers will be provided for the storage of the unused cups, and for the disposal of the used cups.
- Personnel will be instructed to wash their face and hands prior to drinking.
- Outlets and storage containers for non-potable water, such as water for firefighting or decontamination, will be clearly labeled using the following wording to indicate that the water is not suitable for drinking: "CAUTION – WATER UNSAFE FOR DRINKING, WASHING, OR COOKING." At no time will there be a cross connection or open potential between a system furnishing potable water and a system furnishing non-potable water.
- Toilet facilities will be available on the boat.

- Hand and face washing facilities will be available on the boat. Washing facilities will consist of potable running water, soap, and drying towels. Portable eyewash will be available in site vehicles.
- Waste Disposal: A trash receptacle will be present for the disposal of hand drying materials, any disposable PPE, paper towels used to dry hands, and other generated site debris.

D.16.27 FIRE PREVENTION PLAN

In order to prevent fire from occurring, every step will be taken to keep the boat neat and clean. All equipment and materials not in use will be put away in designated locations. Trash cans, with lids, will be available, and will be emptied on a daily basis to keep trash from accumulating. All flammable liquids will be stored in approved flammable liquid cans, in order to prevent spillage and ignition of the material. Bonding and grounding procedures will be in place when transferring flammable liquids from their designated containers and into equipment. Personnel handling explosive and/or flammable materials will wear cotton under and outer garments, to prevent build-up and transfer of static electricity.

D.16.27.1 Fire Protection

Portable fire extinguishers are rated and classified with NUMERAL and LETTER designations, based on fire tests conducted by the Underwriters Laboratories, Inc., or other nationally recognized testing laboratories. The numeral rating indicates the relative extinguishing effectiveness of extinguishers classified for Class A and B fires only. The letter classification coincides with the class of fire. Extinguishers found to be effective on more than one class of fire have multiple letter classifications (Example: B:C).

The rating of hand-portable fire extinguishers is based on the following categories.

- A Class A fire extinguisher is used for ordinary combustible materials.
- A Class B fire extinguisher is used for flammable liquids.
- A Class C fire extinguisher is used for electrical fires.
- A Class D fire extinguisher is used for combustible metal fires.

Many fires are small at origin and may be extinguished by the use of proper hand-portable fire extinguishers. It is strongly recommended that the fire department be notified as soon as a fire is discovered. This alarm should not be delayed awaiting result of application of portable fire extinguishers.

Fire extinguishers can represent an important segment of any overall fire protection program. However, their successful functioning depends upon meeting the following conditions.

- The extinguisher is properly located and in working order.
- The extinguisher is of proper type for a fire that may occur.
- The fire is discovered while it is still small enough for the extinguisher to be effective.
- The fire is discovered by a person ready, willing, and able to use the extinguisher.

Class A fires can be readily extinguished by quenching/cooling with water or a water-mixture agent. Class B fires are more effectively extinguished by an agent that blankets or smothers the fire through exclusion of oxygen surrounding the fire area. Those extinguishers containing bromochlorodifluoromethane, monobromotrifluoromethane, carbon dioxide, or dry chemical are generally best suited for extinguishing Class B fires.

For Class C fires, the primary consideration in extinguishing this type of fire is the selection of nonconductive extinguishing agent, to prevent dangerous electrical shock and possible death to users. Water or water-mixture type extinguishing agent must not be used under any circumstances on energized electrical equipment (Class C) fires. When possible, electrical equipment and circuits should be de-

energized before attacking a Class C fire. Due to its corrosive nature, dry chemical is not recommended for use on computerized, electronic, or other equipment with extensive circuitry.

D.16.28 FATIGUE MANAGEMENT PLAN

This Fatigue Management Plan and its policies apply to all site personnel working on this project, to include Parsons management and field staff as well as subcontractor management and field staff participating in work on this project site. Parsons and subcontractor management staff will be responsible for assuring all personnel working on this site are scheduled in accordance with this Fatigue Management Plan in order to allow for adequate rest between work shifts. The UXOSO will work with the SUXOS in scheduling work and in implementing this Fatigue Management Plan during site operations. Implementing a Fatigue Management Plan includes the following actions:

- Discussing driving to and from work and any possible mitigation of driving as a factor in fatigue
- Scheduling alternate transportation for long commutes
- Creating a work schedule
- Rotating jobs to prevent repetitive work
- Taking breaks at critical times in the work cycle
- Controlling of environmental factors (heat, use of PPE, etc.)
- Establishing a buddy check-in for individuals working alone.

Because of the logistics of performing work in this location and the potential for lost days of work due to hazardous weather and/or hazardous sea conditions, schedule flexibility is required. As a result, a Fatigue Management Plan is being implemented in order to allow the site work team to work longer hours during good weather and sea conditions in order to make up some of the time that may be lost due to hazardous weather and sea conditions.

While the optimum work week would involve four 10-hour days, flexibility is being worked into the schedule in order to ensure that personnel remain well-rested and attentive. Rest is defined as a period of time during which the person concerned is off duty and is not performing work. This includes administrative tasks and afforded the opportunity for uninterrupted sleep. However, this does not include time for breaks, meals, or travel time to and from work.

The following procedures will be strictly adhered to on this project site:

- Personnel operating boats will not be permitted to work in excess of 12 hours of duty time in any 24-hour period. A minimum of 8 consecutive hours of rest between shifts in a 24-hour period is required.
- All personnel working from the boats will be scheduled to receive a minimum of 8 hours of rest in any 24-hour period.
- Rest periods may be interrupted only in case of emergency, drill, or other overriding operational necessity. Work will only occur only during hours of daylight.

All site personnel will be trained in the following topics:

- Symptoms of fatigue (weakness, impaired memory or concentration, insomnia, muscle pain, joint pain without swelling, headaches, and unrefreshing sleep)
- Habits and actions that the worker may take to avoid fatigue (maintain physical fitness, healthy diet, maintain hydration, adequate time for sleep each night)

- Actions that workers should take if they observe fatigue in a co-worker (assist a co-worker who is experiencing fatigue, alert the supervisor or UXOSO of the situation, encourage worker to take a break and to allow enough time for adequate sleep in the evening)
- Controls that are in place to prevent fatigue (allowing breaks throughout the day, maintaining a schedule that will allow for workers to have 8 hours of continuous sleep in the evening, training workers in signs/symptoms of fatigue and making their supervisor aware if they are experiencing fatigue).

Sleep apnea makes an individual more susceptible to the effects of fatigue. All site personnel with sleep apnea will make this fact known to their supervisor and the UXOSO, so that they can monitor those workers more frequently, particularly during days when working in excess of 10 hours.

Symptoms of sleep apnea include excessive daytime sleepiness, loud snoring, episodes of breathing cessation during sleep witnessed by another person, abrupt awakenings accompanied by shortness of breath, awakening with a dry mouth or sore throat, morning headache, insomnia, and attention difficulties. Many people with sleep apnea go undiagnosed, and anyone experiencing these symptoms will also be more prone to the negative effects of fatigue and should be monitored more frequently during work days exceeding 10 hours.

D.17 CONTRACTOR INFORMATION

Parsons is the prime contractor on this project. This APP and SSHP (included in Attachment 4) are based on Parsons procedures. USA and tiered subcontractors (ASI, Javier E. Bidot, and Culebra Marine Services), are all subcontractors on this project. All subcontractors will be required to comply with all site requirements and will attend the initial mobilization training, which will describe the work to be performed, and all safety and health requirements regarding that work. They will also be required to attend the daily Tailgate Safety Briefings, which will go over the operations expected to take place that day. Any subcontractor personnel working on this project will also be required to attend any special safety meetings that are taking place for the duration of their operations on the site.

D.18 SITE-SPECIFIC HAZARDS AND CONTROLS

Site-specific hazards and controls are detailed in the Activity Hazard Analyses for each activity of the operation. These can be found in Attachment 2. The specific activities on this site are as follows:

- Underwater Instrument Verification Strip (IVS)
- Underwater Geophysical Survey
- Underwater MEC Investigation
- MEC Disposal Operations on Land
- Underwater MEC Disposal Operations
- Underwater MC Sampling
- Diving Operations
- Snorkeling Operations
- MPPEH Inspection
- Quality Control
- Vehicle Operations
- Boat Transportation
- Boat Operations.

Because of the nature of planned site operations, the potential risk for exposure to safety hazards is high. Anticipated safety hazards that may be encountered during site activities, and precautions to be followed, are in individual AHAs found in Attachment 2.

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APPENDIX D, ATTACHMENT 1
OSHA FORM 300

This attachment contains a copy of OSHA Form 300.

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OSHA's Form 300 (Rev. 01/2004)

Log of Work-Related Injuries and Illnesses

Attention: This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.

Year _____

U.S. Department of Labor
Occupational Safety and Health Administration

You must record information about every work-related injury or illness that involves loss of consciousness, restricted work activity or job transfer, days away from work, or medical treatment beyond first aid. You must also record significant work-related injuries and illnesses that are diagnosed by a physician or licensed health care professional. You must also record work-related injuries and illnesses that meet any of the specific recording criteria listed in 29 CFR 1904.8 through 1904.12. Feel free to use two lines for a single case if you need to. You must complete an injury and illness incident report (OSHA Form 301) or equivalent form for each injury or illness recorded on this form. If you're not sure whether a case is recordable, call your local OSHA office for help.

Form approved OMB no. 1218-0176

Establishment name _____

City _____ State _____

Identify the person			Describe the case			Classify the case				Enter the number of days the injured or ill worker was:		Check the "injury" column or choose one type of illness:					
						CHECK ONLY ONE box for each case based on the most serious outcome for that case:						(M)					
(A) Case No.	(B) Employee's Name	(C) Job Title (e.g., Welder)	(D) Date of injury or onset of illness (mo./day)	(E) Where the event occurred (e.g. Loading dock north end)	(F) Describe injury or illness, parts of body affected, and object/substance that directly injured or made person ill (e.g. Second degree burns on right forearm from acetylene torch)	Death	Days away from work	Remained at work		Away From Work (days)	On job transfer or restriction (days)	Injury	Skin Disorder	Respiratory Condition	Poisoning	Hearing Loss	All other illnesses
								Job transfer or restriction	Other record-able cases								
						(G)	(H)	(I)	(J)	(K)	(L)	(1)	(2)	(3)	(4)	(5)	(6)
					Page totals	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*

Be sure to transfer these totals to the Summary page (Form 300A) before you post it.

Public reporting burden for this collection of information is estimated to average 14 minutes per response, including time to review the instruction, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistics, Room N-3644, 200 Constitution Ave, NW, Washington, DC 20210. Do not send the completed forms to this office.

OSHA's Form 300A (Rev. 01/2004)

Summary of Work-Related Injuries and Illnesses

Year _____

U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

All establishments covered by Part 1904 must complete this Summary page, even if no injuries or illnesses occurred during the year. Remember to review the Log to verify that the entries are complete

Using the Log, count the individual entries you made for each category. Then write the totals below, making sure you've added the entries from every page of the log. If you had no cases write "0."

Employees former employees, and their representatives have the right to review the OSHA Form 300 in its entirety. They also have limited access to the OSHA Form 301 or its equivalent. See 29 CFR 1904.35, in OSHA's Recordkeeping rule, for further details on the access provisions for these forms.

Number of Cases

Total number of deaths	Total number of cases with days away from work	Total number of cases with job transfer or restriction	Total number of other recordable cases
0	0	0	0
(G)	(H)	(I)	(J)

Number of Days

Total number of days away from work	Total number of days of job transfer or restriction
0	0
(K)	(L)

Injury and Illness Types

Total number of…	(M)		
(1) Injury	0	(4) Poisoning	0
(2) Skin Disorder	0	(5) Hearing Loss	0
(3) Respiratory Condition	0	(6) All Other Illnesses	0

Post this Summary page from February 1 to April 30 of the year following the year covered by the form

Establishment information

Your establishment name _____

Street _____

City _____ State _____ Zip _____

Industry description (e.g., Manufacture of motor truck trailers)

_____

Standard Industrial Classification (SIC), if known (e.g., SIC 3715)

____ ____ ____ ____

OR North American Industrial Classification (NAICS), if known (e.g., 336212)

____ ____ ____ ____ ____ ____

Employment information

Annual average number of employees _____

Total hours worked by all employees last year _____

Sign here

Knowingly falsifying this document may result in a fine.

I certify that I have examined this document and that to the best of my knowledge the entries are true, accurate, and complete.

_____ _____
Company executive Title

_____ _____
Phone Date

OSHA's Form 301
Injuries and Illnesses Incident Report

Attention: This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.

U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

This *Injury and Illness Incident Report* is one of the first forms you must fill out when a recordable work-related injury or illness has occurred. Together with the *Log of Work-Related injuries and Illnesses* and the accompanying *Summary*, these forms help the employer and OSHA develop a picture of the extent and severity of work-related incidents.

Within 7 calendar days after you receive information that a recordable work-related injury or illness has occurred, you must fill out this form or an equivalent. Some state workers' compensation, insurance, or other reports may be acceptable substitutes. To be considered an equivalent form, any substitute must contain all the information asked for on this form.

According to Public Law 91-596 and 29 CFR 1904, OSHA's recordkeeping rule, you must keep this form on file for 5 years following the year to which it pertains

If you need additional copies of this form, you may photocopy and use as many as you need.

Completed by _____

Title _____

Phone _____ Date _____

Information about the employee

1) Full Name _____

2) Street _____

City _____ State _____ Zip _____

3) Date of birth _____

4) Date hired _____

5) ☐ Male
☐ Female

Information about the physician or other health care professional

6) Name of physician or other health care professional

_____

7) If treatment was given away from the worksite, where was it given?

Facility _____

Street _____

City _____ State _____ Zip _____

8) Was employee treated in an emergency room?
☐ Yes
☐ No

9) Was employee hospitalized overnight as an in-patient?
☐ Yes
☐ No

Information about the case

10) Case number from the Log _____ *(Transfer the case number from the Log after you record the case.)*

11) Date of injury or illness _____

12) Time employee began work _____ AM/PM

13) Time of event _____ AM/PM ☐ Check if time cannot be determined

14) **What was the employee doing just before the incident occurred?** Describe the activity, as well as the tools, equipment or material the employee was using. Be specific. Examples: "climbing a ladder while carrying roofing materials"; "spraying chlorine from hand sprayer"; "daily computer key-entry."

15) **What happened?** Tell us how the injury occurred. Examples: "When ladder slipped on wet floor, worker fell 20 feet"; "Worker was sprayed with chlorine when gasket broke during replacement"; "Worker developed soreness in wrist over time."

16) **What was the injury or illness?** Tell us the part of the body that was affected and how it was affected; be more specific than "hurt", "pain", or "sore." Examples: "strained back"; "chemical burn, hand"; "carpal tunnel syndrome."

17) **What object or substance directly harmed the employee?** Examples: "concrete floor"; "chlorine"; "radial arm saw." If this question does not apply to the incident, leave it blank.

18) **If the employee died, when did death occur?** Date of death

APPENDIX D, ATTACHMENT 2
ACTIVITY HAZARD ANALYSES

This attachment contains the following Activity Hazard Analyses related to the RI/FS effort:

- Boat Operations
- Boat Transportation
- Diving Operations
- MEC Disposal on Land
- MPPEH Inspection and Certification
- Quality Control
- Snorkeling Operations
- Underwater Geophysical Survey
- Underwater IVS
- Underwater MC Sampling
- Underwater MEC Disposal
- Underwater MEC Investigation
- Vehicle Operations

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ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)
(Use highest code): L

Date: 9 October 2014 Project: RI/FS

Activity: Boat Operations

Activity Location: Culebra Island, Puerto Rico

Prepared By: Cheryl M. Riordan, CSP

Risk Assessment Code Matrix

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Add Identified Hazards

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	• Locate MEC under water using geophysical equipment as well as visual survey of video taken with equipment in order to characterize the site. • An EM61 mounted to one of a variety of platforms can be deployed to detect MEC/anomalies on the sea floor, or beneath the sea floor. • A small hoist on the boat will be used to place the floating EM61 over the side of the boat and into the water. • An ROV may be used under water in order to provide video of MEC under water at various depths, which also allows for the Team Biologist and Marine Scientist to examine the biology at these locations, without disturbing sensitive habitats. • This equipment will present video of the items located and identify the latitude/longitude coordinates of MEC items identified. • This is an MEC avoidance operation that will be performed remotely from boats on the surface of the water. • At no time will physical contact be made with MEC.	• Underwater MEC hazards • Uneven and/or moving working surfaces of the boat – slip, trip, and fall hazards • Muscle strain carrying instruments/equipment • Pinch/laceration hazards from hoisting equipment • Dropping load from hoisting equipment • Heat Stress • Biological hazards – bees, wasps, mosquitoes, spiders. • Noise • Sunburn • Hazardous weather conditions	• On-site MEC Training • Perform MEC avoidance by avoiding operating the boat in shallow waters in which the boats hull, outdrives or jet-drives impact the sea floor • Boat Operator will ensure that boat is well maintained and in good condition prior to taking on passengers. • Boat Operator will ensure that Captain and vessel are licensed in accordance with local requirements. • Boat Operator will be in communication with Captain and aware of destination, when boat leaves wharf and docks on each trip. • Emergency radios will be in operating condition prior to leaving the wharf. There will be a primary and alternate means of communication, and extra batteries will be available. • Directions for contacting the Coast Guard and hospital will be posted with each radio and cell phone. • Personnel will attend daily safety briefing by Captain prior to transport by boat, and will obey all directions from the Captain during transport. • Boat will be equipped with rescue equipment to handle a man overboard situation (such as life ring with rope, or similar equipment), and personnel trained in its use. • Personnel will wear rubber-soled shoes to prevent slipping while on the boat, and will avoid stepping in wet areas that could be slippery. • Follow appropriate lifting/carrying procedures. Lift with legs, maintain balance, use work gloves, and never lift more than you can safely carry. • Ensure hoisting mechanism is adequate for the load imposed and is securely braced and anchored. • A positive latching device will be used to secure the load and rigging. • Operator of hoisting equipment will be trained in its use. • Hoisting and rigging equipment will be inspected daily. • Heat stress monitoring, drinking water, work-rest schedule, and cool shelter for breaks.	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Continuation of prior step.	Continued of prior step.	• Training in biological hazards avoidance. • Use PPE in accordance with this AHA. • Use insect repellents as necessary. • Use sunscreen and wear cap. • Fire extinguishers will be readily available. • First Aid Kits will be readily available. • ROV will be characterizing levels of underwater MEC contamination and sensitive habitats through video taping of underwater conditions. Contact with MEC items is not intended or anticipated. • Personnel will remain seated while boat is in motion, and keep all extremities inside the boat. • All personnel will wear personal flotation devices while boat is in transit and during inclement weather. At all other times, a personal flotation device should be readily available and accessible. • Good housekeeping standards will be enforced. Cargo will be properly staged on the boat to prevent tripping hazards. • Local weather will be monitored and boat operations will be terminated should a storm be approaching, or should sea conditions make it unsafe to continue.	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	• Move generator to open, well-ventilated area • Fuel generator • Start generator • Hook up electrical equipment, energize equipment • Upon completion of tasks, de-energize equipment • Remove electrical equipment • Shut down generator • Cool down generator • Return to storage	• Strains, sprains, sore muscles • Carbon monoxide poisoning • Electrical shock • Burns • Fire	• Use proper lifting techniques when moving generator. • Know how to stop the generator quickly in case of emergency. • Understand the use of all generator controls, output receptacles, and connections. • Exhaust contains poisonous carbon monoxide, a colorless and odorless gas. Always use generator in well-ventilated area. • Shut off the engine before performing any maintenance. If the engine must be run, make sure the area is well ventilated. • The generator produces enough electric power to cause a serious shock or electrocution if misused. Using a generator or electrical appliance in wet conditions, such as rain, or when your hands are wet, could result in electrocution. Keep the generator dry. • If the generator is stored outdoors, unprotected from the weather, check all electrical components on the control pane before each use. Ensure the Ground Fault Circuit Interrupter (GFCI) is in good working order prior to use. Moisture can cause a malfunction or short circuit in electrical components which could result in electrocution. • The exhaust system gets hot enough to ignite some materials. - Keep the generator at least 3 ft away from buildings and other equipment during operation. - Do not enclose the generator in any structure. - Keep flammable materials away from the generator. • Gasoline is extremely flammable and is explosive under certain conditions. Refuel in a well-ventilated area with the engine stopped and cooled down. Do not smoke or allow flames or sparks within 50 ft of where the engine is refueled or where gasoline is stored. • Do not overfill the fuel tank (there should be no fuel in the filler neck). After refueling, make sure the tank cap is closed properly and securely. Be careful not to spill fuel when refueling. Spilled fuel or fuel vapor may ignite. If any fuel is spilled, use materials from the spill kit and make sure the area is dry before starting the engine. Avoid repeated or prolonged contact with skin or breathing of vapor. • Fuel vapors are extremely flammable and may ignite after the engine has started. Make sure that any spilled fuel has been wiped up before starting the generator. • Ensure fuel spill kit and fire extinguisher are readily available at refueling area. • The muffler becomes very hot during operation and remains hot for a while after stopping the engine. Be careful not to touch the muffler while it is hot. Let the engine cool before refueling or storing the generator indoors. • Fuel vapors are extremely flammable and may ignite after the engine has started. Make sure that any spilled fuel has been wiped up before starting the generator. • Ensure fuel spill kit and fire extinguisher are readily available at refueling area.	

ACTIVITY HAZARDS ANALYSIS

Add Items

	EQUIPMENT	TRAINING	INSPECTION
X	• Footwear with rubber soles to prevent slipping • Safety toe footwear required in the vicinity of hoisting operations • Back braces (optional) • Appropriate clothing and PPE (to include personal flotation device, canvas or leather work gloves, safety sunglasses and cap). Hearing protection will be required if noise from boat engine or generator reaches hazardous levels. • Chemical-resistant gloves for use in fueling operation	• PPE Training	• PPE inspected daily prior to use.
X	• Boat • EM61 or other model of underwater magnetometer • Hoisting equipment • ROV • Generator • Fuel spill kit • Generator tool kit • Fuel container	• UXO personnel will meet training and experience requirements outlined in DDESB TP 18 • Site specific MEC training will be presented to all site personnel • Equipment familiarity training • Site-specific training, slip/fall hazards • Site-specific training/lifting and carrying techniques • All site personnel will have current HAZWOPER training • Site-specific training in use of tools	• UXOSO will ensure that all controls are being followed, all equipment is being correctly utilized, and all personnel have received appropriate training. • Equipment inspected daily prior to use. • Daily serviceability check of magnetometers. • Inspect generator prior to use. • Daily inspection of hoisting equipment.
X	• Communications equipment • First Aid Kit • Fire extinguishers • Man overboard rescue equipment (hook, rope, life ring) • WBGT monitor	• Emergency response procedures • Heat Stress symptoms/first aid • Site-specific biological hazards to include first aid • Equipment familiarity training	• Communications equipment checked daily prior to use. • First Aid kits checked daily and inspected weekly. • Fire extinguishers checked daily and inspected weekly. • Equipment inspected daily prior to use.

Involved Personnel:

Acceptance Authority (digital signature):

Digitally signed by Robert D. Crownover
DN: cn=Robert D. Crownover, o=USA Environmental, Inc., ou=DSQ, email=rcrownover@usatampa.com, c=US
Date: 2014.10.10 11:38:09 -04'00'

	PRINT	SIGNATURE	
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UXOSO Name:			**Date/Time:**
Employee Name(s):			**Date/Time:**
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ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC) (Use highest code): L

Date: 10 October 2013 Project: RI/FS

Activity: Boat Transportation

Activity Location: Culebra Island, Puerto Rico

Prepared By: Cheryl M. Riordan, CSP

Risk Assessment Code Matrix

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	• Identify the hazards associated with boat operations. • UXOSO will inspect boat for physical condition and condition and presence of required safety and rescue equipment. • UXOSO will ensure all personnel are wearing required personal flotation device. • Captain will give safety briefing prior to transport of personnel.	• Potential for malfunction of boat engine or equipment • Fire hazards • Slip, trip, and fall hazards • Heat stress • Weather hazards • Sunburn	• Boat Captain will ensure that boat is well maintained and in good condition prior to taking on passengers. • UXOSO will ensure that Captain and vessel are licensed in accordance with local requirements. • A daily Float Plan (which lists destinations and manifest on board) will be filed each day with Shore Team or PM prior to departure. • Emergency VHF radios will be in operating condition prior to leaving the wharf. There will be a primary and alternate means of communication, and extra batteries will be available. • Directions for contacting the Coast Guard and hospital will be posted with each radio and cell phone. • Personnel will attend daily safety briefing by Captain prior to transport by boat, and will obey all directions from the Captain during transport. • All passengers will wear personal flotation device at all times while boat is in transit and when experiencing inclement weather. At other times, personal flotation devices will be available and readily accessible. • Boat will be equipped with rescue equipment to handle a man overboard situation (such as life ring with rope, or similar equipment) and personnel trained in its use. • Block, brace, and secure cargo from movement during transportation. • Fire extinguishers and First Aid kit must be readily available. • Personnel will wear shoes with non-slip soles and will avoid walking in wet areas of the boat that may be slippery. • Heat stress monitoring, drinking water, work-rest schedule, and cool shelter for breaks. • Personnel will wear caps and use sunscreen.	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	• Captain will operate boat to transport personnel to desired destination	• Potential for boat accidents during transport • Potential for malfunction of boat engine or equipment • Fire hazards • Drowning hazards • Slip, trip, and fall hazards • Heat stress • Biological hazards – bees, wasps, mosquitoes, and spiders • Weather hazards • Sunburn • Noise from boat engine	• A daily Float Plan (which lists destinations and manifest on board) will be filed each day with Shore Team or PM prior to departure. • Emergency radios will be in operating condition prior to leaving the wharf. There will be a primary and alternate means of communication, and extra batteries will be available. • Directions for contacting the Coast Guard and hospital will be posted with each radio and cell phone. • Personnel will attend daily safety briefing by the Captain prior to transport by boat, and will obey all directions from the Captain during transport. • All passengers will wear personal flotation device at all times while on boat. • Passengers will remain seated while boat is in motion. • Boat will be equipped with rescue equipment to handle a "man overboard" situation (such as life preserver with rope, or similar equipment) and personnel will be trained in its use • Fire extinguishers and first aid kit must be readily available. • Personnel will wear shoes with non-slip soles and will avoid walking in wet areas of the boat that may be slippery. • Heat stress monitoring, drinking water, work-rest schedule, and cool shelter for breaks. • Personnel will not ride in boat during electrical storm, or if electrical storm is approaching. • Personnel will wear caps and use sunscreen. • Training in biological hazards avoidance. • PPE for noise. • Use barrier creams/insect repellents, as necessary. • Use sunscreen and wear cap. • Fire extinguishers will be readily available. • First Aid kits will be readily available. • Good housekeeping standards will be enforced. Cargo will be properly staged on the boat to prevent tripping hazards. • Local weather will be monitored and boat operations will be terminated should a storm be approaching, or should sea conditions make it unsafe to continue.	L

Add Items

	EQUIPMENT	TRAINING	INSPECTION
X	• PPE to include personal flotation device, safety sunglasses and cap. Hearing protection will be required if noise from boat engine reaches hazardous levels.	• PPE training	• PPE inspected daily prior to use

ACTIVITY HAZARDS ANALYSIS

	EQUIPMENT	TRAINING	INSPECTION
X	• Boat • Storm detection monitor	• Licensed boat Captain • Training in boat safety procedures • All personnel will have current HAZWOPER training • Equipment familiarity training • Site-specific training, slip/fall hazards • Training in lifting and carrying techniques	• UXOSO will ensure that all controls are being followed, all equipment is being correctly utilized, and all personnel have received appropriate training, • Ensure that Boat Operator is providing daily inspection of their boats. • Equipment inspected daily prior to use.
X	• First Aid kit • Fire extinguishers • Communication equipment (radios, cell phones and extra batteries • Man overboard rescue equipment (rope w/ life ring) • WBGT monitor	• Emergency response procedures training • Fire extinguisher training • Heat stress training and First Aid • Site-specific biological hazards to include First Aid • Equipment familiarity training	• Communications equipment checked daily prior to use. • First Aid kits checked daily and inspected weekly. • Fire extinguishers checked daily and inspected weekly. • Rescue equipment will be inspected daily prior to boat leaving dock. • Equipment inspected daily prior to use.

Involved Personnel:

Acceptance Authority (digital signature): Robert D Crownover

Digitally signed by Robert D. Crownover
DN: cn=Robert D. Crownover, o=USA Environmental, Inc., ou=Safety and Quality, email=rcrownover@usatampa.com, c=US
Date: 2013.10.11 13:43:57 -04'00'

	PRINT	SIGNATURE	
SUXOS Name:			**Date/Time:**
UXOSO Name:			**Date/Time:**
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ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)
(Use highest code): M

Date: 10 October 2013 Project: RI/FS

Activity: Diving Operations

Activity Location: Culebra Island, Puerto Rico

Prepared By: Cheryl M. Riordan, CSP

Risk Assessment Code Matrix

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Add Identified Hazards

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	• Brief pre-dive operations, task assignments, and check equipment	• Boating hazards • Hazardous tides or currents (rip tides, high tide, etc.)	• All divers are certified per EM 385-1-1. • Divers will receive an orientation briefing on dangerous marine life and what actions to take if encountered (such as terminate dive). • Divers will be briefed on tides and currents. If currents exceed 1 knot the dive will be terminated until the speed of the current subsides. • Prior to water entry, have complete task brief. Divers are fully trained and have current certification which enables them to identify hazards below the surface. • Review specific hazards and controls located in the Dive Plan. • Review DSOPs 1, 3, 4, 5, 6, and 7 as related to current task, assignment, or pre-, during, and post- dive activities. • Standby diver will be dressed out and checked out by DV Sup and then may down dress, but must be at the ready when divers are in the water. • All personnel trained in diving distress signals. • Boat will be equipped with rescue equipment to handle a "man overboard" situation (such as life ring with rope, or similar equipment), and personnel trained in its use. • Dive Supervisor equipped with rescue equipment and First Aid supplies and equipment. • Emergency radios will be in operating condition prior to leaving the wharf. There will be a primary and alternate means of communication, and extra batteries will be available. • Be observant while in water; note, avoid, and report unsafe conditions or activities. Avoid stepping on coral or sharp underwater objects. • Determine types of hazardous aquatic life found in this location from local marine or harbor police or lifeguard headquarters. • Training in biological hazards avoidance - do not wear flashing jewelry, as it may attract aquatic life; do not perform underwater operations at dawn or at dusk, when sharks are most likely to be feeding; be observant for schools of bait fish (on which sharks feed) as there could be a shark chasing them; leave area immediately if hazardous conditions are observed. • Use PPE IAW this AHA. • Local weather will be monitored and boat operations will be terminated should a storm be approaching, or should sea conditions make it unsafe to continue. • Determine areas where hazardous tasks, tides or currents may be present and times of day or conditions likely to cause them from local marine or harbor police of lifeguard headquarters. Training in how to safely handle these circumstances. If currents exceed 1 knot, the dive will be terminated until the speed of the current subsides.	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	• Locate and move to dive area and complete pre-dive checks. • Diver dons all required fully functional SCUBA equipment. • Dive Supervisor verifies diver dressed out properly with adequate air supply.	• Boating hazards • Drowning hazards • Hazardous tides or currents (rip tides, high tide, etc.)	• All divers are certified per EM 385-1-1. • Boat will be equipped with rescue equipment to handle a "man overboard" situation (such as life ring with rope, or similar equipment), and personnel trained in its use. • Emergency radios will be in operating condition prior to leaving the wharf. There will be a primary and alternate means of communication, and extra batteries will be available. • Determine types of hazardous aquatic life found in this location from local marine or harbor police or lifeguard headquarters. • All passengers will wear a personal flotation device while the boat is in transit or during adverse weather. • Passengers will ensure a firm grip at all times on handholds or boat structure while the boat is in motion and keep all extremities inside boat. • Use PPE IAW this AHA. • Local weather will be monitored and boat operations will be terminated should a storm be approaching, or should sea conditions make it unsafe to continue. • Determine areas where hazardous tasks, tides or currents may be present and times of day or conditions likely to cause them from local marine or harbor police of lifeguard headquarters. Training in how to safely handle these circumstances. If currents exceed 1 knot, the dive will be terminated until the speed of the current subsides.	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	• Perform underwater diving operations • Enter water properly, roll off boat, step off boat • Diver maintains situational awareness while performing task • Divers perform visual inspection of an anomaly • Diver excavation of anomaly in sand • Photograph and Video Anomaly for further investigation	• MEC hazards • Drowning hazards • Boating hazards • Underwater hazards from stepping on coral or other sharp underwater objects • Biological hazards – box jellyfish, sharks, barracudas, sea urchins and stingray • Hazardous tides or currents (rip tides, high tide, etc.) • Diving-related illnesses • Diver impact with bottom • Impact with unseen objects • Impact with dive partner • Fouled/entangled diver • Tending line/witness float line fouled in prop • Limited visibility • Lost diver • Loss of air • Decompression sickness and arterial gas embolism	• On-site MEC Training. • Perform MEC avoidance measures using approved methods and techniques. • All divers are certified per EM 385-1-1. • Review specific hazards and controls located in the Dive Plan. • Review DSOPs 1, 3, 4, 5, 6, 7 as related to current task, assignment, or pre-, during, and post- dive activities. • Accurately determine water depth. • If water less than 6 feet, ease diver over side versus roll-off entry. • Check for object on surface or near entry point. • Ensure dive partner is clear of entry point. • Ensure vessel engine in neutral or turned off. • Standby diver assigned to the team will be at the ready when divers are in the water. Tender will be aware of diver's movement. • Walk line around boat passing line under anchor line. • All personnel trained in diving distress signals. • Boat will be equipped with rescue equipment to handle a "man overboard" situation (such as rescue hook, life preserver with rope, or similar equipment). • Dive Supervisor is equipped with rescue equipment and First Aid supplies and equipment. • Personal flotation devices will be worn during boat transit and during inclement weather, and will be readily available and accessible at all other times while on boat. • Emergency VHF radios will be in operating condition prior to leaving the wharf. There will be a primary and alternate means of communication, and extra batteries will be available. • Be observant while in water; note, avoid, and report unsafe conditions or activities. Avoid stepping on coral or sharp underwater objects. Terminate the dive, should conditions warrant. • Determine types of hazardous aquatic life found in this location from local marine or harbor police or lifeguard headquarters. Training in biological hazards avoidance. • If sharks are a hazard in this area, operations will not occur at dawn or at dusk, when they are most likely to be feeding. Personnel will be observant for schools of bait fish on which sharks feed, and leave the area immediately if sighted. No flashing jewelry will be worn. • Determine areas where hazardous tasks, tides or currents may be present and times of day or conditions likely to cause them from local marine or harbor police of lifeguard headquarters. Training in how to safely handle these circumstances. If currents exceed 1 knot, the dive will be terminated until the speed of the current subsides. • If poor visibility is encountered, the UXO Dive Supervisor has the authority to suspend dive operations until the dive site visibility increases to ensure the diver's safety.	M

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Continuation of performing diving operations.	Continuation of performing diving operations.	• If a diver becomes fouled, diver and/or dive partner will assist to free diver. Standby diver may be deployed if situation warrants. • Topside actions for lost diver: Initiate emergency recall. Identify GPS coordinates of the last known location of the diver. Mark last known location with anchor and buoy. • Divers underwater should look in 360º to look for dive partner. Diver will surface if dive partner can not be seen. Dive Supervisor will deploy the Standby diver to aid in search of missing diver. • If breathing resistance occurs on the bottom, surface immediately, using controlled ascent. • If out of air completely, go onto emergency come home bottle. • Alternative method is to "Buddy Breathe" with dive partner. • Adhere to No D tables to prevent decompression sickness. • Divers will be required to remain in sight of each other at all times, during and after dive. • Divers will not investigate anomalies unless there is suitable visibility. • Dive team to maintain neutral buoyancy as much as possible to remain above seabed. • Divers approach anomaly from down-current side to prevent unintended contact. • Divers photograph and video anomaly on surface of sea floor in a manner that equipment does not strike the anomaly. • A single tended diver will perform excavation by hand of anomalies in the sand bottom. Use diver discipline to maintain neutral buoyancy. • Divers will wait at least 12 hours before flying after any dive. This will be extended to 24 hours following multiple days of repetitive dives.	M

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	• Recover dive team • Exit water properly • Perform post-dive operations	• MEC hazards • Drowning hazards • Boating Hazards • Biological hazards – box jellyfish, sharks, barracudas, sea urchins, and stingray • Hazardous tides or currents (rip tides, high tide, etc.) • Dive-related illnesses • Impact with unseen objects • Impact with dive partner • Fouled/entangled diver • Tending line/witness float line fouled in prop • Limited visibility • Lost diver • Loss of air • Decompression sickness and Arterial Gas Embolism	• All divers are certified per EM 385-1-1. • Review specific hazards and controls located in the Dive Plan. • Review DSOPs 1, 3, 4, 5, 6, 7 as related to current task, assignment, or pre, during, and post dive activities. • Standby diver assigned to the team will be at the ready when divers are in the water. • All personnel trained in diving distress signals. • Boat will be equipped with rescue equipment to handle a "man overboard" situation (such as life preserver with rope, or similar equipment). • Dive Supervisor will be equipped with rescue equipment and First Aid supplies and equipment. • Personal flotation devices will be worn during boat transit and during inclement weather, and will be readily available and accessible at all other times while on boat. • Emergency VHF radios will be in operating condition prior to leaving the wharf. There will be a primary and alternate means of communication, and extra batteries will be available. • Be observant while in water; note, avoid, and report unsafe conditions or activities. • Determine types of hazardous aquatic life found in this location from local marine or harbor police or lifeguard headquarters. Training in biological hazards avoidance. • If sharks are a hazard in this area, operations will not occur at dawn or at dusk, when they are most likely to be feeding. Personnel will be observant for schools of bait fish on which sharks feed, and leave the area immediately if sighted No flashing jewelry will be worn. • Determine areas where hazardous tasks, tides or currents may be present and times of day or conditions likely to cause them from local marine or harbor police of lifeguard headquarters. Training in how to safely handle these circumstances. If currents exceed 1 knot, the dive will be terminated until the speed of the current subsides. • Monitor divers after dive. If decompression sickness is suspected, provide oxygen to the diver, and transport to Recompression Chamber. • Adhere to No D tables to prevent decompression sickness. • When ascending, breathe normally, ascending 30 feet per minute. • Divers will be required to remain in sight of each other at all times, during and after dive.	

Add Items

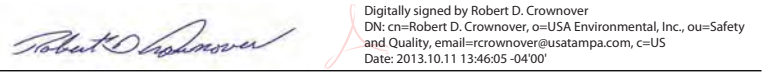
EQUIPMENT	TRAINING	INSPECTION

ACTIVITY HAZARDS ANALYSIS

	EQUIPMENT	TRAINING	INSPECTION
X	• Snorkels • Fins • Buoyancy compensators • Weight belt • Dive tanks • Regulators • Watches • Knives • Masks • Depth gauge • Manual reserve (J valve) or authorized independent system • Thermal protection • Gloves • Depth Indicator (sonar) • Personal flotation device • Tending line, if required • Witness float line, if required • Dive ladder or platform to recover divers • Underwater Metal Detector • Camera • Video Camera	• UXO personnel will meet training and experience requirements outlined in DDESB TP 18. • Site-specific MEC training will be presented to all site personnel. • All divers are certified per EM 385-1-1 • All personnel will demonstrate strong swimming skills. • Training in hazardous tides and currents and how to handle them. • Training in biological hazards. • All dive team members will review and be briefed on the Dive Plan, Dive SOPs, and this AHA. • Site-specific training on slip, trip, and fall hazards. • Site-specific training/lifting techniques. • Site-specific training in use of tools and equipment. • UXO Divers and tenders understand line pull signals. • All site personnel will have current HAZWOPER training.	• Dive Supervisor will ensure that all dive operation controls are being followed, all equipment is being correctly utilized, and all personnel have received appropriate training. • Dive equipment inspected daily prior to use. • PPE inspected daily prior to use. • Inspect location to be used for water entry and determine depth. • Inspect divers for proper tending line attachment (if required). • Inspect lines and floats (if required). • Inspect dive ladder or platform.
X	• Communications equipment • Fire extinguishers • "Man overboard" rescue equipment (hook, rope, life ring) • WBGT monitor • Weather radio • First Aid kit equipped for surface and waterborne injuries with oxygen cylinder and mask	• Instrument familiarity training • Site-specific biological hazards to include First Aid • Emergency response procedures • Training in emergency dive procedures to include diving distress hand signals and rescue procedures • Site-specific hazards to include First Aid • First Aid and CPR and Oxygen training as required by the Dive Plan	• Equipment inspected for serviceability daily prior to use. • Communications equipment checked daily prior to use. • First Aid kits checked daily and inspected weekly. • Fire extinguishers checked daily and inspected weekly. • Rescue equipment will be inspected daily.
X			

Involved Personnel:

Acceptance Authority (digital signature):



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ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC) (Use highest code): M

Date: 9 October 2014 Project: RI/FS

Activity: MEC Disposal on Land

Activity Location: Culebra Island, Puerto Rico

Prepared By: Cheryl M. Riordan, CSP

Risk Assessment Code Matrix

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Add Identified Hazards

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	• Any rounds of MEC that are encountered will be inspected to identify if they are acceptable to move. Those MEC items that are acceptable to move will be brought to the surface by the divers and transported to shore, or, if the MEC item is considered unacceptable to move, divers will attach a bridle to it and it will be relocated to shore by a lifting balloon and all operations will be done remotely.	• Underwater MEC hazards • Diving hazards • Biological hazards (underwater) – box jellyfish, sharks, barracudas, sea urchins and stingrays • Biological hazards (on boat) – bees, wasps, mosquitoes, spiders • Weather hazards • Uneven and/or moving working surfaces of the boat – slip, trip, and fall hazards • Heat stress • Sunburn • Falling overboard/drowning • Diving-related illnesses	• On-site MEC training. • Establish and enforce Exclusion Zone (EZ) around operation. • MEC avoidance will be practiced during boat approach to the beach area to ensure MEC and subsurface anomalies are avoided in shallow waters in which the boat is intended or has the potential to ground on land • Perform MEC and Anomaly avoidance procedures when selecting the location for the disposal site • Notify Coast Guard of location of operations and EZ, so they can make radio announcements to local mariners (NOTICE TO MARINERS). • Two boats with Spanish-speaking Captains will enforce the EZ if boats attempt to enter the area during operations. • All divers are certified per EM 385-1-1. • Observe all MEC/UXO safety precautions, such as movement, heat, shock, and friction. • Do not handle MEC/UXO items unnecessarily. • Review specific hazards and controls located in the Dive Plan. • Review DSOPs 1, 3, 4, 5, 6, 7 as related to current task, assignment, or pre-, during, and post- dive activities. • Standby diver assigned to the team will be at the ready when divers are in the water. • All personnel trained in diving distress signals. • Dive Supervisor will be equipped with rescue equipment and FirstAid supplies and equipment. • Emergency VHF radios will be in operating condition prior to leaving the wharf. There will be a primary and alternate means of communication, and extra batteries will be available. • Be observant while in water; note, avoid, and report unsafe conditions or activities. Avoid stepping on coral or sharp underwater objects. • Determine types of hazardous aquatic life found in this location from local marine or harbor police or lifeguard headquarters. • Training in biological hazards avoidance: Do not wear flashing jewelry, as it may attract aquatic life. Do not perform underwater operations at dawn or at dusk, when sharks are most likely to be feeding. Be observant for schools of bait fish (on which sharks feed) as there could be a shark chasing them. Leave area immediately if hazardous conditions are observed. • Personnel will wear rubber-soled shoes to prevent slipping while on the boat, and will avoid stepping in wet areas that could be slippery • Heat stress monitoring, drinking water, work-rest schedule, and cool shelter for breaks.	M

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Continuation of prior step.	Continuation of prior step.	• Training in biological hazards avoidance. • Use insect repellents, as necessary. • Use PPE IAW this AHA. • Use sunscreen and wear cap. • Boat will be equipped with rescue equipment to handle a "man overboard" situation (such as life ring with rope, or similar equipment), and personnel trained in its use. • Local weather will be monitored and boat operations will be terminated should a storm be approaching, or should sea conditions make it unsafe to continue. • Determine areas where hazardous tasks, tides. or currents may be present and times of day or conditions likely to cause them from local marine or harbor police of lifeguard headquarters. Training in how to safely handle these circumstances. • First Aid kits and fire extinguishers will be readily available	M
X	• Evacuate area around disposal operation for required fragmentation distance except for personnel involved in disposal operation. • Place guard on any access road at least fragmentation distance to assure no further entry into site. • As disposal area will be on or near beach, EZ will also be enforced on the water.	• Unauthorized personnel in area • Uneven working surfaces – slip, trip, and fall hazards • Heat stress • Biological hazards – hazardous plants, trees, bees, wasps, centipedes, ticks, mosquitoes, spiders, and rodents • Sunburn	• Perform MEC and Anomaly avoidance procedures when selecting the location for the disposal site • Be alert. Cease operations if unsafe conditions arise. • Controlled use of radios and cell phones. • Establish EZ and secure according to type of shot. • Notify Coast Guard of location of operations and EZ, so they can make radio announcements to local mariners (NOTICE TO MARINERS). • Two boats with Spanish-speaking Captains will enforce the EZ if boats attempt to enter the area during operations. • Maintain positive site control; cease operations if unauthorized entry is made. • Do not allow smoking or flame-producing devices in the vicinity of explosives. • Keep personnel to a minimum during operations. • Use and enforce the buddy system. • Use PPE IAW this AHA. • Be observant while walking. Use sturdy leather work boots with ankle support and non-slip soles. • Training in biological hazards avoidance. • Wear cotton shirts and long pants. • Heat stress monitoring, drinking water, work-rest schedule, and cool shelter for breaks. • Use barrier creams/insect repellents, as necessary. • Use sunscreen and cap.	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	• Identify item. • Prepare shot. • Make notifications of impending shot. • Personnel performing disposal evacuate to fragmentation distance or to shielded area. • Observe area for potential unauthorized entrants. If any are observed, halt operation until they are removed.	• MEC hazards • Unauthorized personnel in area • Uneven working surfaces – slip, trip, and fall hazards • Heat stress • Biological hazards – hazardous plants, trees, bees, wasps, centipedes, ticks, mosquitoes, spiders, and rodents • Sunburn • Noise • Fire hazards	• On-site MEC Training. • Perform MEC and Anomaly avoidance procedures when selecting the location for the disposal site • Be alert. Cease operations if unsafe conditions arise. • Controlled use of radios and cell phones. • Establish Exclusion Zone (EZ) and secure according to type of shot. • Notify Coast Guard of location of operations and EZ, so they can make radio announcements to local mariners (NOTICE TO MARINERS). • Two boats with Spanish-speaking Captains will enforce the EZ if boats attempt to enter the area during operations. • Maintain positive site control; cease operations if unauthorized entry is made. • Observe all MEC/UXO safety precautions, such as movement, heat, shock, and friction. • Do not handle MEC/UXO items unnecessarily. • Only UXO-qualified personnel will perform demolitions operations. • Use engineering controls to reduce or eliminate fragmentation/ overpressure hazards. • Observe safe work practices, operating precautions, and instructions for the equipment in use. • Do not allow smoking or flame-producing devices in the vicinity of explosives. • Keep personnel to a minimum during operations. • Use and enforce the buddy system. • Use PPE IAW this AHA. • Be observant while walking. Use sturdy leather work boots with ankle support and non-slip soles. • Training in biological hazards avoidance. • Wear cotton shirts and long pants. • Heat stress monitoring, drinking water, work-rest schedule, and cool shelter for breaks. • Use barrier creams/insect repellents as necessary. • Use sunscreen and cap. • First Aid kits and fire extinguishers will be readily available.	M

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	• Sound signal for impending shot. • Perform disposal operation. • Check to see that disposal operation was successful. • If not successful, repeat disposal operation. • Give signal that operation is complete.	• MEC hazards • Unauthorized personnel in area • Uneven working surfaces – slip, trip, and fall hazards • Heat stress • Biological hazards – hazardous plants, trees, bees, wasps, centipedes, ticks, mosquitoes, spiders, and rodents • Sunburn • Noise • Fire hazards	• On-site MEC Training. • Perform MEC and Anomaly avoidance procedures when selecting the location for the disposal site • Be alert. Cease operations if unsafe conditions arise. • Controlled use of radios and cell phones. • Establish EZ and secure according to type of shot. • Notify Coast Guard of location of operations and EZ, so they can make radio announcements to local mariners (NOTICE TO MARINERS). • Two boats with Spanish-speaking Captains will enforce the EZ if boats attempt to enter the area during operations. • Maintain positive site control; cease operations if unauthorized entry is made. • Observe all MEC/UXO safety precautions, such as movement, heat, shock, and friction. • Do not handle MEC/UXO items unnecessarily. • Only UXO qualified personnel will perform demolitions operations. • Use engineering controls to reduce or eliminate fragmentation/ overpressure hazards. • Observe safe work practices, operating precautions, and instructions for the equipment in use. • Do not allow smoking or flame-producing devices in the vicinity of explosives. • Keep personnel to a minimum during operations. • Use and enforce the buddy system. • Use PPE IAW this AHA. • Be observant while walking. Use sturdy leather work boots with ankle support and non-slip soles. • Training in biological hazards avoidance. • Wear cotton shirts and long pants. • Heat stress monitoring, drinking water, work-rest schedule, and cool shelter for breaks. • Use barrier creams/insect repellents as necessary. • Use sunscreen and cap. • First Aid kits and fire extinguishers will be readily available.	M

Add Items

EQUIPMENT	TRAINING	INSPECTION

ACTIVITY HAZARDS ANALYSIS

	EQUIPMENT	TRAINING	INSPECTION
X	• Demolitions Equipment • Explosives • Balloon lift • Boat	• UXO personnel will meet training and experience requirements outlined in DDESB TP 18. • Site-specific MEC training will be presented to all site personnel. • PR blaster's license for MEC Disposal Supervisor. • Training in disposal operations for items expected to be encountered. • All site personnel will have current HAZWOPER training. • Site-specific slip/fall hazards.	• UXOSO will ensure that all controls are being followed, all equipment is being correctly utilized, and all personnel have received appropriate training. • Equipment inspected daily prior to use.
X	• Communications equipment • First Aid kit • Fire extinguishers • WBGT monitor	• Equipment familiarity training. • Emergency response procedures. • Heat stress symptoms/First Aid. • Site-specific biological hazards to include First Aid. • First Aid and CPR and Oxygen training as required by the Dive Plan.	• Equipment inspected daily prior to use. • Communications equipment checked daily prior to use. • First Aid kits checked daily and inspected weekly. • Fire extinguishers checked daily and inspected weekly.
X	Equipment for diving operations • Snorkels • Fins • Buoyancy compensators • Weight belt • Dive tanks • Regulators • Watches • Knives • Masks • Manual reserve (J valve) or authorized independent system	• All divers are AAUS certified. • All personnel will demonstrate strong swimming skills. • Training in hazardous tides and currents and how to handle them. • All dive team members will review and be briefed on the Dive Plan, Dive SOPs, and this AHA. • Instrument/equipment familiarity training.	• Dive Supervisor will ensure that all dive operation controls are being followed, all equipment is being correctly utilized, and all personnel have received appropriate training. • Dive equipment inspected daily prior to use.

Involved Personnel:

Acceptance Authority (digital signature):

Digitally signed by Robert D. Crownover
DN: cn=Robert D. Crownover, o=USA Environmental, Inc., ou=DSQ, email=rcrownover@usatampa.com, c=US
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ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)
(Use highest code)

L

Date: 10 October 2013

Project: RI/FS

Activity: MPPEH Inspection and Certification

Activity Location: Culebra Island, Puerto Rico

Prepared By: Cheryl M. Riordan, CSP

Risk Assessment Code Matrix

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Add Identified Hazards

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	• When MPPEH scrap is encountered, two UXO Technicians will inspect it and verify that it is Material Documented as Safe (MDAS). • After a disposal operation, the disposal team will check the area of the shot for MPPEH and two UXO technicians will inspect it and verify that it is MDAS.	• MEC hazards. • Unauthorized personnel entering site during operations. • Uneven working surfaces – slip, trip, and fall hazards. • Heat stress. • Biological hazards – hazardous plants, trees, bees, wasps, centipedes, ticks, mosquitoes, spiders, rodents, box jellyfish, sharks, barracudas, sea urchins, and stingrays. • Sunburn. • Cuts and abrasions from handling MPPEH/MD. • Diving hazards. • Weather hazards.	• On-site MEC training. • Site control measures will be implemented (fencing, barricades, signage) and Exclusion Zone (EZ) established. • Notify Coast Guard of location of operations and EZ, so they can make radio announcements to local mariners. • Two boats with Spanish-speaking Captains will enforce the EZ if boats attempt to enter the area during operation. • Observe all MEC safety precautions, such as movement, heat, shock, and friction. • Only UXO-trained personnel will inspect/certify and handle MEC scrap. • Maintain positive site control; cease operations if unauthorized entry is made. • All divers are certified per EM 385-1-1. • Review specific hazards and controls located in the Dive Plan. • Review DSOPs 1, 3, 4, 5, 6, and 7 as related to current task, assignment, or pre-, during, and post- dive activities. • Standby diver assigned to the team will be at the ready when divers are in the water. • All personnel trained in diving distress signals. • Boat will be equipped with rescue equipment to handle a "man overboard" situation (such as rescue hook, life ring with rope, or similar equipment), and personnel trained in its use. • Dive Supervisor will be equipped with rescue equipment and First Aid supplies and equipment. • Emergency VHF radios will be in operating condition prior to leaving the wharf. There will be a primary and alternate means of communication, and extra batteries will be available. • Training in biological hazards avoidance : Do not wear flashing jewelry, as it may attract aquatic life. Do not perform underwater operations at dawn or at dusk, when sharks are most likely to be feeding. Be observant for schools of bait fish (on which sharks feed) as there could be a shark chasing them. Leave the area immediately if hazardous conditions are observed. • Local weather will be monitored and boat operations will be terminated should a storm be approaching, or should sea conditions make it unsafe to continue. • Keep personnel to a minimum during operations. • Use and enforce the buddy system. • Be observant while walking. Use sturdy leather work boots with ankle support and non-slip soles on land. Use rubber-soled shoes on boat. • Wear cotton shirts and long pants. • Use PPE IAW this AHA. • Use insect repellents and barrier creams/ointments, as necessary. • Heat stress monitoring, drinking water, work-rest schedule, and cool shelter for breaks. • Ensure First Aid kits and fire extinguishers are in place. • No smoking, except in designated areas. • Use sunscreen and wear cap.	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	• MDAS will be placed in a secured bin on the site until the completion of site operations. • The bin will remain secured to prevent intermingling of MDAS items and live items. • QC Specialist will inspect bin periodically to assure procedures are followed and no live MEC is intermingled.	• Uneven working surfaces – slip, trip, fall hazards • Heat Stress • Biological hazards – hazardous plants, trees, bees, wasps, centipedes, ticks, mosquitoes, spiders, rodents • Sunburn • Cuts and abrasions from handling MPPEH/MD	• Only UXO trained personnel will inspect/certify and handle MPPEH • Maintain positive site control; cease operations if unauthorized entry is made • Use and enforce the buddy system • Cease operations if unsafe conditions arise • Properly close and seal each container after inspection • Be observant while walking. Use sturdy leather work boots with ankle support and non-slip soles • Training in biological hazards avoidance • Wear cotton shirts and long pants • Use PPE IAW this AHA • Use insect repellents and barrier creams/ointments as necessary • Heat stress monitoring, drinking water, work-rest schedule, and cool shelter for breaks • Ensure First Aid Kits and Fire Extinguishers are in place • Communications equipment in place • No smoking, except in designated areas • Use sunscreen and wear cap	L
X	• At conclusion of site operations, the MDAS will be certified and transferred to an approved recycler for demilitarization and recycling of the metal scrap.	• Uneven working surfaces – slip, trip, fall hazards • Heat Stress • Biological hazards – hazardous plants, trees, bees, wasps, centipedes, ticks, mosquitoes, spiders, and rodents. • Sunburn	• Maintain positive site control; cease operations if unauthorized entry is made • Use and enforce the buddy system • Cease operations if unsafe conditions arise • Be observant while walking. Use sturdy leather work boots with ankle support and non-slip soles • Training in biological hazards avoidance • Wear cotton shirts and long pants • Use PPE IAW this AHA • Use insect repellents and barrier creams/ointments as necessary • Heat stress monitoring, drinking water, work-rest schedule, and cool shelter for breaks • Ensure First Aid Kits and Fire Extinguishers are in place • Communications equipment in place • No smoking, except in designated areas • Use sunscreen and wear cap	L
X				

Add Items

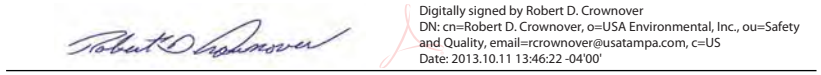
	EQUIPMENT	TRAINING	INSPECTION
X	• Footwear with ankle support and non-slip soles • Appropriate clothing and PPE to include safety glasses or goggles, leather or canvas work gloves, cotton clothing	• PPE Training	• PPE inspected daily prior to use.

ACTIVITY HAZARDS ANALYSIS

	EQUIPMENT	TRAINING	INSPECTION
X	• MPPEH Scrap bin, secured • Hand tools	• UXO personnel will meet training and experience requirements outlined in DDESB TP 18. • Site-specific MEC training will be presented to all site personnel. • All divers are certified per EM 385-1-1. • All personnel will demonstrate strong swimming skills. • Training in hazardous tides and currents and how to handle them. • All dive team members will review and be briefed on the Dive Plan, Dive SOPs, and this AHA. • Instrument/equipment familiarity training. • Requirements under DoD 4160.21-M. • Required documents for inspection, certification and verification of MPPEH related scrap. • Site-specific training on slip, trip, and fall hazards. • All site personnel will have current HAZWOPER training.	• UXOSO will ensure that all controls are being followed; all equipment is being correctly utilized and that all personnel have received appropriate training. • Equipment inspected daily prior to use. • Serviceability of containers. • Daily check for security of scrap to prevent intermingling with inspected scrap.
X	• Communications equipment • Fire extinguishers • Man overboard rescue equipment (hook, rope, life ring) • WBGT monitor • Weather radio • First aid kit equipped for surface and waterborne injuries with Oxygen cylinder and mask	• Instrument familiarity training. • Site-specific flora/fauna to include First Aid. • Emergency response procedures. • Training in emergency dive procedures to include diving distress hand signals and rescue procedures. • Site-specific hazards to include First Aid. • First Aid and CPR and Oxygen training as required by the Dive Plan. • Heat stress symptoms/First Aid.	• Equipment inspected for serviceability daily prior to use. • Communications equipment checked daily prior to use. • First Aid kits checked daily and inspected weekly. • Fire extinguishers checked daily and inspected weekly. • Rescue equipment will be inspected daily.
X	Equipment for diving operations • Snorkels • Fins • Buoyancy compensators • Weight belt • Dive tanks • Regulators • Watches • Knives • Masks • Manual reserve (J valve) or authorized independent system	Diving equipment training.	Diving equipment will be inspected daily prior to use.

ACTIVITY HAZARDS ANALYSIS

Involved Personnel:

Acceptance Authority (digital signature): 

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ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)
(Use highest code): L

Date: 10 October 2013 Project: RI/FS

Activity: Quality Control

Activity Location: Culebra Island, Puerto Rico

Prepared By: Cheryl M. Riordan, CSP

Risk Assessment Code Matrix

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Add Identified Hazards

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	• Inspection of Project Documentation, Site Conditions, Work Performance and Operations.	• Underwater MEC hazards • Unauthorized personnel entering site during operations • Diving hazards • Uneven and/or moving working surfaces of the boat – slip, trip, and fall hazards • Muscle strain carrying instruments/equipment • Heat Stress • Biological hazards – bees, wasps, mosquitoes, spiders, box jellyfish, sharks, barracudas, sea urchins, and stingrays • Noise • Sunburn • Hazardous weather conditions	• On-site MEC Training. • ROV and other equipment will be characterizing levels of underwater MEC contamination and observing the biology and sensitive habitats through video taping of underwater conditions. • EM 61 or other magnetometers will perform underwater geophysical survey, much of it performed remotely, with specific areas performed by divers. • Boat Captain will ensure that boat is well maintained and in good condition prior to taking on passengers • SUXOS will verify that Captain and vessel are licensed in accordance with local requirements. • A daily Float Plan (which lists destinations and manifest on board) will be filed each day with Shore Team or PM prior to departure. • Emergency radios will be in operating condition prior to leaving the wharf. There will be a primary and alternate means of communication, and extra batteries will be available. • Directions for contacting the Coast Guard and hospital will be posted with each radio and cell phone. • Personnel will attend daily safety briefing by Captain prior to transport by boat, and will obey all directions from the Captain during transport. • Boat will be equipped with rescue equipment to handle a "man overboard" situation (such as life ring with rope, or similar equipment), and personnel trained in its use. • Personnel will wear rubber-soled shoes to prevent slipping while on boat, and will avoid stepping in wet areas that could be slippery. • Personnel will remain seated while boat is in motion, with extremities kept inside the boat. • All personnel will wear personal flotation devices while boat is in transit or during inclement weather, and PFDs will be available and accessible at all times on boat. • Good housekeeping standards will be enforced. Cargo will be properly staged on the boat to prevent tripping hazards. • Local weather will be monitored and boat operations will be terminated should a storm be approaching, or should sea conditions make it unsafe to continue. • Be alert. Cease operations if unsafe conditions arise. • Use PPE IAW this AHA. • Heat stress monitoring, drinking water, work-rest schedule, and cool shelter for breaks. • Training in biological hazards avoidance. • Use insect repellents as necessary. • Follow appropriate lifting/carrying procedures. • Ensure First Aid kits and fire extinguishers are in place. • No smoking, except in designated areas. • Hearing protection program in noisy areas. • Use sunscreen and wear cap. • Ensure required site documentation is on hand.	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	• Inspection of Material and Packaging of Containers	• Uneven and/or moving working surfaces of the boat – slip, trip, and fall hazards • Muscle strain carrying instruments/equipment • Heat stress • Biological hazards – bees, wasps, mosquitoes, spiders • Sunburn • Hazardous weather conditions	• Emergency radios will be in operating condition prior to leaving the wharf. There will be a primary and alternate means of communication, and extra batteries will be available. • Directions for contacting the Coast Guard and hospital will be posted with each radio and cell phone. • Personnel will attend daily safety briefing by Captain prior to transport by boat, and will obey all directions from the Captain during transport. • Personnel will wear rubber-soled shoes to prevent slipping while on boat, and will avoid stepping in wet areas that could be slippery. • Personnel will maintain firm grip on hand-holds and vessel structure during transit and keep extremities in the boat • All personnel will wear personal flotation devices while boat is in operation and during inclement weather. PFD's will be available and readily accessible at all times on boat. • Good housekeeping standards will be enforced. Cargo will be properly staged on the boat to prevent tripping hazards. • Local weather will be monitored and boat operations will be terminated should a storm be approaching, or should sea conditions make it unsafe to continue. • Be alert. Cease operations if unsafe conditions arise. • Use PPE IAW this AHA. • Use insect repellents as necessary. • Heat stress monitoring, drinking water, work-rest schedule, and cool shelter for breaks. • Training in biological hazards avoidance. • Ensure First Aid kits and fire extinguishers are in place. • No smoking, except in designated areas. • Use sunscreen and wear cap.	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	• Inspection of Completed Project Documentation	• Uneven and/or moving working surfaces of the boat – slip, trip, and fall hazards • Muscle strain carrying instruments • Heat stress • Biological hazards – bees, wasps, mosquitoes, and spiders • Sunburn • Hazardous weather conditions	• Emergency radios will be in operating condition prior to leaving the wharf. There will be a primary and alternate means of communication, and extra batteries will be available. • Directions for contacting the Coast Guard and hospital will be posted with each radio and cell phone. • Personnel will attend daily safety briefing by Captain prior to transport by boat, and will obey all directions from the Captain during transport. • Personnel will wear rubber-soled shoes to prevent slipping while on the boat, and will avoid stepping in wet areas that could be slippery. • Personnel will remain seated while boat is in motion and keep extremities in the boat. • All personnel will wear personal flotation devices while boat is in operation. PFDs will be available and readily accessible at all times. • Good housekeeping standards will be enforced. Cargo will be properly staged on the boat to prevent tripping hazards. • Local weather will be monitored and boat operations will be terminated should a storm be approaching, or should sea conditions make it unsafe to continue. • Be alert. Cease operations if unsafe conditions arise. • Use PPE IAW this AHA. • Use insect repellents, as necessary. • Heat stress monitoring, drinking water, work-rest schedule, and cool shelter for breaks. • Training in biological hazards avoidance. • Ensure First Aid kits and fire extinguishers are in place. • No smoking, except in designated areas. • Use sunscreen and wear cap. • Ensure required site documentation is on hand. • Ensure logs, briefings, reports and forms are completed in a timely and accurate manner. • Review or inspect all site generated documents for accuracy and deliverability. • Ensure concerned parties receive copies of documents pertaining to their activities. • Ensure contract deliverables have been met.	L
X				

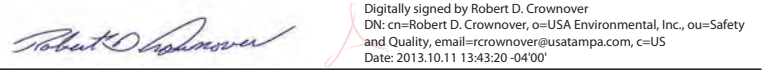
Add Items

EQUIPMENT	TRAINING	INSPECTION

ACTIVITY HAZARDS ANALYSIS

	EQUIPMENT	TRAINING	INSPECTION
X	• Footwear with rubber soles to prevent slipping • Back braces (optional) • Appropriate clothing and PPE (to include personal flotation device, canvas or leather gloves, safety sunglasses and cap). Hearing protection will be required if noise from boat engine or generator reaches hazardous levels.	• PPE training.	• PPE inspected daily prior to use.
X	Equipment for diving operations • Snorkels • Fins • Buoyancy compensators • Weight belt • Dive tanks • Regulators • Watches • Knives • Masks • Manual reserve (J valve) or authorized independent system • Appropriate geophysical equipment • ROV • Equipment platforms	• UXO personnel will meet training and experience requirements outlined in DDESB TP 18. • Site-specific MEC training will be presented to all site personnel. • All divers are certified IAW EM-385-1-1. • All dive team personnel will demonstrate strong swimming skills. • Training in hazardous tides and currents and how to handle them. • All dive team members will review and be briefed on the Dive Plan, Dive SOPs, and this AHA. • Instrument/equipment familiarity training. • All site personnel will have current HAZWOPER training. • Site-specific training, slip/fall hazards. • Site-specific training/lifting and carrying techniques.	• The UXOSO will ensure that all controls are being followed, all equipment is being correctly utilized, and all personnel have received appropriate training. • Equipment inspected daily prior to use, • Daily serviceability check of magnetometers, • Dive Supervisor will ensure that all dive operation controls are being followed, all equipment is being correctly utilized, and all personnel have received appropriate training, • Dive equipment inspected daily prior to use,
X	• Communications equipment • Fire extinguishers • "Man overboard" rescue equipment (hook, rope, life ring) • WBGT monitor • Weather radio • First aid kit equipped for surface and waterborne injuries with Oxygen cylinder and mask	• Instrument/equipment familiarity training. • Site-specific biological hazards to include First Aid. • Emergency response procedures. • Training in emergency dive procedures to include diving distress hand signals and rescue procedures. • Site-specific hazards to include First Aid • First Aid and CPR and Oxygen training as required by the Dive Plan. • Heat Stress symptoms/First Aid.	• Equipment inspected for serviceability daily prior to use, • Communications equipment checked daily prior to use, • First aid kits checked daily and inspected weekly, • Fire extinguishers checked daily and inspected weekly, • Rescue equipment will be inspected daily,

Involved Personnel:

Acceptance Authority (digital signature): 
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ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC) (Use highest code): L

Date: 31 January 2014 Project: RI/FS

Activity: Snorkeling Operations

Activity Location: Culebra Island, Puerto Rico

Prepared By: Cheryl M. Riordan, CSP

Risk Assessment Code Matrix

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Add Identified Hazards

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	• Pre-snorkeling operations brief, task assignments, and check equipment.	• Boating Hazards • Hazardous tides or currents (rip tides, high tide, etc.) • Weather hazards • Sunburn	• Boat will be equipped with rescue equipment to handle a man overboard situation (such as life ring with 70 foot rope, or similar equipment), and personnel trained in its use • All personnel will be familiar with emergency signal to request assistance • Personnel will wear rubber soled shoes to prevent slipping while on boat, and will avoid stepping in wet areas that could be slippery • Areas of extreme water velocity and turbulence will be avoided • Training in biological hazards avoidance • Use sunscreen • Weather radio and local weather will be monitored and boat operations will be terminated should a storm be approaching, or should sea conditions make it unsafe to continue. Snorkelers will return to the boat to evacuate. • Emergency VHF radios will be in operating condition prior to leaving the wharf. There will be a primary and alternate means of communication, and extra batteries will be available. • Be observant while in water; note, avoid, and report unsafe conditions or activities. Avoid stepping on coral or sharp underwater objects. • Determine types of hazardous aquatic life found in this location from local marine or harbor police or lifeguard headquarters • Training in biological hazards avoidance - do not wear flashing jewelry, as it may attract aquatic life; do not perform underwater operations at dawn or at dusk, when sharks are most likely to be feeding; be observant for schools of bait fish (on which sharks feed) as there could be a shark chasing them; leave area immediately if hazardous conditions are observed • Snorkeling team will be made up of no less than 2 persons--a snorkeler and an observer/assistant • Use PPE IAW this AHA • Local weather will be monitored and boat operations will be terminated should a storm be approaching, or should sea conditions make it unsafe to continue. • Determine areas where hazardous tasks, tides or currents may be present and times of day or conditions likely to cause them from local marine or harbor police of lifeguard headquarters. Training in how to safely handle these circumstances. • Use sunscreen	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	• Locate and move boat to snorkeling area.	• Hazardous tides • Sunburn • Drowning • Weather hazards	• Boat will be equipped with rescue equipment to handle a man overboard situation (such as life ring with 70 foot rope, or similar equipment), and personnel trained in its use • Areas of extreme water velocity and turbulence will be avoided • Emergency VHF radios will be in operating condition prior to leaving the wharf. There will be a primary and alternate means of communication, and extra batteries will be available. • Determine types of hazardous aquatic life found in this location from local marine or harbor police or lifeguard headquarters • All passengers will wear a personal flotation device while on boat with boat in transit to work station • Passengers will remain seated while boat is in motion and keep all extremities inside boat • Use PPE IAW this AHA • Local weather will be monitored and boat operations will be terminated should a storm be approaching, or should sea conditions make it unsafe to continue. • Determine areas where hazardous tasks, tides or currents may be present and times of day or conditions likely to cause them from local marine or harbor police or lifeguard headquarters. Training in how to safely handle these circumstances. • Use sunscreen	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	• Perform snorkeling operation. • No submerging or diving of any kind will be permitted. • Untethered, scientific snorkeling, and snorkeling in waters greater than 5 feet deep has been allowed by special request to the DDC for this project (approval and documentation is available upon request).	• Underwater MEC hazards • Weather hazards • Sunburn • Drowning • Underwater hazards from stepping on coral or other sharp underwater objects • Biological hazards – box jellyfish, sharks, barracudas, sea urchins and stingray • Hazardous tides or currents (rip tides, high tide, etc.)	• On-site MEC Training • Perform MEC avoidance measures using approved methods and techniques • Snorkeling team will be made up of no less than 2 persons--a snorkeler and an observer/assistant • 2 Snorkelers will work as observer/assistants to each other and will remain within 50 feet of each other • Standby assigned to the team will be at the ready when snorkelers are in the water • Snorkelers must be escorted by a boat. In waters deeper than 5 feet, the boat must be within 50 feet of snorkelers. • All personnel will be familiar with emergency signal to request assistance • Areas of extreme water velocity and turbulence will be avoided • Boat will be equipped with rescue equipment to handle a man-overboard situation (such as rescue hook, life ring with 70 foot rope, or similar equipment) • Personal flotation devices will be worn during boat transit and during inclement weather, and will be readily available and accessible at all other times while on boat. Personnel flotation will be worn by snorkelers while performing swimming operations • Emergency VHF radios will be in operating condition prior to leaving the wharf. There will be a primary and alternate means of communication, and extra batteries will be available. • Be observant while in water; note, avoid, and report unsafe conditions or activities. Avoid stepping on coral or sharp underwater objects. • Determine types of hazardous aquatic life found in this location from local marine or harbor police or lifeguard headquarters. Training in biological hazards avoidance. • Training in biological hazards avoidance - If sharks are a hazard in this area, operations will not occur at dawn or at dusk, when they are most likely to be feeding. Personnel will be observant for schools of bait fish on which sharks feed, and leave the area immediately if sited. No flashing jewelry will be worn. • Weather radio and local weather will be monitored and boat operations will be terminated should a storm be approaching, or should sea conditions make it unsafe • Determine areas where hazardous tasks, tides or currents may be present and times of day or conditions likely to cause them from local marine or harbor police or lifeguard headquarters. Training in how to safely handle these circumstances. • Be observant while walking • Use fins to protect feet • Use PPE IAW this AHA • Use sunscreen • Buddy system will be implemented	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	• Recover snorkelers and return to shore.	• MEC hazards • Boating Hazards • Biological hazards – box jellyfish, sharks, barracudas, sea urchins and stingray • Hazardous tides or currents (rip tides, high tide, etc.) • Heat stress • Sunburn • Weather hazards	• Boat will be equipped with rescue equipment to handle a man-overboard situation (such as life ring with 70 foot rope, or similar equipment) • Areas of extreme water velocity and turbulence will be avoided • Personal flotation devices will be worn during boat transit and during inclement weather, and will be readily available and accessible at all other times while on boat • Emergency VHF radios will be in operating condition prior to leaving the wharf. There will be a primary and alternate means of communication, and extra batteries will be available • Determine types of hazardous aquatic life found in this location from local marine or harbor police or lifeguard headquarters. Training in biological hazards avoidance. • Determine areas where hazardous tasks, tides or currents may be present and times of day or conditions likely to cause them from local marine or harbor police or lifeguard headquarters. Training in how to safely handle these circumstances. • Personnel will wear rubber soled shoes to prevent slipping while on boat, and will avoid stepping in wet areas that could be slippery • Use PPE IAW this AHA • Use sunscreen • Weather radio and local weather will be monitored and boat operations will be terminated should a storm be approaching, or should sea conditions make it unsafe to continue.	L

Add Items

	EQUIPMENT	TRAINING	INSPECTION
X	Appropriate clothing and PPE to include Type III personal flotation device or fully inflated snorkeling vest (providing a minimum of 5.5 pounds [7 kg] of positive buoyancy), professional grade diving mask and snorkel, diving fins	PPE Training	PPE inspected daily prior to use

ACTIVITY HAZARDS ANALYSIS

	EQUIPMENT	TRAINING	INSPECTION
X	• Communications equipment • Fire extinguishers • Man overboard/rescue equipment (hook, rope, life ring). The rope and life ring will be capable of reaching out to 70 feet • WBGT monitor • Weather radio • First aid kit equipped for surface and waterborne injuries	• UXO personnel will meet training and experience requirements outlined in DDESB TP 18 • Site-specific MEC training will be presented to all site personnel • Dive Supervisor will be qualified and experienced in snorkeling • All personnel will demonstrate strong swimming skills • Training in hazardous tides and currents and how to handle them • All site personnel will have current HAZWOPER training • Emergency response procedures. including distress signals and use of emergency equipment • Site-specific biological hazards to include first aid • Equipment familiarity training	• UXOSO will ensure that all dive operation controls are being followed; all equipment is being correctly utilized, and all personnel have received appropriate training • Equipment inspected daily prior to use • Communications equipment checked daily prior to use • First aid kits checked daily and inspected weekly • Fire extinguishers checked daily and inspected weekly

Involved Personnel:

Acceptance Authority (digital signature): Digitally signed by Robert D. Crownover
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ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC) (Use highest code): M

Date: 10 October 2014 Project: RI/FS

Activity: Underwater Geophysical Survey

Activity Location: Culebra Island, Puerto Rico

Prepared By: Cheryl M. Riordan, CSP

Risk Assessment Code Matrix

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Proceed with the underwater geophysical survey. An ROV platform will be used in areas that are too deep for the floated system. Transects with scattered coral reef, or colonized hard bottom will be surveyed with method resulting in no contact with sea floor. In shallow water areas (up to 4 ft. depth) where contact with the sea floor is not desired, coil will be floated or will be suspended beneath a floating platform.	• Underwater MEC hazards • Uneven and/or moving working surfaces of the boat – slip, trip, and fall hazards • Back strain from carrying equipment • Heat stress • Biological hazards – bees, wasps, mosquitoes, spiders • Sunburn • Falling overboard/drowning • Weather hazards	• On-site MEC training. • Personnel will wear rubber-soled shoes to prevent slipping while on boat, and will avoid stepping in wet areas that could be slippery. • Follow appropriate lifting/carrying procedures: Lift with legs; maintain footing; use gloves for firm grip; never lift more than you can safely handle. • Heat stress monitoring, drinking water, work-rest schedule, and cool shelter for breaks. • Training in biological hazards avoidance. • Use insect repellents as necessary. • Use PPE IAW this AHA. • Use sunscreen and wear cap. • Boat will be equipped with rescue equipment to handle a "man overboard" situation (such as life ring with rope or similar equipment), and personnel trained in its use. • Local weather will be monitored and boat operations will be terminated should a storm be approaching, or should sea conditions make it unsafe to continue.	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	In areas where an ROV platform is not suitable, SCUBA or snorkelers will perform an instrument aided visual survey of the transect. A floating jack stay will be used as a visual reference to guide SCUBA divers along the transect.	• MEC hazards • Drowning hazards • Boating hazards • Underwater hazards from stepping on coral or other sharp underwater objects • Biological hazards – box jellyfish, sharks, barracudas, sea urchins and stingrays • Hazardous tides or currents (rip tides, high tide, etc.) • Diving-related illnesses • Diver impact with bottom • Impact with unseen objects • Impact with dive partner • Fouled/Entangled diver • Tending line/witness float line fouled in prop • Limited visibility • Lost diver • Loss of air • Decompression sickness and Arterial Gas Embolism	• On-site MEC Training. • Perform MEC avoidance measures using approved methods and techniques. • All divers are certified per EM 385-1-1. • Review specific hazards and controls located in the Dive Plan. • Review DSOPs 1, 3, 4, 5, 6, and 7 as related to current task, assignment, or pre-, during, and post-dive activities. • Accurately determine water depth. • If water less than 6 ft, ease diver over side versus roll-off entry. • Check for object on surface or near entry point. • Ensure dive partner is clear of entry point. • Ensure vessel engine is in neutral or turned off. • Standby diver assigned to the team will be at the ready when divers are in the water. Tender be aware of diver's movement. • Walk line around boat passing line under anchor line. • All personnel trained in diving distress signals. • Boat will be equipped with rescue equipment to handle a "man overboard" situation (such as rescue hook, life preserver with rope, or similar equipment). • Dive Supervisor equipped with rescue equipment and First Aid supplies and equipment. • Personal flotation devices will be worn during boat transit and during inclement weather, and will be readily available and accessible at all other times while on boat. • Emergency VHF radios will be in operating condition prior to leaving the wharf. There will be a primary and alternate means of communication, and extra batteries will be available. • Be observant while in water; note, avoid, and report unsafe conditions or activities. Avoid stepping on coral or sharp underwater objects. Terminate the dive should conditions warrant. • Determine types of hazardous aquatic life found in this location from local marine or harbor police or lifeguard headquarters. Training in biological hazards avoidance. • If sharks are a hazard in this area, operations will not occur at dawn or at dusk, when they are most likely to be feeding. Personnel will be observant for schools of bait fish on which sharks feed, and leave the area immediately if sighted. No flashing jewelry will be worn. • Determine areas where hazardous tasks, tides, or currents may be present and times of day or conditions likely to cause them from local marine or harbor police of lifeguard headquarters. Training in how to safely handle these circumstances. If currents exceed 1 knot, the dive will be terminated until the speed of the current subsides. • If poor visibility is encountered, the UXO Dive Supervisor has the authority to suspend dive operations until the dive site visibility increases to ensure the diver's safety	M

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Continuation of prior step.	Continuation of prior step.	• If a diver becomes fouled, diver and/or dive partner will assist to free diver. Standby diver may be deployed if situation warrants. • Topside actions for lost diver: Initiate emergency recall. Identify GPS coordinates of the last known location of the diver. Mark last known location with anchor and buoy. • Divers underwater should look in 360º to look for dive partner. Diver will surface if dive partner cannot be seen. Dive Supervisor will deploy the Standby diver to aid in search of missing diver. • If breathing resistance occurs on the bottom, surface immediately, using controlled ascent. • If out of air completely, go onto emergency come home bottle. • Alternative method is to "Buddy Breath" with dive partner. • Adhere to No D tables to prevent decompression sickness. • Divers will be required to remain in sight of each other at all times, during and after dive. • Divers will not investigate anomalies unless there is suitable visibility. • Dive team to maintain neutral buoyancy as much as possible to remain above seabed. • Divers approach anomaly from down-current side to prevent unintended contact. • Divers photograph and video anomaly on surface of sea floor in a manner that equipment does not strike the anomaly. • A single tended diver will perform excavation by hand of anomalies in the sand bottom. Use diver discipline to maintain neutral buoyancy. • Divers will wait at least 12 hours before flying after any dive. This will be extended to 24 hours following multiple days of repetitive dives.	M
X	If SCUBA is used, anomalies will be investigated on discovery.	IAW Underwater MEC Investigation AHA	IAW Underwater MEC Investigation AHA	M

Add Items

	EQUIPMENT	TRAINING	INSPECTION
X	• Footwear with rubber soles to prevent slipping • Back braces (optional) • Appropriate clothing and PPE (to include personal flotation device, canvas or leather gloves, tinted safety glasses, and cap). Hearing protection will be required if noise from generator or boat motor reaches hazardous levels.	PPE Training	PPE inspected daily prior to use.

ACTIVITY HAZARDS ANALYSIS

	EQUIPMENT	TRAINING	INSPECTION
X	Equipment for diving operations • Snorkels • Fins • Buoyancy compensators • Weight belt • Dive tanks • Regulators • Watches • Knives • Masks • Depth gauge • Manual reserve (J valve) or authorized independent system • Thermal protection • Gloves • Depth Indicator (sonar) • Personal flotation device • Tending line, if required • Witness float line, if required • Dive ladder or platform to recover divers • ROV • EM61 magnetometer • Sled • Cart • Floating platform • ROV platform • Generator • Boat	• UXO personnel will meet training and experience requirements outlined in DDESB TP 18. • Site-specific MEC training will be presented to all site personnel. • All divers are certified per EM 385-1-1. • All personnel will demonstrate strong swimming skills. • Training in hazardous tides and currents and how to handle them. • All dive team members will review and be briefed on the Dive Plan, Dive SOPs, and this AHA. • UXO divers and tenders understand line pull signals. • Instrument/equipment familiarity training. • Site-specific training, slip/fall hazards. • Site-specific training/lifting techniques. • Site-specific flora/fauna to include First Aid. • All site personnel will have current HAZWOPER training.	• UXOSO will esure that all controls are being followed; all equipment is being correctly utilized and that all personnel have received appropriate training. • Equipment inspected daily for serviceability prior to use. • Daily serviceability check of magnetometers. • Dive Supervisor will ensure that all dive operation controls are being followed, all equipment is being correctly utilized, and all personnel have received appropriate training. • Dive equipment inspected daily prior to use. • Inspect location to be used for water entry and determine depth. • Inspect divers for proper tending line attachment (if required). • Inspect lines and floats (if required). • Inspect dive ladder or platform.
X	• Communications equipment • Fire extinguishers • "Man overboard" rescue equipment (rope with life ring) • WBGT monitor • Weather radio • First Aid kit equipped for surface and waterborne injuries with Oxygen cylinder and mask	• Instrument familiarity training. • Heat Stress symptoms/First Aid. • Site-specific biological hazards to include First Aid. • Emergency response procedures. • Training in emergency dive procedures to include diving distress hand signals and rescue procedures. • Site-specific hazards to include First Aid. • First Aid and CPR and Oxygen training as required by the Dive Plan.	• Equipment inspected for serviceability daily prior to use. • Communications equipment checked daily prior to use. • First Aid kits checked daily and inspected weekly. • Fire extinguishers checked daily and inspected weekly. • Rescue equipment will be inspected daily.

Involved Personnel:

ACTIVITY HAZARDS ANALYSIS

Acceptance Authority (digital signature): 

Digitally signed by Robert D. Crownover
DN: cn=Robert D. Crownover, o=USA Environmental, Inc., ou=DSQ, email=rcrownover@usatampa.com, c=US
Date: 2014.10.10 11:38:45 -04'00'

	PRINT	SIGNATURE	
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UXOSO Name:			**Date/Time:**
Employee Name(s):			**Date/Time:**
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ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC) (Use highest code): M

Date: 11 October 2013 Project: RI/FS

Activity: Underwater Instrument Verification Strip

Activity Location: Culebra Island, Puerto Rico

Prepared By: Cheryl M. Riordan, CSP

Risk Assessment Code Matrix

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	• The UXOQCS will put in place an IVS for EM Float, ROV and snorkel operations and a separate IVS for EM Sled and intrusive investigations items with a similar signatures as to the munitions anticipated to be present on site. A site free of anomalies will be selected for the IVS's.	• Underwater MEC hazards • Uneven and/or moving working surfaces of the boat – slip, trip, fall hazards • Back strain from carrying equipment • Heat stress • Biological hazards – bees, wasps, mosquitoes, spiders • Sunburn • Falling overboard/drowning • Weather hazards	• On-site MEC training • Personnel will wear rubber soled shoes to prevent slipping while on boat, and will avoid stepping in wet areas that could be slippery • Follow appropriate lifting/carrying procedures - Lift with legs, maintain footing, use gloves for firm grip, never lift more than you can safely handle • Heat stress monitoring, drinking water, work-rest schedule, and cool shelter for breaks • Training in biological hazards avoidance • Use insect repellents as necessary • Use PPE IAW this AHA • Use sunscreen and wear cap • Emergency VHF radios will be in operating condition prior to leaving the wharf. There will be a primary and alternate means of communication, and extra batteries will be available. • Boat will be equipped with rescue equipment to handle a man overboard situation (such as life ring with rope, or similar equipment), and personnel trained in its use. • Local weather will be monitored and boat operations will be terminated should a storm be approaching, or should sea conditions make it unsafe to continue.	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	• Prior to the start of operations each day, the geophysical equipment will be moved over the IVS; functional checks will be made of the imaging and latitude/longitude coordinates will be checked. If this equipment is functioning correctly, it can be used for operations that day.	• Uneven and/or moving working surfaces of the boat – slip, trip, and fall hazards • Back strain from carrying equipment • Heat stress • Biological hazards – bees, wasps, mosquitoes, spiders • Sunburn • Falling overboard/drowning • Weather hazards	• Personnel will wear rubber-soled shoes to prevent slipping while on boat, and will avoid stepping in wet areas that could be slippery. • Follow appropriate lifting/carrying procedures: Lift with legs, maintain footing, use gloves for firm grip, and never lift more than you can safely handle. • Heat stress monitoring, drinking water, work-rest schedule, and cool shelter for breaks. • Training in biological hazards avoidance. • Use insect repellents as necessary. • Use PPE IAW this AHA. • Use sunscreen and wear cap. • Emergency VHF radios will be in operating condition prior to leaving the wharf. There will be a primary and alternate means of communication, and extra batteries will be available. • Boat will be equipped with rescue equipment to handle a "man overboard" situation (such as rescue hook, life ring with rope, or similar equipment), and personnel trained in its use. • Local weather will be monitored and boat operations will be terminated should a storm be approaching, or should sea conditions make it unsafe to continue.	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	• Prior to start of Intrusive operation, the divers will be run through the IVS to verify operation and equipment operation. Analog functional checks will be made against an ISO to confirm function. If this equipment is functioning correctly, it can be used for operations that day.	• Diving hazards • Biological hazards – box jellyfish, sharks, barracudas, sea urchins, and stingrays • Weather hazards • Drowning hazards • Boating hazards • Underwater hazards from stepping on coral or other sharp underwater objects • Hazardous tides or currents (rip tides, high tide, etc.) • Diving-related illnesses • Diver impact with bottom • Impact with unseen objects • Impact with dive partner • Fouled/entangled diver • Tending line/witness float line fouled in prop • Limited visibility • Lost diver • Loss of air • Decompression sickness and Arterial Gas Embolism	• On-site MEC Training. • Perform MEC avoidance measures using approved methods and techniques. • All divers are certified per EM 385-1-1. • Review specific hazards and controls located in the Dive Plan. • Review DSOPs 1, 3, 4, 5, 6, 7 as related to current task, assignment, or pre, during, and post dive activities. • Accurately determine water depth • If water less than 6 feet, ease diver over side versus roll-off entry. • Check for object on surface or near entry point • Ensure dive partner is clear of entry point • Ensure vessel engine in neutral or turned off • Standby diver assigned to the team will be at the ready when divers are in the water. Tender be aware of divers movement • Walk line around boat passing line under anchor line. • All personnel trained in diving distress signals. • Boat will be equipped with rescue equipment to handle a "man overboard" situation (such as rescue hook, life preserver with rope, or similar equipment). • Dive Supervisor will be equipped with rescue equipment and First Aid supplies and equipment. • Personal flotation devices will be worn during boat transit and during inclement weather, and will be readily available and accessible at all other times while on boat. • Emergency VHF radios will be in operating condition prior to leaving the wharf. There will be a primary and alternate means of communication, and extra batteries will be available. • Be observant while in water; note, avoid, and report unsafe conditions or activities. Avoid stepping on coral or sharp underwater objects. Terminate the dive should conditions warrant. • Determine types of hazardous aquatic life found in this location from local marine or harbor police or lifeguard headquarters. Training in biological hazards avoidance. • If sharks are a hazard in this area, operations will not occur at dawn or at dusk, when they are most likely to be feeding. Personnel will be observant for schools of bait fish on which sharks feed, and leave the area immediately if sited. No flashing jewelry will be worn. • Determine areas where hazardous tasks, tides or currents may be present and times of day or conditions likely to cause them from local marine or harbor police of lifeguard headquarters. Training in how to safely handle these circumstances. If currents exceed 1 knot. the dive will be terminated until the speed of the current subsides. • If poor visibility is encountered, the UXO Dive Supervisor has the authority to suspend dive operations until the dive site visibility increases to ensure the diver's safety.	M

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Continuation of prior step.	Continuation of prior step.	• If a diver becomes fouled, diver and/or dive partner will assist to free diver. Standby diver may be deployed if situation warrants. • Topside actions for lost diver: Initiate emergency recall, Identify GPS coordinates of the last known location of the diver. Mark last known location with anchor and buoy. • Divers underwater should look in 360º to look for dive partner. Diver will surface if dive partner can not be seen. Dive Supervisor will deploy the Standby diver to aid in search of missing diver. • If breathing resistance occurs on the bottom, surface immediately, using controlled ascent. • If out of air completely, go onto emergency come home bottle. • Alternative method is to "Buddy Breath" with dive partner. • Adhere to No D tables to prevent decompression sickness. • Divers will be required to remain in sight of each other at all times, during and after dive. • Divers will not investigate anomalies unless there is suitable visibility. • Dive team to maintain neutral buoyancy as much as possible to remain above seabed. • Divers approach anomaly from down-current side to prevent unintended contact. • Divers photograph and video anomaly on surface of sea floor in a manner that equipment does not strike the anomaly. • A single tended diver will perform excavation by hand of anomalies in the sand bottom. Use diver discipline to maintain neutral buoyancy. • Divers will wait at least 12 hours before flying after any dive. This will be extended to 24 hours following multiple days of repetitive dives.	M
X	• If either piece of equipment does not pass these functional checks, it will be put aside for repairs and another piece of equipment will be selected, until one is found that can pass the functional checks. USA may move this IVS area to another location as work on the project progresses.	• Uneven and/or moving working surfaces of the boat – slip, trip, and fall hazards • Back strain from carrying equipment • Heat stress • Biological hazards – bees, wasps, mosquitoes, spiders • Sunburn • Falling overboard/drowning • Weather hazards	• Personnel will wear rubber soled shoes to prevent slipping while on boat, and will avoid stepping in wet areas that could be slippery • Follow appropriate lifting/carrying procedures - Lift with legs, maintain footing, use gloves for firm grip, never lift more than you can safely handle • Heat stress monitoring, drinking water, work-rest schedule, and cool shelter for breaks • Training in biological hazards avoidance • Use insect repellents as necessary • Use PPE IAW this AHA • Use sunscreen and wear cap • Emergency VHF radios will be in operating condition prior to leaving the wharf. There will be a primary and alternate means of communication, and extra batteries will be available. • Boat will be equipped with rescue equipment to handle a man overboard situation (such as rescue hook, life ring with rope, or similar equipment), and personnel trained in its use. • Local weather will be monitored and boat operations will be terminated should a storm be approaching, or should sea conditions make it unsafe to continue.	L

ACTIVITY HAZARDS ANALYSIS

Add Items

	EQUIPMENT	TRAINING	INSPECTION
X	• Footwear with rubber soles to prevent slipping • Back braces (optional) • Appropriate clothing and PPE (to include personal flotation device, canvas or leather gloves, tinted safety glasses and cap). Hearing protection will be required if noise from generator or boat motor reaches hazardous levels.	PPE Training	PPE inspected daily prior to use.
X	• EM61 magnetometer • Sled • Cart • Floating platform • ROV • ROV platform • Generator • Boat	• UXO personnel will meet training and experience requirements outlined in DDESB TP 18. • Site-specific MEC training will be presented to all site personnel. • Site-specific training, slip/fall hazards • Site-specific training/lifting techniques • All divers are certified per EM 385-1-1. • All personnel will demonstrate strong swimming skills. • Training in hazardous tides and currents and how to handle them • All dive team members will review and be briefed on the Dive Plan, Dive SOPs, and this AHA. • UXO Divers and tenders understand line pull signals • Instrument/equipment familiarity training • All site personnel will have current HAZWOPER training	• UXOSO will ensure that all controls are being followed, all equipment is being correctly utilized, and all personnel have received appropriate training.• Equipment inspected daily for serviceability prior to use. • Daily serviceability check of magnetometers. • Dive Supervisor will ensure that all dive operation controls are being followed, all equipment is being correctly utilized, and all personnel have received appropriate training. • Dive equipment inspected daily prior to use. • PPE inspected daily prior to use. • Inspect location to be used for water entry and determine depth. • Inspect divers for proper tending line attachment (if required). • Inspect lines and floats (if required). • Inspect dive ladder or platform.
X	• Communications equipment • First aid kit • Fire extinguishers • Man overboard rescue equipment (hook, rope, life ring) • WBGT monitor • Weather radio	• Instrument familiarity training • Heat Stress symptoms/first aid • Site-specific biological hazards to include first aid • Emergency response procedures • First Aid and CPR and Oxygen training as required by the Dive Plan	• Equipment inspected for serviceability daily prior to use. • Communications equipment checked daily prior to use. • First Aid kits checked daily and inspected weekly. • Fire extinguishers checked daily and inspected weekly. • Rescue equipment will be inspected daily.

ACTIVITY HAZARDS ANALYSIS

	EQUIPMENT	TRAINING	INSPECTION
X	Equipment for diving operations • Snorkels • Fins • Buoyancy compensators • Weight belt • Dive tanks • Regulators • Watches • Knives • Masks • Depth gauge • Manual reserve (J valve) or authorized independent system • Thermal protection • Gloves • Depth Indicator (sonar) • Personal flotation device • Tending line, if required • Witness float line, if required • Dive ladder or platform to recover divers	• Dive Equipment Training	• Dive equipment inspected daily prior to use.

Involved Personnel:

Acceptance Authority (digital signature): Robert D. Crownover

Digitally signed by Robert D. Crownover
DN: cn=Robert D. Crownover, o=USA Environmental, Inc., ou=Safety and Quality, email=rcrownover@usatampa.com, c=US
Date: 2013.10.11 13:46:40 -04'00'

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ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)
(Use highest code): M

Date: 11 October 2013 Project: RI/FS

Activity: Underwater MC Soil Sampling

Activity Location: Culebra Island, Puerto Rico

Prepared By: Cheryl M. Riordan, CSP

Risk Assessment Code Matrix

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Add Identified Hazards

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	• SUXOS and MC Scientist will determine appropriate locations for taking soil samples from the sea floor. • UXO personnel will don diving gear, descend to the sea floor, and collect soil samples in the specified locations. • MEC avoidance will be practiced during the sampling efforts.	• Underwater MEC hazards • Unauthorized personnel entering site during operations • Diving hazards • Biological hazards – box jellyfish, sharks, barracudas, sea urchins, and stingrays • Weather hazards • Drowning hazards • Boating Hazards • Underwater hazards from stepping on coral or other sharp underwater objects • Hazardous tides or currents (rip tides, high tide, etc.) • Diving related illnesses • Diver impact with bottom • Impact with unseen objects • Impact with dive partner • Fouled/Entangled diver • Tending line/witness float line fouled in prop • Limited visibility • Lost Diver • Loss of air • Decompression sickness and Arterial Gas • Embolism	• On-site MEC Training. • Perform MEC avoidance measures using approved methods and techniques. • All divers are certified per EM 385-1-1. • Review specific hazards and controls located in the Dive Plan. • Review DSOPs 1, 3, 4, 5, 6, 7 as related to current task, assignment, or pre-, during, and post- dive activities. • Accurately determine water depth. • If water less than 6 feet, ease diver over side versus roll off entry. • Check for object on surface or near entry point. • Ensure dive partner is clear of entry point. • Ensure vessel engine in neutral or turned off. • Standby diver assigned to the team will be at the ready when divers are in the water. Tender is to be aware of diver's movement. • Walk line around boat passing line under anchor line. • All personnel trained in diving distress signals. • Boat will be equipped with rescue equipment to handle a "man overboard" situation (such as rescue hook, life preserver with rope, or similar equipment). • Dive Supervisor will be equipped with rescue equipment and First Aid supplies and equipment. • Personal flotation devices will be worn during boat transit and during inclement weather, and will be readily available and accessible at all other times while on boat. • Emergency VHF radios will be in operating condition prior to leaving the wharf. There will be a primary and alternate means of communication, and extra batteries will be available. • Be observant while in water; note, avoid, and report unsafe conditions or activities. Avoid stepping on coral or sharp underwater objects. Terminate the dive should conditions warrant. • Determine types of hazardous aquatic life found in this location from local marine or harbor police or lifeguard headquarters. Training in biological hazards avoidance. • If sharks are a hazard in this area, operations will not occur at dawn or at dusk, when they are most likely to be feeding. Personnel will be observant for schools of bait fish on which sharks feed, and leave the area immediately if sighted No flashing jewelry will be worn. • Determine areas where hazardous tasks, tides or currents may be present and times of day or conditions likely to cause them from local marine or harbor police of lifeguard headquarters. Training in how to safely handle these circumstances. If currents exceed 1 knot, the dive will be terminated until the speed of the current subsides. • If poor visibility is encountered, the UXO Dive Supervisor has the authority to suspend dive operations until the dive site visibility increases to ensure the diver's safety.	M

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Continuation of prior step.	Continuation of prior step.	• If a diver becomes fouled, diver and/or dive partner will assist to free diver. Standby diver may be deployed if situation warrants. • Topside actions for lost diver: Initiate emergency recall, Identify GPS coordinates of the last known location of the diver. Mark last known location with anchor and buoy, • Divers underwater should look in 360º to look for dive partner. Diver will surface if dive partner can not be seen. Dive Supervisor will deploy the Standby diver to aid in search of missing diver. • If breathing resistance occurs on the bottom, surface immediately, using controlled ascent, • If out of air completely, go onto emergency come home bottle. • Alternative method is to "Buddy Breath" with dive partner • Adhere to No D tables to prevent decompression sickness • Divers will be required to remain in site of each other at all times, during and after dive. • Divers will not investigate anomalies unless there is suitable visibility. • Dive team to maintain neutral buoyancy as much as possible to remain above seabed. • Divers approach anomaly from down current side to prevent unintended contact. • Divers photograph and video anomaly on surface of sea floor in a manner that equipment does not strike the anomaly • A single tended diver will perform excavation by hand of anomalies in the sand bottom. Use diver discipline to maintain neutral buoyancy • Divers will wait at least 12 hours before flying after any dive. This will be extended to 24 hours following multiple days of repetitive dives.	M
X	• In accordance with EPA requirements, soil samples will be collected with clean, stainless steel implements, placed in clean containers, labeled as to sample number, location, date, time and person taking sample, and the samples will be sent to a certified laboratory for analysis. Due to samples being collected at depth, the samples will be placed in a plastic bag underwater and then transferred to a more appropriate container once on the surface.	• Uneven and/or moving working surfaces of the boat – slip, trip, and fall hazards • Heat stress • Biological hazards – bees, wasps, mosquitoes, spiders • Sunburn • Falling overboard/drowning • Weather hazards	• Personnel will wear rubber-soled shoes to prevent slipping while on boat, and will avoid stepping in wet areas that could be slippery. • Heat stress monitoring, drinking water, work-rest schedule, and cool shelter for breaks. • Training in biological hazards avoidance. • Use insect repellents as necessary. • Use PPE IAW this AHA. • Use sunscreen and wear cap. • Boat will be equipped with rescue equipment to handle a "man overboard" situation (such as life ring with rope or similar equipment), and personnel trained in its use. • Local weather will be monitored and boat operations will be terminated should a storm be approaching, or should sea conditions make it unsafe to continue.	L

Add Items

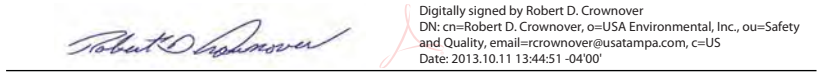
EQUIPMENT	TRAINING	INSPECTION

ACTIVITY HAZARDS ANALYSIS

	EQUIPMENT	TRAINING	INSPECTION
X	• Footwear with rubber soles to prevent slipping • Back braces (optional) • Appropriate clothing and PPE for surface crews (to include personal flotation device, canvas or leather gloves, tinted safety glasses and cap). Hearing protection will be required if noise from generator or boat motor reaches hazardous levels.	PPE Training	PPE inspected daily prior to use.
X	• Appropriate geophysical equipment. • Sampling Equipment • Labels Equipment for diving operations • Snorkels • Fins • Buoyancy compensators • Weight belt • Dive tanks • Regulators • Watches • Knives • Masks • Depth gauge • Manual reserve (J valve) or authorized independent system • Thermal protection • Gloves • Depth Indicator (sonar) • Personal flotation device • Tending line, if required • Witness float line, if required • Dive ladder or platform to recover divers • Underwater Metal Detector • Camera • Video Camera	• UXO personnel will meet training and experience requirements outlined in DDESB TP 18. • Site-specific MEC training will be presented to all site personnel. • All divers are certified per EM 385-1-1. • All personnel will demonstrate strong swimming skills. • Training in hazardous tides and currents and how to handle them. • All dive team members will review and be briefed on the Dive Plan, Dive SOPs, and this AHA. • Site-specific training on slip, trip, and fall hazards. • Site-specific training/lifting techniques. • Site-specific training in use of tools and equipment. • UXO divers and tenders understand line pull signals • All site personnel will have current HAZWOPER training.	• UXOSO will ensure that all controls are being followed, all equipment is being correctly utilized, and all personnel have received appropriate training. • Equipment inspected daily for serviceability prior to use. • Daily serviceability check of magnetometers. • Dive Supervisor will ensure that all dive operation controls are being followed, all equipment is being correctly utilized, and all personnel have received appropriate training. • Dive equipment inspected daily prior to use. • Inspect location to be used for water entry and determine depth. • Inspect divers for proper tending line attachment (if required). • Inspect lines and floats (if required). • Inspect dive ladder or platform.
X	• Communications equipment. • First Aid kit. • Fire extinguishers. • WBGT monitor.	• Instrument familiarity training • Heat stress symptoms/First Aid • Site-specific biological hazards to include First Aid • Emergency response procedures • First Aid and CPR and Oxygen training as required by the Dive Plan	• Communications equipment checked daily prior to use. • First Aid kits checked daily and inspected weekly. • Fire extinguishers checked daily and inspected weekly. • Equipment inspected daily prior to use. • Rescue equipment will be inspected daily.
X			

ACTIVITY HAZARDS ANALYSIS

Involved Personnel:

Acceptance Authority (digital signature): 

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ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC) (Use highest code): M

Date: 11 October 2013 Project: RI/FS

Activity: Underwater MEC Disposal

Activity Location: Culebra Island, Puerto Rico

Prepared By: Cheryl M. Riordan, CSP

Risk Assessment Code Matrix

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	• Evacuate area around disposal operation for required distance except for personnel involved in disposal operation. • Make required notifications of MEC disposal	• Underwater MEC hazards • Unauthorized personnel entering site during operations • Weather hazards	• On-site MEC Training • Establish Exclusion Zone (EZ) around site. • Notify Coast Guard of location of operations and EZ, so they can make radio announcements to local mariners (Notice to Mariners). • Two boats with Spanish-speaking Captains will enforce the EZ if boats attempt to enter the area during operations. • Boat will be equipped with rescue equipment to handle a "man overboard" situation (such as life ring with rope or similar equipment), and personnel trained in its use. • Emergency VHF radios will be in operating condition prior to leaving the wharf. There will be a primary and alternate means of communication, and extra batteries will be available. • Use PPE IAW this AHA. • Local weather will be monitored and boat operations will be terminated should a storm be approaching, or should sea conditions make it unsafe to continue. • Determine areas where hazardous tasks, tides or currents may be present and times of day or conditions likely to cause them from local marine or harbor police of lifeguard headquarters. Training in how to safely handle these circumstances.	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Preparing, Placing, and Detonating Explosives	• Underwater MEC hazards • Unauthorized personnel entering site during operations • Diving hazards • Biological hazards – box jellyfish, sharks, barracudas, sea urchins and stingrays in water • Weather hazards • Drowning hazards • Boating Hazards • Underwater hazards from stepping on coral or other sharp underwater objects • Hazardous tides or currents (rip tides, high tide, etc.) • Diving related illnesses • Diver impact with bottom • Impact with unseen objects • Impact with dive partner • Fouled/entangled diver • Tending line/witness float line fouled in prop • Limited visibility • Lost diver • Loss of air • Decompression sickness and Arterial Gas Embolism	• On-site MEC Training. • Perform MEC avoidance measures using approved methods and techniques. • All divers are certified per EM 385-1-1. • Review specific hazards and controls located in the Dive Plan. • Review DSOPs 1, 3, 4, 5, 6, 7 as related to current task, assignment, or pre-, during, and post- dive activities. • Accurately determine water depth. • If water less than 6 feet. ease diver over side versus roll off entry. • Check for object on surface or near entry point. • Ensure dive partner is clear of entry point. • Ensure vessel engine in neutral or turned off. • Standby diver assigned to the team will be at the ready when divers are in the water. Tender will be aware of diver's movement. • Walk line around boat passing line under anchor line. • All personnel trained in diving distress signals. • Boat will be equipped with rescue equipment to handle a "man overboard" situation (such as rescue hook, life preserver with rope, or similar equipment). • Dive Supervisor will be equipped with rescue equipment and First Aid supplies and equipment. • Personal flotation devices will be worn during boat transit and during inclement weather, and will be readily available and accessible at all other times while on boat. • Emergency VHF radios will be in operating condition prior to leaving the wharf. There will be a primary and alternate means of communication, and extra batteries will be available. • Be observant while in water; note, avoid, and report unsafe conditions or activities. Avoid stepping on coral or sharp underwater objects. Terminate the dive should conditions warrant. • Determine types of hazardous aquatic life found in this location from local marine or harbor police or lifeguard headquarters. Training in biological hazards avoidance. • If sharks are a hazard in this area, operations will not occur at dawn or at dusk, when they are most likely to be feeding. Personnel will be observant for schools of bait fish on which sharks feed, and leave the area immediately if sighted No flashing jewelry will be worn. • Determine areas where hazardous tasks, tides or currents may be present and times of day or conditions likely to cause them from local marine or harbor police of lifeguard headquarters. Training in how to safely handle these circumstances. If currents exceed 1 knot, the dive will be terminated until the speed of the current subsides. • If poor visibility is encountered, the UXO Dive Supervisor has the authority to suspend dive operations until the dive site visibility increases to ensure the diver's safety.	M

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Continuation of prior step.	Continuation of prior step.	• If a diver becomes fouled, diver and/or dive partner will assist to free diver. Standby diver may be deployed if situation warrants. • Topside actions for lost diver: Initiate emergency recall, Identify GPS coordinates of the last known location of the diver. Mark last known location with anchor and buoy, • Divers underwater should look in 360º to look for dive partner. Diver will surface if dive partner cannot be seen. Dive Supervisor will deploy the Standby diver to aid in search of missing diver. • If breathing resistance occurs on the bottom, surface immediately, using controlled ascent. • If out of air completely, go onto emergency come home bottle. • Alternative method is to "Buddy Breathe" with dive partner. • Adhere to No D tables to prevent decompression sickness. • Divers will be required to remain in sight of each other at all times, during and after dive. • Divers will not investigate anomalies unless there is suitable visibility. • Dive team to maintain neutral buoyancy as much as possible to remain above seabed. • Divers approach anomaly from down current side to prevent unintended contact. • Divers photograph and video anomaly on surface of sea floor in a manner that equipment does not strike the anomaly. • A single tended diver will perform excavation by hand of anomalies in the sand bottom. Use diver discipline to maintain neutral buoyancy. • Divers will wait at least 12 hours before flying after any dive. This will be extended to 24 hours following multiple days of repetitive dives.	M

Add Items

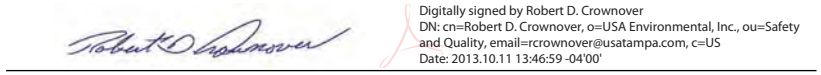
EQUIPMENT	TRAINING	INSPECTION

ACTIVITY HAZARDS ANALYSIS

	EQUIPMENT	TRAINING	INSPECTION
X	Equipment for diving operations • Snorkels • Fins • Buoyancy compensators • Weight belt • Dive tanks • Regulators • Watches • Knives • Masks • Depth gauge • Manual reserve (J valve) or authorized independent system • Thermal protection • Gloves • Depth Indicator (sonar) • Personal flotation device • Tending line, if required • Witness float line, if required • Dive ladder or platform to recover divers • Underwater Metal Detector • Camera • Video Camera	Diving Equipment Training	Diving equipment inspected daily prior to use
X	• Demolitions Equipment • Explosives	• UXO personnel will meet training and experience requirements outlined in DDESB TP 18. • PR blaster's license for MEC Disposal Supervisor • Site-specific MEC training will be presented to all site personnel. • All divers are certified per EM 385-1-1. • All personnel will demonstrate strong swimming skills. • Training in hazardous tides and currents and how to handle them. • All dive team members will review and be briefed on the Dive Plan, Dive SOPs, and this AHA. • Instrument/equipment familiarity training. • All site personnel will have current HAZWOPER training. • Techniques for Underwater MEC/UXO Disposal.	• UXOSO will ensure that all controls are being followed, all equipment is being correctly utilized, and all personnel have received appropriate training • Equipment inspected daily for serviceability prior to use. • Dive Supervisor will ensure that all dive operation controls are being followed, all equipment is being correctly utilized, and all personnel have received appropriate training. • Dive equipment inspected daily prior to use. • Check demolitions equipment for serviceability. • Inspect location to be used for water entry and determine depth. • Inspect divers for proper tending line attachment (if required). • Inspect lines and floats (if required). • Inspect dive ladder or platform.
X	• Communications equipment • Fire extinguishers • "Man overboard" rescue equipment (hook, rope, life ring) • WBGT monitor • Weather radio • First Aid kit equipped for surface and waterborne injuries with Oxygen cylinder and mask	• Instrument familiarity training • Site-specific flora/fauna to include First Aid • Emergency response procedures • Training in emergency dive procedures to include diving distress hand signals and rescue procedures • Site-specific hazards to include First Aid • First Aid and CPR and Oxygen training as required by the Dive Plan	• Equipment inspected for serviceability daily prior to use • Communications equipment checked daily prior to use • First aid kits checked daily and inspected weekly • Fire extinguishers checked daily and inspected weekly • Rescue equipment will be inspected daily

ACTIVITY HAZARDS ANALYSIS

Involved Personnel:

Acceptance Authority (digital signature): 

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ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)
(Use highest code): M

Date: 11 October 2013 Project: RI/FS

Activity: Underwater MEC Investigation

Activity Location: Culebra Island, Puerto Rico

Prepared By: Cheryl M. Riordan, CSP

Risk Assessment Code Matrix

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Add Identified Hazards

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	• Intrusive MEC investigation will occur in areas with high anomaly densities. Using an underwater man portable EM sensor (if there are no risks to coral or sponges), reacquire anomalies	• MEC hazards • Drowning hazards • Boating hazards • Underwater hazards from stepping on coral or other sharp underwater objects • Biological hazards – box jellyfish, sharks, barracudas, sea urchins, and stingrays • Weather hazards • Hazardous tides or currents (rip tides, high tide, etc.) • Diving related illnesses • Diver impact with bottom • Impact with unseen objects • Impact with dive partner • Fouled/entangled diver • Tending line/witness float line fouled in prop • Limited visibility • Lost diver • Loss of air • Decompression sickness and Arterial Gas Embolism	• On-site MEC Training. • Perform MEC avoidance measures using approved methods and techniques. • All divers are certified per EM 385-1-1. • Review specific hazards and controls located in the Dive Plan. • Review DSOPs 1, 3, 4, 5, 6, 7 as related to current task, assignment, or pre-, during, and post- dive activities. • Accurately determine water depth. • If water less than 6 feet, ease diver over side versus roll off entry. • Check for object on surface or near entry point. • Ensure dive partner is clear of entry point. • Ensure vessel engine in neutral or turned off. • Standby diver assigned to the team will be at the ready when divers are in the water. Tender be aware of divers movement. • Walk line around boat passing line under anchor line. • All personnel trained in diving distress signals. • Boat will be equipped with rescue equipment to handle a man-overboard situation (such as rescue hook, life preserver with rope, or similar equipment). • Dive Supervisor will be equipped with rescue equipment and First Aid supplies and equipment. • Personal flotation devices will be worn during boat transit and during inclement weather, and will be readily available and accessible at all other times while on boat. • Emergency VHF radios will be in operating condition prior to leaving the wharf. There will be a primary and alternate means of communication, and extra batteries will be available. • Be observant while in water; note, avoid, and report unsafe conditions or activities. Avoid stepping on coral or sharp underwater objects. Terminate the dive should conditions warrant. • Determine types of hazardous aquatic life found in this location from local marine or harbor police or lifeguard headquarters. Training in biological hazards avoidance. • If sharks are a hazard in this area, operations will not occur at dawn or at dusk, when they are most likely to be feeding. Personnel will be observant for schools of bait fish on which sharks feed, and leave the area immediately if sighted. No flashing jewelry will be worn. • Determine areas where hazardous tasks, tides, or currents may be present and times of day or conditions likely to cause them from local marine or harbor police of lifeguard headquarters. Training in how to safely handle these circumstances. If currents exceed 1 knot, the dive will be terminated until the speed of the current subsides. • If poor visibility is encountered, the UXO Dive Supervisor has the authority to suspend dive operations until the dive site visibility increases to ensure the diver's safety.	M

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Continuation of prior step	Continuation of prior step	• If a diver becomes fouled, diver and/or dive partner will assist to free diver. Standby diver may be deployed if situation warrants. • Topside actions for lost diver: Initiate emergency recall, Identify GPS coordinates of the last known location of the diver. Mark last known location with anchor and buoy. • Divers underwater should look in 360º to look for dive partner. Diver will surface if dive partner cannot be seen. Dive Supervisor will deploy the Standby diver to aid in search of missing diver. • If breathing resistance occurs on the bottom, surface immediately, using controlled ascent. • If out of air completely, go onto emergency come home bottle. • Alternative method is to "Buddy Breathe" with dive partner. • Adhere to No D tables to prevent decompression sickness. • Divers will be required to remain in sight of each other at all times, during and after dive. • Divers will not investigate anomalies unless there is suitable visibility. • Dive team to maintain neutral buoyancy as much as possible to remain above seabed. • Divers approach anomaly from down-current side to prevent unintended contact. • Divers photograph and video anomaly on surface of sea floor in a manner that equipment does not strike the anomaly. • A single tended diver will perform excavation by hand of anomalies in the sand bottom. Use diver discipline to maintain neutral buoyancy. • Divers will wait at least 12 hours before flying after any dive. This will be extended to 24 hours following multiple days of repetitive dives.	M

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	• UXO-qualified divers investigate MEC using hands and hand tools. Non-MEC metal items will be brought to the surface for collection and sent to a qualified recycler at the end of project operations.	• MEC hazards • Drowning hazards • Boating Hazards • Underwater hazards from stepping on coral or other sharp underwater objects • Biological hazards – box jellyfish, sharks, barracudas, sea urchins and stingray • Hazardous tides or currents (rip tides, high tide, etc.) • Diving related illnesses • Diver impact with bottom • Impact with unseen objects • Impact with dive partner • Fouled/entangled diver • Tending line/witness float line fouled in prop • Limited visibility • Lost diver • Loss of air • Decompression sickness and Arterial Gas Embolism	• On-site MEC Training. • Perform MEC avoidance measures using approved methods and techniques. • All divers are certified per EM 385-1-1. • Review specific hazards and controls located in the Dive Plan. • Review DSOPs 1, 3, 4, 5, 6, 7 as related to current task, assignment, or pre-, during, and post- dive activities. • Accurately determine water depth. • If water less than 6 feet,ease diver over side versus roll off entry. • Check for object on surface or near entry point. • Ensure dive partner is clear of entry point. • Ensure vessel engine in neutral or turned off. • Standby diver assigned to the team will be at the ready when divers are in the water. Tender will be aware of diver's movement. • Walk line around boat passing line under anchor line. • All personnel trained in diving distress signals. • Boat will be equipped with rescue equipment to handle a "man overboard" situation (such as rescue hook, life preserver with rope, or similar equipment). • Dive Supervisor will be equipped with rescue equipment and First Aid supplies and equipment. • Personal flotation devices will be worn during boat transit and during inclement weather, and will be readily available and accessible at all other times while on boat. • Emergency VHF radios will be in operating condition prior to leaving the wharf. There will be a primary and alternate means of communication, and extra batteries will be available. • Be observant while in water; note, avoid, and report unsafe conditions or activities. Avoid stepping on coral or sharp underwater objects. Terminate the dive should conditions warrant. • Determine types of hazardous aquatic life found in this location from local marine or harbor police or lifeguard headquarters. Training in biological hazards avoidance. • If sharks are a hazard in this area, operations will not occur at dawn or at dusk, when they are most likely to be feeding. Personnel will be observant for schools of bait fish on which sharks feed, and leave the area immediately if sighted. No flashing jewelry will be worn. • Determine areas where hazardous tasks, tides or currents may be present and times of day or conditions likely to cause them from local marine or harbor police of lifeguard headquarters. Training in how to safely handle these circumstances. If currents exceed 1 knot, the dive will be terminated until the speed of the current subsides. • If poor visibility is encountered, the UXO Dive Supervisor has the authority to suspend dive operations until the dive site visibility increases to ensure the diver's safety.	M

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Continuation of prior step	Continuation of prior step	• If a diver becomes fouled, diver and/or dive partner will assist to free diver. Standby diver may be deployed if situation warrants. • Topside actions for lost diver: Initiate emergency recall, Identify GPS coordinates of the last known location of the diver. Mark last known location with anchor and buoy, • Divers underwater should look in 360º to look for dive partner. Diver will surface if dive partner can not be seen. Dive Supervisor will deploy the Standby diver to aid in search of missing diver. • If breathing resistance occurs on the bottom, surface immediately, using controlled ascent. • If out of air completely, go onto emergency come home bottle. • Alternative method is to "Buddy Breathe" with dive partner • Adhere to No D tables to prevent decompression sickness. • Divers will be required to remain in sight of each other at all times, during and after dive. • Divers will not investigate anomalies unless there is suitable visibility. • Dive team to maintain neutral buoyancy as much as possible to remain above seabed. • Divers approach anomaly from down-current side to prevent unintended contact. • Divers photograph and video anomaly on surface of sea floor in a manner that equipment does not strike the anomaly. • A single tended diver will perform excavation by hand of anomalies in the sand bottom. Use diver discipline to maintain neutral buoyancy. • Divers will wait at least 12 hours before flying after any dive. This will be extended to 24 hours following multiple days of repetitive dives.	M
X	• MPPEH will be inspected by two UXO Technicians and MDAS will be brought to the surface for collection and sent to a qualified recycler at the end of project operations.	IAW AHA for MPPEH Inspection and Certification	IAW AHA for MPPEH Inspection and Certification.	M
X	• MEC that is not safe to move will be marked with a clump and the area surrounding the site is filmed with attention to coral and biology in the immediate area in order to identify a suitable disposal method later.	IAW AHA for MEC Underwater Disposal Operations	IAW AHA for MEC Underwater Disposal Operations.	M
X	• MEC that is acceptable to move will be transported to a designated disposal location on shore, where a MEC disposal will occur.	IAW AHA for MEC Disposal on Land	IAW AHA for MEC Disposal on Land.	M

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	• MEC that is within coral or rock will receive only a visual investigation.	• MEC hazards • Drowning hazards • Boating hazards • Underwater hazards from stepping on coral or other sharp underwater objects • Biological hazards – box jellyfish, sharks, barracudas, sea urchins, and stingrays • Hazardous tides or currents (rip tides, high tide, etc.) • Diving-related illnesses • Diver impact with bottom • Impact with unseen objects • Impact with dive partner • Fouled/entangled diver • Tending line/witness float line fouled in prop • Limited visibility • Lost diver • Loss of air • Decompression sickness and Arterial Gas Embolism	• On-site MEC Training. • Perform MEC avoidance measures using approved methods and techniques. • All divers are certified per EM 385-1-1. • Review specific hazards and controls located in the Dive Plan. • Review DSOPs 1, 3, 4, 5, 6, 7 as related to current task, assignment, or pre-, during, and post- dive activities. • Accurately determine water depth. • If water less than 6 feet, ease diver over side versus roll off entry. • Check for object on surface or near entry point. • Ensure dive partner is clear of entry point. • Ensure vessel engine in neutral or turned off. • Standby diver assigned to the team will be at the ready when divers are in the water. Tender will be be aware of diver's movement. • Walk line around boat passing line under anchor line. • All personnel trained in diving distress signals. • Boat will be equipped with rescue equipment to handle a "man overboard" situation (such as rescue hook, life preserver with rope, or similar equipment). • Dive Supervisor will be equipped with rescue equipment and First Aid supplies and equipment. • Personal flotation devices will be worn during boat transit and during inclement weather, and will be readily available and accessible at all other times while on boat. • Emergency VHF radios will be in operating condition prior to leaving the wharf. There will be a primary and alternate means of communication, and extra batteries will be available. • Be observant while in water; note, avoid, and report unsafe conditions or activities. Avoid stepping on coral or sharp underwater objects. Terminate the dive should conditions warrant. • Determine types of hazardous aquatic life found in this location from local marine or harbor police or lifeguard headquarters. Training in biological hazards avoidance. • If sharks are a hazard in this area, operations will not occur at dawn or at dusk, when they are most likely to be feeding. Personnel will be observant for schools of bait fish on which sharks feed, and leave the area immediately if sighted. No flashing jewelry will be worn. • Determine areas where hazardous tasks, tides or currents may be present and times of day or conditions likely to cause them from local marine or harbor police of lifeguard headquarters. Training in how to safely handle these circumstances. If currents exceed 1 knot, the dive will be terminated until the speed of the current subsides. • If poor visibility is encountered, the UXO Dive Supervisor has the authority to suspend dive operations until the dive site visibility increases to ensure the diver's safety.	M

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Continuation of prior step.	Continuation of prior step.	• If a diver becomes fouled, diver and/or dive partner will assist to free diver. Standby diver may be deployed if situation warrants. • Topside actions for lost diver: Initiate emergency recall, and identify GPS coordinates of the last known location of the diver. Mark last known location with anchor and buoy. • Divers underwater should look in 360º to look for dive partner. Diver will surface if dive partner cannot be seen. Dive Supervisor will deploy the Standby diver to aid in search of missing diver. • If breathing resistance occurs on the bottom, surface immediately, using controlled ascent, • If out of air completely, go onto emergency come home bottle. • Alternative method is to "Buddy Breathe" with dive partner. • Adhere to No D tables to prevent decompression sickness. • Divers will be required to remain in sight of each other at all times, during and after dive. • Divers will not investigate anomalies unless there is suitable visibility. • Dive team to maintain neutral buoyancy as much as possible to remain above seabed. • Divers approach anomaly from down-current side to prevent unintended contact. • Divers photograph and video anomaly on surface of sea floor in a manner that equipment does not strike the anomaly. • A single tended diver will perform excavation by hand of anomalies in the sand bottom. Use diver discipline to maintain neutral buoyancy. • Divers will wait at least 12 hours before flying after any dive. This will be extended to 24 hours following multiple days of repetitive dives.	M

Add Items

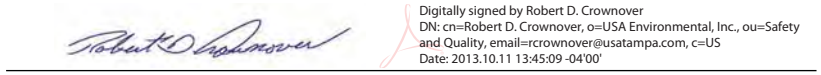
EQUIPMENT	TRAINING	INSPECTION

ACTIVITY HAZARDS ANALYSIS

	EQUIPMENT	TRAINING	INSPECTION
X	Equipment for diving operations • Snorkels • Fins • Buoyancy compensators • Weight belt • Dive tanks • Regulators • Watches • Knives • Masks • Depth gauge • Manual reserve (J valve) or authorized independent system • Thermal protection • Gloves • Depth indicator (sonar) • Personal flotation device • Tending line, if required • Witness float line, if required • Dive ladder or platform to recover divers • Underwater Metal Detector • Camera • Video Camera	Dive Equipment Training	Dive equipment inspected daily prior to use
X	• Appropriate geophysical equipment • Hand tools • Underwater camera • Generator • Boat	• UXO personnel will meet training and experience requirements outlined in DDESB TP 18. • Site specific MEC training will be presented to all site personnel. • All divers are certified per EM 385-1-1. • All personnel will demonstrate strong swimming skills. • Training in hazardous tides and currents and how to handle them. • All dive team members will review and be briefed on the Dive Plan, Dive SOPs, and this AHA. • Instrument/equipment familiarity training. • All site personnel will have current HAZWOPER training.	• UXOSO will ensure that all controls are being followed, all equipment is being correctly utilized, and all personnel have received appropriate training. • Equipment inspected daily for serviceability prior to use. • Daily serviceability check of magnetometers. • Dive Supervisor will ensure that all dive operation controls are being followed, all equipment is being correctly utilized, and all personnel have received appropriate training. • Dive equipment inspected daily prior to use. • Inspect location to be used for water entry and determine depth. • Inspect divers for proper tending line attachment (if required). • Inspect lines and floats (if required). • Inspect dive ladder or platform.
X	• Communications equipment • Fire extinguishers • "Man overboard" rescue equipment (hook, rope, life ring) • WBGT monitor • Weather radio • First Aid kit equipped for surface and waterborne injuries with Oxygen cylinder and mask	• Instrument familiarity training. • Site-specific flora/fauna to include First Aid. • Emergency response procedures. • Training in emergency dive procedures to include diving distress hand signals and rescue procedures. • Site-specific hazards to include First Aid. • First Aid and CPR and Oxygen training as required by the Dive Plan.	• Equipment inspected for serviceability daily prior to use. • Communications equipment checked daily prior to use. • First Aid kits checked daily and inspected weekly. • Fire extinguishers checked daily and inspected weekly. • Rescue equipment will be inspected daily.

ACTIVITY HAZARDS ANALYSIS

Involved Personnel:

Acceptance Authority (digital signature): 

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ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC) (Use highest code): L

Date: 11 October 2013 Project: RI/FS

Activity: Vehicle Operations

Activity Location: Culebra Island, Puerto Rico

Prepared By: Cheryl M. Riordan, CSP

Risk Assessment Code Matrix

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	• Identify the hazards associated with vehicle operations • Inspect vehicle	• Vehicle hazards • Fire hazards	• Use the parking brake if parked on inclines and/or as necessary. • Daily vehicle inspections will be performed to ensure a safe operating vehicle. • Operator must have a valid driver's license (CDL for transporting explosives). • Fire extinguisher and First Aid kit must be with vehicle. If transporting explosives, two fire extinguishers are required.	L
X	• Load cargo onto vehicle	• MEC hazards • Fire hazards	• Use the parking brake if parked on inclines and/or as necessary. • Fire extinguisher and First Aid kit must be with vehicle. If transporting explosives, two fire extinguishers are required. • Ensure placards are visible on all four sides of vehicle when transporting explosive materials. • Ensure explosives are properly packed and braced in the vehicle. • Fill out DD Form 626 when transporting explosives. • Ensure vehicle is chocked while loading/unloading cargo.	L

ACTIVITY HAZARDS ANALYSIS

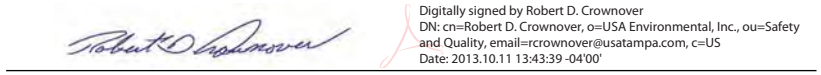
	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	• Drive to destination	• Potential for vehicle accidents during field operations • MEC hazards • Fire hazards	• Always wear a seat belt. • Use a ground guide when reversing and/or as needed. • Prior to backing or when working alone, drivers will apply the GOAL technique: "Get Out And Look." • Obey the speed limit. • Obey all traffic signs. • Use established roads. • Use the parking brake if parked on inclines and/or as necessary. • Never leave the vehicle running unattended. • Operator must have a valid driver's license (CDL for transporting explosives). • Fire extinguisher and First Aid kit must be with vehicle. If transporting explosives, two fire extinguishers are required. • Never fuel a vehicle loaded with explosive cargo. • No passengers will be transported in back of a pick-up truck. All passengers will be in a seat with a seat belt in use during vehicle operation. • There will be no use of cell phones, portable headphones, earphones, or other electronic devices while operating a vehicle. • Silence or turn off all electronic devices prior to operating motor vehicle. • If an electronic device must be used, park the vehicle in an appropriate location and turn engine off prior to turning on and using electronics.	L

Add Items

	EQUIPMENT	TRAINING	INSPECTION
X	• Vehicles • Placards	• UXO personnel will meet training and experience requirements outlined in DDESB TP 18. • All site personnel will have current HAZWOPER training. • Valid Driver's license (CDL for transporting explosives). • Vehicle familiarity training.	• UXOSO will ensure that all controls are being followed, all equipment is being correctly utilized and all personnel have received appropriate training. • Vehicle inspected daily prior to use.
X	• First Aid kit • Fire extinguisher • Communication equipment	• Knowledge of the Emergency Response and Notification procedures. • Fire extinguisher training. • Equipment familiarity.	• Communications equipment checked daily prior to use. • First Aid kits checked daily and inspected weekly. • Fire extinguishers checked daily and inspected weekly.
X			

ACTIVITY HAZARDS ANALYSIS

Involved Personnel:

Acceptance Authority (digital signature): 

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APPENDIX D, ATTACHMENT 3
DIRECTIONS TO CULEBRA HOSPITAL AND EMERGENCY TELEPHONE NUMBERS

This attachment contains the following information:

- Directions to Culebra Hospital
- Emergency Telephone Numbers.

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A local medical facility and ambulance service is available on the island of Culebra, and is capable of treating urgent medical issues. Directions to the local medical facility on Culebra:

- Located near the island ferry landing, at the end of C. William Font street
- C. William Font Street extends up the hill, past the collection of local government buildings
- The medical building is identified by a Red Cross symbol, and is marked by a "Recetas" (prescriptions) sign

Figure D3-1 indicates the location of the Culebra Hospital.

Any injury will first be addressed on-site by First Aid/Cardiopulmonary Resuscitation (CPR)-qualified personnel. As required, injured divers who cannot perform physical functions will be extracted from the water unto land and/or the dive platform by the safest means possible. This procedure may range from placement of the injured diver onto a floating backboard, or hand lifting the diver from the water.

Once recovered, the DS will direct the commencement of immediate medical treatment, and assign specific tasks to individual team members as applicable.

The DS will work with local emergency support units to ensure the fastest care at the closest medical facility for all injuries.

Table D3-1: Emergency Telephone Numbers

Contact	Phone Number
Fire	787-742-3530
Police	787-742-3501
Hospital: Culebra Medical Clinic	787-742-3511
AERO Med Medical Evacuation Flight	787-756-3480
Emergency Management Office - Culebra	787-742-3849
Recompression Chamber: Puerto Rico Medical Center, San Juan, PR	787-777-3535 24 Hour Phone: 787-390-3243
Alternate Recompression Chamber: Hyperbaric Medicine, Isabela, PR	787-872-8365 787-648-0130
Poison Control Hotline	1-800-222-1222
USEPA National Response Center	1-800-424-8802
CHEMTREC	1-800-424-9300
Federal OSHA Emergency Hotline	1-800-321-OSHA (6742)
Project Manager, Patricia Berry	678-969-2410
USA Corporate Safety and Health Manager, Robert Crownover	813-343-6364

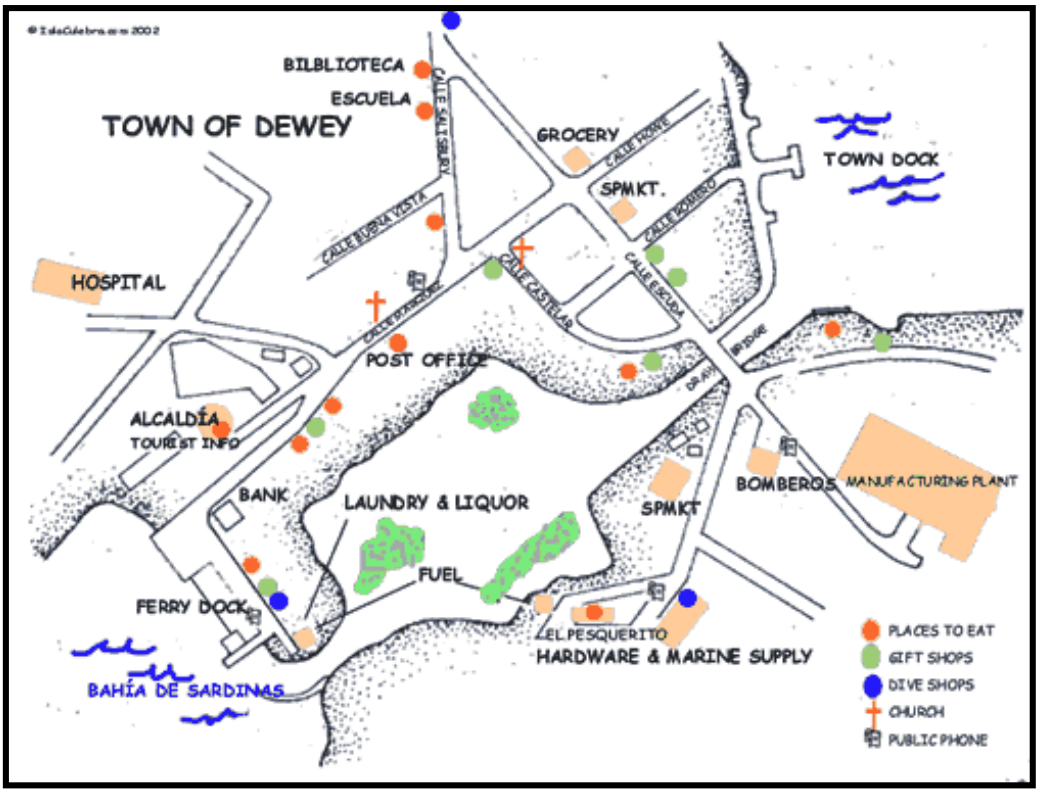

Figure D3-1: Directions to Culebra Hospital

APPENDIX D, ATTACHMENT 4
SITE SAFETY AND HEALTH PLAN

This attachment contains the Site Safety and Health Plan for this project.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

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1.0 INTRODUCTION

This Site Safety and Health Plan (SSHP) establishes the responsibilities, requirements, and procedures for protecting the project personnel and the surrounding community from the hazards associated with the Phase 2 Underwater Geophysical Survey and Phase 3 Intrusive Investigation of the RI/FS on Culebra, Puerto Rico. The purpose of the project is to perform a geophysical survey (Phase 2) in order to characterize the extent of munitions and explosives of concern (MEC) and munitions constituents (MC) contamination within the Culebra Island Munitions Response Sites (MRSs) 02 and 07 (water areas), and to investigate underwater anomalies (Phase 3).

1.1 SITE DESCRIPTION

The sites involve former range areas in the waters around Culebra Island. The project location is Culebra Island (MRSs 02 and 07), approximately 17 miles east of the main island of Puerto Rico.

The objective of this project is to document and characterize the extent of MEC and MC contamination as part of the RI/FS within the underwater areas surrounding MRS 07 and the cayos of MRS 02. These activities have been addressed to stakeholders as part of the TPP process.

1.2 CONTAMINANT CHARACTERISTICS

As these MRSs were formerly used for artillery, strafing, and bombing training, considerable MEC contamination is expected in these waters. The munitions of concern are listed in Table 1.

Table 1: Munitions of Concern

Site	MEC
MRS 02	High explosive (HE) bombs; (HE) projectiles; (HE) rockets; illumination rounds; practice rounds
MRS 07	20mm projectiles, Mk 44 and Mk 45 flares; live and practice bombs up to 500 pounds; 2.75-inch rockets; British bombs and rockets

2.0 HAZARD/RISK ANALYSIS

An Activity Hazard Analysis (AHA) has been conducted and documented for each activity warranted by the hazards associated with the activity (see Attachment D-2 for the site-specific AHAs). The following AHAs have been prepared for all anticipated field operations:

- Underwater Instrument Verification Strip (IVS)
- Underwater Geophysical Survey
- Underwater MEC Investigation
- MEC Disposal Operations on Land
- Underwater MEC Disposal Operations
- Underwater MC Sampling
- Diving Operations
- Snorkeling Operations
- MPPEH Inspection
- Quality Control
- Boat Transportation
- Boat Operations
- Vehicle Operations.

Risk management is and will continue to be integrated into the planning, preparation, and execution of all operations at each site. Risk management is a dynamic process, and is continuously improved upon as personnel become more familiar with the site operations, equipment, and environment. Site personnel are trained to continuously identify hazards and assess accident risks. Once identified, these hazards will be brought to the attention of the Team Leader or UXO Quality Control Specialist/UXO Safety Officer (UXOQCS/UXOSO). Control measures will be developed and coordinated by Parsons' safety personnel. All site personnel are responsible for continuous assessment of variable hazards and the implementation of risk controls.

2.1 CLASSIC SAFETY

2.1.1 SLIP, TRIP, AND FALL HAZARDS

Site personnel will be instructed to make themselves aware of foot placement at all times, to avoid slips, trips, and falls. While on the boat, close-toed shoes with rubber non-slip soles will prevent slips. Personnel will also be instructed to watch their step on the vessel, to avoid stepping in wet or potentially slippery areas, and to remain seated while the vessel is in operation.

2.1.2 CUTS/LACERATION HAZARDS

Project personnel should expect a high likelihood of cuts/lacerations if proper care is not taken. During all activities involving the handling of site materials and tools, personnel will wear leather work gloves to prevent injury to hands.

2.1.3 PINCHED/CRUSHED FINGERS AND TOES

Personnel will utilize proper lifting techniques and when appropriate, will use additional personnel or material handling equipment for heavy objects.

2.1.4 HAND TOOL OPERATION

Use of improper or defective tools can contribute significantly to the occurrence of accidents on-site. Therefore, the following safe work practices will be observed when using hand tools.

- Hand tools will be inspected for defects prior to each use.
- Defective hand tools will be removed from service and repaired or discarded.
- Tools will be selected and used in the manner for which they were designed.
- Be sure of footing and grip before using any tool.
- Do not use tools that have split handles, mushroom heads, worn jaws, or other defects.
- Gloves will be worn whenever they increase gripping ability or if cut, laceration, or puncture hazards exist during the use of hand tools.
- Safety glasses with side shields, goggles, or a face shield will be used if tool use presents an eye/face hazard.
- Do not use makeshift tools or other improper tools.
- Use non-sparking tools where there are explosive vapors, gases, or residue.

2.1.5 MATERIAL LIFTING

Many types of objects are handled in normal day-to-day operations. Care will be taken in lifting and handling heavy or bulky items because they are the cause of many joint and back injuries. The following fundamentals address the proper lifting of materials, to avoid joint and back injuries.

- The size, shape, and weight of the object to be lifted must be considered. Site personnel will not lift more than they can handle comfortably.

- A firm grip on the object is essential; therefore, the hands and object will be free of oil, grease, and water, which might prevent a firm grip.
- The hands and especially the fingers will be kept away from any points that cause them to be pinched or crushed, especially when setting the object down.
- The item will be inspected for metal slivers, jagged edges, burrs, rough or slippery surfaces, and pinch points, and gloves will be used, if necessary, to protect the hands.
- The feet will be placed far enough apart for good balance and stability.
- Personnel will ensure that solid footing is available prior to lifting the object.
- When lifting, get as close to the load as possible, bend the legs at the knees, making sure that the back is kept as straight as possible.
- To lift the object, the legs are straightened from their bending position.
- Never carry a load that cannot be seen over or around.
- When placing an object down, the stance and position are identical to that for lifting, with the back kept straight, the legs bent at the knees, and the object lowered.
- If the item to be lifted is too large, bulky, or heavy for one person to safely lift, ask a co-worker for assistance. If a piece of material handling equipment is available that can do the job, use the equipment instead of trying to lift it yourself.
- When two or more people are required to handle an object, coordination is essential to ensure that the load is lifted uniformly and that the weight is equally divided between the individuals carrying the load. When carrying the object, each person, if possible, will face the direction in which the object is being carried.

2.1.6 BOATING SAFETY

A Boat Operator (Caribbean Marine Services, Inc.) or a suitable marine service contractor, will be subcontracted for boat transportation for this project work. The company subcontracted boats will meet Coast Guard requirements for the size of vessel used. The Captain for the DGM or Dive vessel will be Coast Guard Certified and familiar with the waters throughout Puerto Rico. The boat operators for security or logistical purposes are not required to be Coast Guard Certified but will demonstrate safe boat handling skills at all times.

All boats are inspected by the Boat Operator daily, prior to being used for operations to assure they are in optimal mechanical condition. The boats are equipped with personal flotation devices for all passengers. They also maintain readily available rescue equipment (ring buoy with rope and all Coast Guard required equipment for the vessel size and type) in the event of a passenger falling overboard, so that they can quickly be brought back onto the boat. Communications equipment is well maintained and checked daily prior to launching of the boat to assure that they can seek assistance should an emergency occur on the water. There will be a primary means of communication (radio), as well as a back-up, and extra batteries will be available. Directions on how to contact the US Coast Guard and the hospital will be available in each vessel.

Fire extinguishers are also readily available for use in the event of a fire situation on the boat. The Boat Operator personnel as well as field personnel will be trained in the use of fire extinguishers to put out fires in the incipient stages. The boat will also be equipped with a First Aid kit. Parsons will also have a First Aid kit available during operations.

The Captain provides a daily safety briefing to all personnel prior to launching the boat from the dock. All passengers are required to obey any directions given by the Captain and they will also wear personal flotation devices during transit to the work sites and when the boat Captain has deemed it necessary. Personal flotation devices will be readily available at all times during boat operations. Personnel will wear shoes with non-slip soles while on the boat and will avoid stepping in wet areas that may be slippery, as much as possible.

2.1.6.1 Operations Conducted While Aboard Boat

In addition to transportation to offshore sites, operations to take place on board the boat will also include the operation of the Video-Ray Miniature Remotely Operated Vehicle (ROV) for performing underwater surveillance, as well as the generator and computers required to provide power and to record data generated by the ROV. The subcontractor, ASI will also perform DGM operations and other support operations, using the boat as a base. Parsons/USA teams will also operate from the boat as a base to perform snorkeling and diving operations involved in the geophysical survey.

2.1.6.2 Hazards During Boat Operations

Potential hazards that could be encountered during boat operations include heat stress; fire, underwater MEC; falling overboard; biological hazards (insects); sunburn; slips, trips and falls, and weather emergencies. Safety during boat operations will be addressed in the AHA for Boat Operations.

In order to control these hazards, the following will be required:

- Adequate supply of cool drinking water will be available to all personnel working on the boat.
- Heat stress program will be implemented.
- Decrease intake of coffee or caffeinated drinks.
- Monitor workers for signs of heat stress.
- Use sunscreen and cap,
- Fire extinguishers will be readily available.
- First aid kits will be readily available.
- ROV will be characterizing levels of underwater MEC contamination through videotaping of underwater conditions.
- Personnel will remain seated while boat is in motion.
- All personnel will wear personal flotation devices while boat is in motion, and personal flotation devices will be readily available at all times.
- Good housekeeping standards will be enforced. Cargo will be properly staged on the boat to prevent tripping hazards.
- Personnel will wear rubber soled shoes to prevent slipping while on boat, and will avoid stepping in wet areas that could be slippery.
- Emergency equipment will be available for a man overboard situation and personnel will be trained in its use.
- Communication equipment will be functional and readily available.
- Local weather will be monitored and boat operations will be terminated should a storm be approaching, or should sea conditions make it unsafe to continue.

2.2 EXPLOSIVE ORDNANCE

This Phase 2 work will consist of an underwater DGM survey. Suspect MPPEH may be discovered during the DGM Survey Operation through witnessing the suspect MPPEH item through the EM 61 platform camera, or by snorkelers as the small EM 61 float system is pushed along the transect. Suspect MPPEH will have the GPS coordinates, and photos recorded. The OESS will be advised of the suspect MPPEH item. MPPEH locations will not be provided to parties outside of the USACE or Parsons. Results will be included in the DGM daily reports. Non-UXO-qualified personnel will receive site-specific MEC recognition training prior to participation in site activities. Non-UXO-qualified personnel will not touch or disturb any object which could potentially be MEC related, and will immediately notify the nearest UXO-qualified person of the presence of the object.

2.3 CHEMICAL HAZARDS

The only anticipated chemical hazards that would be expected during site activities are those fuels and oils brought for equipment use and maintenance. All site personnel will follow the procedures and precautions outlined in the appropriate SDS. The SDS binder will be kept on the UXOQCS/UXOSO vessel and will be available to all employees upon request. Chemical Warfare Materiel (CWM) is not expected to be found on these sites.

2.4 PHYSICAL HAZARDS

For the planned site activities to be conducted, the potential for exposure to physical hazards is high for this project. The physical hazards that may be encountered during site operations, and precautions to be taken, are described in the following paragraphs.

2.4.1 FLAMMABLE/EXPLOSIVE HAZARDS FROM FUELING EQUIPMENT AND SITE VEHICLES

The chance of fire and/or explosion during vehicle and equipment refueling and maintenance is high when improper procedures are used. All site vehicles will be equipped with a portable fire extinguisher readily available to fight a fire. Cellular phones will not be used around flammable liquids, in accordance with Ordnance and Explosives Safety Group Safety Advisory 03-2003. Grounding and bonding procedures will be used during all fueling operations. No smoking will be permitted in the vicinity of fueling operations, and flammable and combustible materials will be removed from the vicinity of fueling operations. Similar procedures will be followed during fueling operations taking place on the boat.

2.4.2 NOISE HAZARDS

Protection against the effects of noise exposure will be provided when the sound levels exceed those shown in Table 2, as measured on the A scale of a standard sound level meter at slow response. When employees are subjected to sound exceeding those listed in Table 2, feasible administrative or engineering controls will be utilized. If such controls fail to reduce sound to a safe level, PPE will be provided and used to reduce sound exceeding protective levels. If the variations in noise level involve maximal intervals of 1 second or less, it is to be considered continuous.

Parsons and USA will make hearing protection available to all employees exposed to an 8-hour time-weighted average of 85 dB or greater. Hearing protection will be replaced as necessary (will have sound meter or sound level Smartphone application available to indicate when 85dbA is exceeded). Hearing protection will be required for all personnel working in and around any operations likely to produce high noise levels.

Baseline hearing testing and annual follow-up screening as part of the annual HAZWOPER physicals performed on all field employees. All employees receive training in the hearing protection program and the use of hearing protection as part of their mobilization training when they arrive on-site.

Table 2: Permissible Noise Exposures

Duration per Day (Hours)	Sound level dBA (Slow Response)
8.00	90
6.00	92
4.00	95
3.00	97
2.00	100
1.50	102
1.00	105
0.50	110
0.25	115
Note: When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each. If the sum of the following fractions: C1./T1. + C2./T2. C(n)/T(n) exceeds unity, then, the mixed exposure should be considered to exceed the limit value. C(n) indicates the total time of exposure at a specified noise level, and T(n) indicates the total time of exposure permitted at that level. Exposure to impulsive or impact noise should not exceed 140-dB peak sound pressure level.	

2.4.3 HEAT STRESS

Heat stress is one of the most common (and potentially serious) illnesses that affect hazardous waste site workers. When site personnel are engaged in operations involving hot environments, a number of physiological responses can occur that may seriously affect the health and safety of the workers. These effects can be eliminated or controlled through the use of a comprehensive heat stress prevention and monitoring program. Therefore, it is the objective of this program to outline the methods and procedures to be used by personnel for the prevention, control, and/or treatment of heat-related illnesses.

2.4.3.1 Causes of Heat Stress

The most common cause of heat stress during site activities is the effect that PPE has on the body's natural cooling mechanism. Individuals will vary in their susceptibility and degree of response to the stress induced by increased body heat. Heat stress can result in health effects ranging from transient heat fatigue to serious illness or death. Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, and the individual characteristics of the worker. Because heat stress is probably one of the most common (and potentially serious) illnesses at hazardous waste sites, regular monitoring and other preventive precautions are vital.

Factors which may predispose a worker to heat stress include:

- Lack of physical fitness
- Lack of acclimatization to hot environments
- Degree of hydration
- Level of obesity
- Current health status (e.g., having an infection, chronic disease, diarrhea, etc.)

- Alcohol or drug use
- The worker's age and sex
- Sunburn.

Reduced work tolerance and the increased risk of excessive heat stress are directly influenced by the amount and type of PPE worn. PPE adds weight and bulk, severely reduces the body's access to normal heat exchange mechanisms (evaporation, convection, and radiation), and increases energy expenditure. Therefore, when selecting PPE, each item's benefit should be carefully evaluated in relation to its potential for increasing the risk of heat stress. Once PPE is selected, the safe duration of work/rest periods should be determined based on the following factors:

- Anticipated work rate
- Ambient temperature and other environmental factors
- Type of protective ensemble
- Individual worker characteristics and fitness.

Prior to initiating site activities each day, and periodically throughout the day, the UXOQCS/UXOSO will inspect site personnel for evidence of the previously mentioned factors, to determine those personnel who are at increased risk for heat stress-related disorders. Evidence of extreme dehydration, illness, or drug or alcohol use may require the UXOQCS/UXOSO to restrict the worker's activities until such time as the worker is fit for duty. Personnel identified as being at high risk for heat stress, who are allowed to participate in site operations, will be monitored frequently by the UXOQCS/UXOSO throughout the day.

2.4.3.2 Heat Stress Disorders

This section outlines the major heat-related illnesses that may result from exposure to high heat environments. For the purpose of this program, reference to "liquids" will indicate the use of water or an electrolyte replacement solution, and not tea or coffee (unless it is decaffeinated) or carbonated soft drinks.

2.4.3.2.1 Heat Rash

Heat rash is caused by continuous exposure to heat and humid air, and is aggravated by wet, chafing clothes. This condition can decrease a worker's ability to tolerate hot environments.

Symptoms: Mild red rash, especially in areas of the body that sweat heavily.

Treatment: Decrease amount of time in protective gear and provide powder such as corn starch or baby powder to help absorb moisture and decrease chafing. Maintain good personal hygiene standards and change into dry clothes if needed.

2.4.3.2.2 Heat Cramps

Heat cramps are caused by a profuse rate of perspiration that is not balanced by adequate fluid and electrolyte intake. The occurrence of heat-related cramps is often an indication that excessive water and electrolyte loss has occurred, which can further develop into heat exhaustion or heat stroke.

Symptoms: Acute, painful spasms of voluntary muscles such as the back, abdomen and extremities.

Treatment: Remove victim to a cool area and loosen restrictive clothing. Stretch and massage affected muscles to increase blood flow to the area. Have patient drink one to two cups of liquids immediately, and every 20 minutes thereafter. Consult with physician if condition does not improve. If available, an electrolyte replacement solution should be taken along with liquids.

2.4.3.2.3 Heat Exhaustion

Heat exhaustion is a state of very definite weakness or exhaustion caused by increased stress on various organs, to meet increased demands to cool the body as a result of excessive loss of fluids from the body. This condition leads to inadequate blood supply and cardiac insufficiency. Heat exhaustion is less dangerous than heat stroke, but nonetheless must be treated. If allowed to go untreated, heat exhaustion can quickly develop into heat stroke.

Symptoms: Pale or flushed, clammy, moist skin, profuse perspiration, and extreme weakness. Body temperature is basically normal or slightly elevated, the pulse is weak and rapid, and breathing is shallow. The individual may have a headache, or be dizzy or nauseated.

Treatment: Use passive and active cooling. Orally administer cool water and/or electrolyte replacement liquids immediately, to hydrate the victim, starting with small sips and continuing with larger amounts as the victim is able to hold it down. Total liquid consumption should be about 1 to 1.6 gallons per day. Transfer to a medical facility if symptoms do not subside, or become more severe.

2.4.3.2.4 Heat Stroke

Heat stroke is an acute and dangerous reaction to heat stress caused by a failure of the heat-regulating mechanisms of the body. The failure of the individual's temperature control system causes the perspiration system to stop working correctly. When this occurs, the body core temperature rises very rapidly to a point [105 degrees Fahrenheit (°F) or higher] where brain damage and death will result if the person is not cooled quickly.

Symptoms: The victim's skin is hot and may or may not be red and dry. Other symptoms include nausea; dizziness; confusion; extremely high body temperatures; rapid respiratory and pulse rate; delirium; convulsions; and unconsciousness or coma.

Treatment: Cool the victim immediately. If the body temperature is not brought down quickly, permanent brain damage or death may result. The victim should be moved to a shady area; laid down and the head kept elevated. Passive and active cooling should be used. If conscious, orally administer cool water and/or electrolyte replacement liquids immediately to hydrate the victim, starting with small sips and increasing amounts as the victim is able to hold it down. Rapidly transfer the victim to an emergency medical facility for immersion in cool water. Do not give the victim caffeinated or alcoholic beverages. Heat stroke is considered a medical emergency.

2.4.3.3 Preventive Measures

Required Preventive Measures – Proper training and preventive measures will help avert serious illness and loss of work productivity. Preventing heat stress is particularly important because, once someone suffers from heat exhaustion, that person may become predisposed to additional heat injuries. In order to avoid heat-related illnesses, proper preventive measures will be implemented whenever environmental conditions dictate the need. These preventive measures represent the minimal steps to be taken and will include the following procedures.

The UXOQCS/UXOSO should examine each site worker prior to start of daily operations to determine the individuals susceptible to heat-induced stress. Workers exhibiting factors that make them susceptible to heat stress will be closely monitored by the UXOQCS/UXOSO.

Site workers will be trained to recognize and treat heat-related illnesses. This training will include the signs, symptoms, and treatment of heat stress disorders as outlined in this program.

In order to maintain workers' body fluids at normal levels, workers will be encouraged to drink, as a minimum, approximately sixteen ounces of liquids prior to start of work in the morning, after lunch, and prior to leaving the site at the conclusion of the day's activities. Disposable cups and liquids will be provided on-site. Acceptable liquids include water and an electrolyte replacement solution. Liquids containing caffeine are to be avoided.

When ambient conditions and site workload requirements dictate, as determined by the UXOQCS/UXOSO, workers will be required to drink a minimum of 16 to 32 ounces of liquids during each rest cycle. The normal thirst mechanism is not sensitive enough to ensure that enough water will be ingested to replace lost sweat. When heavy sweating occurs, workers should be encouraged to drink even though they may not be thirsty. The following strategies may be useful in encouraging fluid intake.

- Maintain water temperature at 50 ºF to 60 °F (10 ºC to 15.6 °C).
- Provide small disposable cups that hold about 4 ounces (0.1 liter).
- Have workers drink 16 ounces (0.5 liters) of fluids (preferably water or dilute drinks) before beginning work.
- Urge workers to drink a cup or two every 15 to 20 minutes, or at each monitoring break. A total of 1 to 1.6 gallons (4 to 6 liters) of fluid per day are recommended, but more may be necessary to maintain body weight.
- A shelter or shaded area will be provided where workers may be protected from direct sunlight during rest periods.

Monitoring of ambient or physiological heat stress indices will be conducted to allow prevention and/or early detection of heat induced stress. Monitoring will be conducted in accordance with applicable paragraphs of this program.

Site workers will be given time to acclimatize to site work conditions, temperature, and workload. Acclimatization usually takes about a week to 10 days of continued work in hot environments, and allows the worker's body to become adjusted to this level and type of work. This process involves a gradual increase in the workload over the required period, the length of which depends upon the nature of the work performed, the ambient temperatures, the level of PPE required for the job and the individual's susceptibility to heat stress.

Work schedules will be adjusted as follows:

- Modify work/rest schedules according to monitoring requirements
- Mandate work slowdowns as needed
- Rotate personnel: alternate job functions to minimize overstress or overexertion at one task
- Add additional personnel to work teams
- Perform work during cooler hours of the day, if possible, or at night if adequate lighting can be provided.

Supplemental Preventive Measures – When possible and/or feasible, the following measures will also be implemented to aid in prevention or reduction of the effects of heat-induced stress.

- Designated rest areas should be air-conditioned and the temperature maintained between 72 °F and 76 °F.
- Workers will be encouraged to achieve and maintain an optimum level of physical fitness. Increased physical fitness will allow workers to better tolerate and respond to hot environments and heavy workloads. In comparison to an unfit person, a fit person will have less physiological strain, a lower heart rate and body temperature, and a more efficient sweating mechanism.

2.4.3.4 Heat Stress Monitoring

Because the incidence of heat stress depends on a variety of factors, all workers, even those not wearing protective equipment, should be monitored. Initially, the frequency of physiological monitoring depends on the air temperature adjusted for solar radiation and the level of physical work (see

). The length of the work cycle will be governed by the frequency of the required physiological monitoring.

For workers wearing permeable clothing (e.g., standard cotton or synthetic work clothes), follow recommendations for monitoring requirements and suggested work/rest schedules in the current ACGIH

Threshold Limit Values for Heat Stress. If the actual clothing worn differs from the ACGIH standard ensemble in insulation value and/or wind and vapor permeability, change the monitoring requirements and work/rest schedules accordingly.

When site personnel are engaged in site activities involving the use of Level D PPE with cotton clothing, in ambient temperatures greater than 75 °F, physiological monitoring will be conducted. The goal of all heat stress monitoring is to ensure that the worker's body temperature does not exceed 100.4 °F. The physiological monitoring methods listed below are to be implemented based upon the severity of the heat and workload. As a minimum, the UXOQCS/UXOSO will use the WBGT readings to monitor temperature and humidity and establish work/rest cycles. Depending on the conditions at the site, the UXOQCS/UXOSO may also monitor the worker's heart rate as an indication of potential heat stress. The frequency of physiological monitoring will be determined using the information presented in

below.

For monitoring the body's recuperative ability toward excess heat, both of the following techniques should be used as a screening mechanism unless the UXOQCS/UXOSO modifies the procedures and documents the log. For personnel wearing Level D PPE with cotton clothing, the monitoring will commence when the ambient temperature reaches 75 °F. Frequency of monitoring should increase as the ambient temperature increases or as slow recovery rates to baseline (pre-work) levels are indicated.

2.4.3.4.1 Wet Bulb, Dry Globe Temperature (WBGT) Monitoring

For site conditions where personnel are working in Level D PPE, and the ambient temperature is greater than 75 °F, the UXOQCS/UXOSO will conduct WBGT monitoring to assist in controlling the potential for site workers experiencing heat-related adverse health effects. The UXOQCS/UXOSO will use a real-time direct reading WBGT monitor and, after estimating the work load, use the values expressed in Table to determine the work/rest schedule to be implemented. The values outlined in this table are designed such that nearly all acclimatized, fully clothed workers with adequate salt and water intake will be able to function without the body temperature exceeding 100.4 °F. If conditions and/or workloads warrant, the UXOQCS/UXOSO may also implement the heart rate monitoring.

Table 3: Permissible WBGT Heat Exposure Threshold Limit Values

Work – Rest Regimen	WORK LOAD		
	Light*	Moderate	Heavy
Continuous work	86 (30.0)	80 (26.7)	77 (25.0)
75% Work - 25% Rest, each hour	87 (30.6)	82 (28.0)	78 (25.9)
50% Work - 50% Rest, each hour	89 (31.4)	85 (29.4)	82 (27.9)
25% Work - 75% Rest, each hour	90 (32.2)	88 (31.1)	86 (30.0)

* Consult the ACGIH TLV booklet for definitions of Light, Moderate, and Heavy workloads.

Values are given in °F and (°C) WBGT, and are intended for workers wearing single layer summer type clothing. Use of semi-permeable or totally impermeable clothing requires monitoring IAW the USA Heat Stress Prevention Program. As workload increases, the heat stress impact on an unacclimatized worker is exacerbated. For unacclimatized workers performing a moderate level of work, the permissible heat exposure TLV should be reduced by approximately 2.5 °C.

Acclimatization is the adaptive process that results in a decrease of the physiological response produced by the application of a constant environmental stress. On initial exposure to a hot environment, there is an impaired ability to work and evidence of physiological strain. If the exposure is repeated on several successive days, there is a gradual return of the ability to work and a decrease in physiological strain. Within 4 to 7 days following initiation of the acclimatization process, a dramatic improvement in the ability

to perform work is noticed: subjective discomfort practically disappears; body temperature and heart rate are lower; there is a more stable blood pressure; and the sweat is more profuse and dilute.

Alcohol should not be consumed in a hot environment because the loss of body fluids increases the risk of heat stress.

2.4.3.4.2 Heart Rate Monitoring

The worker's baseline heart rate should be recorded prior to initiation of site activities, by measuring the radial pulse rate for 30 seconds. After each work cycle, the heart rate should be measured by taking the pulse rate (PR) for 30 seconds as early as possible into the resting period. Taking the radial (wrist) pulse rate is the preferred method; however, the carotid (neck) pulse rate may be taken if a worker has difficulty finding the radial pulse. The PR at the beginning of the rest period should not exceed 110 beats per minute (bpm). If the PR is higher than 110 bpm, the next work period should be shortened by 33 percent, while the length of the rest period stays the same. If the PR exceeds 110 bpm at the beginning of the next rest period, the work cycle should be further shortened by 33 percent. This procedure will be continued until the worker's PR at the beginning of the rest cycle is maintained below 110 bpm.

2.4.3.5 Heat Stress Documentation

The UXOQCS/UXOSO will be responsible for recording all heat stress-related information. This will include training sessions and monitoring data. Training sessions will be documented using the Documentation of Training form. Pulse rate monitoring data will be recorded on the Heat Stress Monitoring Log, with the WBGT being recorded in the Site Safety Log, and/or Site Monitoring Log.

2.4.3.6 Sunburn

Due to the hazards of sunburn from outdoor work, particularly on the water, which reflects the rays of the sun more intensely, personnel will be provided with sunscreen with a sun protection factor (SPF) appropriate for their skin type and exposure. Sunscreen will be used in accordance with the manufacturer's instructions. It will generally need to be re-applied every few hours. Personnel will also be required to wear hats or caps in order to protect the head from the sun. Personnel will wear a short or long-sleeved shirt in order to protect the trunk area from sunburn.

2.5 IONIZING RADIATION HAZARDS

Ionizing radiation is not expected to be an issue on these project sites.

2.6 BIOLOGICAL HAZARDS

Biological hazards that are usually found on-site include bees, spiders, mosquitoes, ticks, snakes, and rodents. Hazardous aquatic life is also a biological hazard for snorkelers and divers. Employee awareness and the safe work practices outlined in the following paragraphs should reduce the risk associated with these hazards.

2.6.1 BEES, HORNETS, AND WASPS

Contact with stinging insects like bees, hornets, and wasps may result in site personnel experiencing adverse health effects that range from being mildly uncomfortable to being life threatening. Therefore, stinging insects present a serious hazard to site personnel, and extreme caution must be exercised whenever site and weather conditions increase the risk of encountering stinging insects. Some of the factors related to stinging insects that increase the degree of risk associated with accidental contact are as follows.

- The nests for these insects are frequently found in remote wooded or grassy areas.
- The nests can be situated in trees, rocks, and bushes or in the ground, and are usually difficult to see.

- Accidental contact with these insects is highly probable, especially during warm weather conditions when the insects are most active.
- If a site worker accidentally disturbs a nest, the worker may be inflicted with multiple stings, causing extreme pain and swelling which can leave the worker incapacitated and in need of medical attention.
- Some people are hypersensitive to the toxins injected by a sting, and when stung, experience a violent and immediate allergic reaction resulting in a life-threatening condition known as anaphylactic shock.
- Anaphylactic shock manifests itself very rapidly and is characterized by extreme swelling of the body, eyes, face, mouth and respiratory passages.
- The hypersensitivity needed to cause anaphylactic shock can, in some people, accumulate over time and exposure; therefore, even if someone has been stung previously, and has not experienced an allergic reaction, there is no guarantee that they will not have an allergic reaction if they are stung again.
- With these things in mind, and with the high probability of contact with stinging insects, all site personnel will comply with the following safe work practices:
  - If a worker knows that he/she is hypersensitive to bee, wasp, or hornet stings, the worker must inform the UXOQCS/UXOSO of this condition prior to participation in site activities.
  - All site personnel will be watchful for the presence of stinging insects and their nests, and will advise the UXOQCS/UXOSO if a stinging insect nest is located or is suspected in the area.
  - Any nests located on-site will be identified and site personnel will be notified of its presence.
  - If stung, site personnel will immediately report to the UXOQCS/UXOSO to obtain first aid treatment and to allow the UXOQCS/UXOSO to observe them for signs of allergic reaction. If a breathing emergency (anaphylactic shock) occurs as a result of the sting, immediately call 911.
  - Site personnel with a known hypersensitivity to stinging insects will keep required emergency medication on or near their person at all times, and will let the UXOQCS/UXOSO and co-workers know where it is kept and how to administer it.

2.6.2 SPIDERS

A large variety of spiders may be encountered during site activities. While most spider bites merely cause localized pain, swelling, reddening, and, in some cases, tissue damage, there are a few spiders that, due to the severity of the physiological effects caused by their venom, are dangerous. These species include the black widow and the brown or violin spiders, as shown in Figure 1.

Figure 1: Examples of Dangerous Spiders

Brown/Violin Spider	Black Widow Spider
	

The black widow is a coal-black bulbous spider about ¾-inch in length, with a bright red hourglass on the underside of the abdomen. The black widow is usually found in dark, moist locations, especially under rocks and rotting logs, and may even be found in outdoor toilets where they inhabit the underside of the seat. Victims of a black widow bite may exhibit the following signs or symptoms:

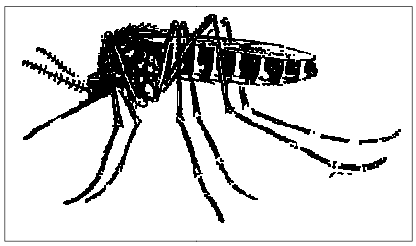
- Sensation of pinprick or minor burning at the time of the bite.
- Appearance of small punctures (but sometimes none are visible).
- After 15 to 60 minutes, intense pain is felt at the site of the bite which spreads quickly, and is followed by profuse sweating, rigid abdominal muscles, muscle spasms, breathing difficulty, slurred speech, poor coordination, dilated pupils, and generalized swelling of face and extremities.

The brown or violin spider is brownish to tan in color, rather flat, about 5/8-in. long with a dark brown "violin" shape on the top. Of the brown spider, there are three varieties found in the United States, which present a problem to site personnel. These are the brown recluse, the desert violin, and the Arizona violin. These spiders may be found in a variety of locations including trees, rocks, or in dark locations. Victims of a brown or violin spider bite may exhibit the following signs or symptoms:

- Blistering at the site of the bite, followed by a local burning at the site 30 to 60 minutes after the bite.
- Formation of a large, red, swollen, postulating lesion with a bull's-eye appearance.
- Systemic effects may include a generalized rash, joint pain, chills, fever, nausea, and vomiting.
- Pain may become severe after 8 hours, with the onset of tissue necrosis.

There is no effective first aid treatment for either of these bites. Except for very young, very old, or weak victims, these spider bites are not considered to be life threatening; however, medical treatment must be sought to reduce the extent of damage caused by the injected toxins. If either of these spiders are suspected or known to be on-site, the UXOQCS/UXOSO will brief site personnel as to the identification and avoidance of the spiders. As with stinging insects, site personnel will report to the UXOQCS/UXOSO if they locate either of these spiders on-site or notice any type of bite while involved in site activities.

2.6.3 MOSQUITOES



The Centers for Disease Control and Prevention (CDCP) has noted the increase of West Nile Virus (WNV), which is transmitted by bites from an infected mosquito. Mosquitoes live in nearly all environments, including urban, wooded, grassy, brushy, arid, or other areas that contain standing pools of water (seeps, drainage, watering holes, etc.).

WNV disease has been documented in at least 42 states. WNV was first detected in the western hemisphere in 1999. The virus is transmitted by certain types of mosquitoes to birds and some mammals, including humans. WNV is not spread from person to person. In areas where the virus exists, usually less than one percent of the mosquito population is likely to be infected with the virus.

Most people who become infected with the WNV do not show symptoms or may show only mild ones. The symptoms of WNV include: fever, headache, body aches, occasional skin rash, and swollen lymph nodes. At its most serious, it can cause encephalitis or meningitis. Less than one percent of people who are bitten by an infected mosquito will develop severe illness. These symptoms include a rapid onset of: severe headache, high fever, stiff neck, confusion, loss of consciousness (coma), or muscle weakness, and may be fatal.

Treatment for WNV includes supportive measures such as rest, observation, intravenous fluids, and respiratory support, as needed.

If you believe you are showing any of the symptoms noted above, contact the UXOQCS/UXOSO, who will authorize you to visit a physician for an examination and possible treatment.

2.6.3.1 Dengue Fever

Symptoms of Dengue Fever include a sudden onset of severe headaches. This is followed by muscle and joint pain, fever and rash. The rash is a bright red and usually appears first on the lower limbs and chest, and in more severe cases can spread over the entire body. Other symptoms include abdominal pain, nausea, vomiting or diarrhea. In more severe cases the disease can develop into Dengue Shock Syndrome, which has a high mortality rate. It can also result in liver disease and is believed to contribute to liver cancer some 10+ years after the illness. Dengue fever normally runs its course in 6 to 7 days.

2.6.3.2 Protective Measures

Standard field gear (shoes, hats, socks, trousers, and work shirts) provides good protection against mosquito bites; exposed skin is particularly susceptible to bites. However, even when wearing field gear, the following precautions will be taken when working in areas that might be infested with mosquitoes.

- Spray outer clothing, **BUT NOT YOUR SKIN**, with an insect repellant that contains permethrin or permanone.
- When working in infested areas, apply an insect repellant containing at least 20 percent DEET to exposed skin and avoid standing water areas as much as possible.
- Also look for the symptoms of the onset of WNV, which occur within 3 to 15 days after being bitten by an infected mosquito.

2.6.4 TICKS

The CDC has noted the increase of Lyme Disease and Rocky Mountain Spotted Fever (RMSF), both of which are caused by bites from infected ticks that live in and near wooded areas, grass, and brush. Ticks are small, ranging from the size of a comma up to about one-quarter inch. They are sometimes difficult to see. When embedded in the skin, they may look like a freckle. The tick season usually extends from spring through summer.

2.6.4.1 Protective Measures

Standard field gear (shoes, socks and light-colored clothing) provide good protection against tick bites, particularly if the joints are taped. However, even when wearing field gear, the following precautions should be taken when working in areas that might be infested with ticks.

- When in the field, check yourself often for ticks, particularly on your lower legs and areas covered with hair.
- Spray outer clothing, particularly your pant legs and socks, **BUT NOT YOUR SKIN**, with an insect repellant that contains permethrin or permanone.
- When working in infested areas, apply an insect repellant containing at least 20 percent DEET to exposed skin and avoid standing water areas as much as possible.
- When walking in wooded areas, wear a hat, and avoid contact with bushes, tall grass, or brush as much as possible.
- If you find a tick, remove it by pulling on it gently with tweezers.
- If the tick resists, cover the tick with salad oil for about 15 minutes to asphyxiate it, then remove it with tweezers.

- **DO NOT** use matches, a lit cigarette, nail polish or any other type of chemical to "coax" the tick out.
- Be sure to remove all parts of the tick's body, and disinfect the area with alcohol or a similar antiseptic after removal.
- For several days to several weeks after removal of the tick, look for the signs of the onset of Lyme disease, such as a rash that looks like a bulls-eye or an expanding red circle surrounding a light area, frequently seen with a small welt in the center.
- Also look for the signs of the onset of RMSF, such as an inflammation which is visible in the form of a rash comprising many red spots under the skin, which appears 3 to 10 days after the tick bite.

2.6.5 SNAKES

Puerto Rico has no identified poisonous snakes. However, even non-poisonous snakes will strike in defense of themselves. When site activities are conducted in warm weather on sites that are located in wooded, grassy, or rocky environments, the potential for contact with snakes becomes a possibility. Normally, if a person is approaching a snake, the noise created by the person is usually sufficient to frighten the snake off. However, during the warm months, caution must be exercised when conducting site operations around areas where snakes might be found (e.g., rocks, bushes, logs, or in holes, crevices, and abandoned pipes). Proper care should be taken by site personnel during activities which may bring them in contact with local wildlife.

2.6.6 CENTIPEDES

Centipedes are commonly found in Puerto Rico. They are larger than those seen on the mainland of the United States and can grow up to 15 inches in length. They are venomous and a bite from a centipede will feel similar to a bee sting. Although the bite can be painful, the venom is rarely fatal to humans unless they experience an allergic reaction. If a worker is bitten by a centipede, report the incident immediately to the UXOQCS/UXOSO who will see that first aid is provided to the victim. The victim will also be monitored for at least 30 minutes to assure there is no allergic reaction. If an allergic reaction occurs, (like anaphylactic shock that is experienced from a bee sting) the victim will be transported to the hospital for medical treatment.

2.6.7 BOX JELLYFISH

Box jellyfish are pale blue in color and can be found in the waters of the Caribbean. These jellyfish have long, stinging tentacles and a sting can be extremely painful, and are sometimes fatal in cases of extreme reaction. If box jellyfish are sighted, do not enter the water in that area.

Symptoms of a sting by a box jellyfish include:

- Stinging
- Burning
- Redness in area of sting, with a long welt line
- Swelling of lymph nodes
- If reaction is severe, symptoms could also involve difficulty breathing and cardiac arrest.

If stung by a box jellyfish, flush the area with copious amounts of white vinegar and use ice for pain. Seek medical attention if there is difficulty breathing.

2.6.8 SHARKS

Sharks are common to the Caribbean. Sharks can be found in shallow inshore water to the open ocean. Sharks have powerful jaws and rows of razor sharp teeth that can cause severe bleeding, and injury to or excision of muscle, bone and appendages. In order to prevent shark bites, avoid murky water. Leave the water if sharks are sighted, or if you have an open cut. Most sharks feed during dusk, night and dawn, so the best preventive measure is to avoid entering the ocean between dusk and dawn when bites are most likely to occur. Because sharks are attracted to shiny objects, which they often mistake for their prey, no jewelry of any kind should be worn during operations. If bitten by a shark, this is a medical emergency, as blood loss can occur rapidly. Attempt to stop the bleeding with pressure while waiting for ambulance transport.

2.6.9 BARRACUDA

The barracuda is a fish that hides in the shadows or under floating objects. They commonly grow to 6 to 8 ft in length. They are attracted to reflective objects that they confuse with their prey. Never wear jewelry of any kind in the water. They have very sharp teeth with strong tearing jaws. A barracuda attack will result in slashed and jagged tears in the skin. Attempt to stop the bleeding with pressure while waiting for ambulance transport.

2.6.10 SEA URCHIN

Sea urchins can be found in shallow reef areas to depths of 100 ft. They have long and extremely brittle spines, which cause injury when they break off and become imbedded in the skin. Do not attempt to handle a sea urchin.

Symptoms of sea urchin injuries include:

- Throbbing pain
- Purplish discoloration.

If a worker is injured by contact with a sea urchin, pull out the protruding spines. If the spine is in a joint or nerve, or when the wound is infected, get medical help.

2.6.11 STINGRAY

Stingrays can be found in shallow sandy areas to deep oceans. A stingray has a tail with a poisonous barb near the base of the body. In order to prevent injuries from contact with stingrays, shuffle feet when walking in shallow inshore waters. Stay clear of swimming stingrays. Do not touch them. An attack from a stingray will cause lacerations and severe pain. Punctures in the abdomen or chest are very serious and must be treated as a medical emergency. If a worker is attacked by a stingray stop any bleeding. Clean the wound thoroughly with mild soap and water. Immerse in hot water to tolerance for pain. Get medical treatment for deep cuts and embedded barb pieces. Do not try to remove embedded pieces on-site.

2.6.12 BLOODBORNE PATHOGENS PROGRAM

The strategy of "Universal Precautions" was developed by the Centers for Disease Control to address concerns regarding transmission of Human Immunodeficiency Virus (HIV). This concept stresses that all sources should be assumed to be infectious for HIV, hepatitis B virus, and other bloodborne pathogens. The philosophy of universal precautions will be applied whenever employees render first aid involving potential contact with blood, body fluids, or other potentially infectious materials. All blood and body fluids will be treated as if they are infectious. PPE and cleanup procedures will be implemented accordingly.

2.6.12.1 Engineering Controls

Engineering controls will be used whenever possible to eliminate or reduce the potential for employee exposure, and will be periodically examined, maintained or replaced to ensure their effectiveness. Employees will observe "universal precautions," and treat all body fluids as potentially infectious materials. The UXOQCS/UXOSO will establish hand-washing facilities readily accessible to employees. Where the installation of hand-washing facilities is not feasible, appropriate antiseptic cleanser and clean paper or cloth towels will be provided. Employees will wash their hands and any other potentially exposed skin with soap and running water as soon as possible:

- After removing gloves or other PPE
- After contact with potentially infectious materials
- Even after washing with antiseptic as described
- Employees will flush eyes or other mucous membranes with copious amounts of water as soon as possible after contact of these areas with potentially infectious materials.

For emergency first aid situations involving multiple victims, equipment will not be used on different victims unless it has been properly decontaminated, or if the victim's medical condition would be seriously affected by a delay in treatment.

2.6.12.2 Safe Work Practices

Safe work practices will be implemented, whenever possible, to eliminate or reduce the potential for employee exposure. Employees will wash their hands immediately or as soon as feasible after removal of gloves or other PPE. Employees will wash hands and any other skin with soap and water, or flush mucous membranes with water immediately following contact with blood or potentially infectious materials.

If potentially contaminated sharps are encountered, the item will immediately be disposed of in an appropriate puncture-resistant container, or will be decontaminated.

Eating, drinking, smoking, applying cosmetics, sun protection or lip balm, handling of contact lenses, any hand-to-face activities, or storage/handling of food is prohibited in all areas where potentially infectious materials are present.

Equipment that has become contaminated will be decontaminated prior to servicing or storage, unless decontamination is not feasible, in which case the equipment will be disposed of properly in appropriately labeled and color-coded containers.

2.6.12.3 Personal Protective Equipment

When occupational exposures remain after the implementation of engineering and work practice controls, appropriate PPE will be utilized to control employee exposures. Parsons or USA will provide appropriate PPE including gloves, face masks, eye protection, mouthpieces, etc., for protection against potentially infectious materials. PPE will not allow potentially infectious materials to pass through or reach an employee's clothes, skin, eyes, mouth, or other mucous membranes during normal use, for the expected duration of time for which the PPE will be used.

Employees will use the appropriate PPE unless, in unusual circumstances, the employee believes that using the protective equipment will prevent the administering of first aid, or would pose an increased risk. Any incident where the use of protective equipment is declined will be investigated and documented by the UXOQCS/UXOSO and be approved by the CHSM.

Single-use protective equipment, such as surgical gloves, will be disposed of after each use, or as soon as possible after the equipment has become damaged. Multi-use protective equipment, such as coveralls or utility gloves, will be cleaned and decontaminated after each use, or when they become contaminated, in order to maintain its effectiveness. Multi-use protective equipment will be removed, and then disposed of or repaired as soon as possible after becoming damaged. When PPE is removed, it will be placed in an appropriately designated area or container for storage, washing, decontamination or disposal. PPE will be removed and disposed of or decontaminated before leaving the area.

Gloves will be worn when it can be reasonably anticipated that the employee may have hand contact with potentially infectious materials. Disposable (single-use) gloves will not be washed for reuse and will be disposed of after each use, or if their ability to function as a barrier is compromised. Utility gloves may be decontaminated for re-use if the integrity of the gloves is not compromised. However, they must be discarded if they exhibit signs of deterioration, or when their ability to function as a barrier is compromised.

Masks, in combination with eye protection devices such as safety glasses, goggles, or face shields, will be worn whenever blood or other potentially infectious materials may be generated, and eye, nose, or mouth contamination can be reasonably anticipated.

2.6.12.4 Decontamination Procedures

All equipment, working surfaces and non-working surfaces will be decontaminated after contact with potentially infectious materials. A solution of ten parts water to one part bleach, or equally effective material, will be used to clean contaminated areas.

Contaminated sharp objects will be cleaned up using mechanical means, such as a brush and dustpan. Sharp objects will not be picked up directly with the hands.

Two pairs of gloves, inner surgical gloves and outer utility gloves will be worn for cleaning contaminated surfaces. A smock or apron and eye protection will also be worn.

Only those employees directly involved with the decontamination efforts will be allowed in the work area while cleaning is taking place.

All cleaning equipment will be disinfected or disposed of in accordance with this program.

For minor injuries where the employee is able to return to work, the injured employee will clean up his/her own blood, or other potentially infectious materials.

2.6.12.5 Housekeeping and Waste Disposal

The work site will be maintained in a clean and sanitary condition, to prevent the spread of contamination to other areas of the facility. All equipment and working surfaces will be cleaned and decontaminated after contact with blood or other potentially infectious materials. Contaminated work surfaces and equipment will be decontaminated with an appropriate disinfectant immediately after they become contaminated, in accordance with the decontamination section of this program. Regulated waste, other than contaminated sharps, will be placed in containers which are; closable, constructed to contain all contents and prevent leakage, properly labeled or color-coded, and closed prior to removal or replacement. Labels or color-coding will be fluorescent orange or orange-red, and display the biohazard symbol in a contrasting color.

Regulated waste containing contaminated sharps will be placed in containers that are; closable, puncture resistant and leak proof on sides and bottom, properly labeled or color-coded, and closed prior to removal or replacement. Contaminated clothing, equipment, and other materials will be handled as little as

possible and with minimum agitation. Bags containing contaminated materials will not be carried or handled from the bottom. All regulated waste will be disposed of in accordance with applicable Federal, state, and local regulations.

2.7 HAZARD MITIGATION

2.7.1 IMPLEMENTATION OF ENGINEERING CONTROLS AND WORK PRACTICES

Training in site procedures and the use of site equipment can prevent accidents from occurring. Training in recognition of MEC or MEC pieces that could be hazardous will be given to all site workers. MEC will not be disturbed.

2.7.2 UPGRADES/DOWNGRADES IN LEVELS OF PERSONAL PROTECTIVE EQUIPMENT

Because of the types of hazards at this site, Level D PPE will be required. This type of PPE is used for levels of contamination that may present a nuisance, but not an identifiable hazard. Level D PPE consists of safety glasses or goggles, hearing protection (as required), canvas or dive gloves for snorkelers or for the boat crew during towing operations, and close-toed, rubber-soled footwear while on the boat and a personal flotation device while in transit to and from the work site. The hearing protection will be worn only in if the noise from the boat's motor or generator reach hazardous levels. A cap will be worn to provide protection from the sun. If site hazards are encountered that require additional PPE, the PPE level can be increased by the UXOQCS/UXOSO or CHSM, who would base the decision on documented evidence of the hazards. If the site is not as hazardous as originally anticipated, the level of PPE can be downgraded by the CHSM. This decision would also be based on definitive data that confirms the PPE can be lessened. Normally, downgrading of PPE would require at least a week's worth of data demonstrating that the site is not as hazardous as originally suspected.

For snorkeling and SCUBA operations, equipment will include: Snorkel, fins, and masks and SCUBA equipment. See the Dive Operations Plan at Appendix L for additional information.

2.7.3 WORK STOPPAGE AND/OR EMERGENCY EVACUATION OF ON-SITE PERSONNEL

All personnel are trained to be constantly aware of their work environment. Anyone has the ability to stop operations for safety reasons. No worker is expected to perform any operation for which he has not been properly trained, or to perform any operation that is considered to be unsafe. After operations are stopped for safety reasons, the UXOQCS/UXOSO will be notified and will evaluate the situation. The UXOQCS/UXOSO will, in consultation with the CHSM, determine what steps need to be taken to make the situation safe for operations to continue.

In the event of an emergency that requires evacuation of the site, verbal instruction will be given by the UXOQCS/UXOSO to evacuate the area. Personnel will assemble in the boat, and the boat will head for the docking area. After evacuation, the UXOQCS/UXOSO will account for all personnel, ascertain information about the emergency, contact and advise responding emergency personnel. The UXOQCS/UXOSO will coordinate with responding off-site emergency personnel to meet the boat at the dock if deemed necessary by the situation.

Potentially hazardous weather conditions will be closely monitored by the UXOQCS/UXOSO. The UXOQCS/UXOSO will determine if high wind or heavy rain or hazardous sea conditions pose a hazard to site operations, in which case, personnel will assemble in the boat, all personnel will be accounted for, and the boat will return to the dock, where personnel will wait for conditions to clear or for further instructions from the UXOQCS/UXOSO.

In all situations that require evacuation, personnel shall not re-enter the work area until the following conditions have been met.

- The conditions causing the emergency have been corrected
- The hazard has been reassessed
- The SSHP has been revised and reviewed with on-site personnel, if needed
- Instructions have been given for authorized re-entry by the UXOQCS/UXOSO.

After the emergency situation has been controlled and eliminated, or has passed the Project Manager, UXOQCS/UXOSO, and CHSM will review the way the emergency was handled and change/update procedures if necessary.

2.7.4 PREVENTION AND/OR MINIMIZATION OF PUBLIC EXPOSURE TO HAZARDS CREATED BY SITE ACTIVITIES

The training of all site workers in the hazards and recognition of MEC will reduce the potential for public exposure to hazards. Any worker observing MEC or pieces of MEC will not touch or handle it in any way. If unauthorized personnel are observed in the work area, all operations will cease until the area is cleared of unauthorized personnel.

3.0 STAFF ORGANIZATION, QUALIFICATIONS, AND RESPONSIBILITIES

Chapter 2 of the WP provides detail on the project team, qualifications, and responsibilities of the different organizations and staff involved in this project. Figure 2.1 of the WP shows the organizational structure of the team. Additional requirements are provided below for the PM, CHSM, and SSHO.

3.1 PROJECT MANAGER

The Parsons PM is responsible for all project personnel to include subcontractors and designates safety duties to the on-site personnel.

3.2 CORPORATE HEALTH AND SAFETY MANAGER

The CHSM must be a Certified Industrial Hygienist (CIH), Certified Safety Professional (CSP), or Certified Health Physicist (CHP), dependent upon the contaminant-related hazards on the project. The CHSM will have 3 years of experience managing safety and occupational health at hazardous waste site cleanup operations. The CHSM will enlist the support of safety and occupational health professionals with appropriate education and experience when working on sites with multiple hazards. The CHSM responsibilities include the following:

- Develop, maintain, and oversee implementation of the SSHP.
- Visit the project site as needed to audit the effectiveness of the SSHP.
- Remain available for project emergencies.
- Develop modifications to the SSHP as needed.
- Evaluate occupational exposure monitoring data/air-sampling data and adjust the SSHP requirements as necessary.
- Serve as a QC staff member.
- Approve the SSHP by signature.

3.3 SITE SAFETY AND HEALTH OFFICER

At a minimum, the SSHO will have completed the 30-hour OSHA construction safety class. The SSHO will have at least one year of experience implementing safety and occupational health procedures at cleanup operations and have the training and experience to select and adjust PPE. A UXOSO who meets these qualifications may also serve as the SSHO. The training and experience criteria of the SSHO will be documented in writing and filed on-site. The SSHO will:

- Be present during operations to implement the SSHP.
- Inspect site activities to identify safety and occupational health deficiencies and correct them.
- Be responsible for managing, implementing and enforcing the Parsons' Safety and Health Program in accordance with the APP.
- Coordinate changes and modifications to the SSHP with the PSHO, SM, and Contracting Officer.
- Conduct site-specific training.

3.4 REVIEW AND CONCURRENCE

A UXO qualified individual meeting the personnel qualification requirements for a UXOSO shall review the APP and SSHP and sign their concurrence with the PSHO.

4.0 TRAINING

Training is discussed in Section D.10 of the APP.

5.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

The PPE Program for the site is described in Section D.15 of the APP.

6.0 MEDICAL SURVEILLANCE

Medical surveillance of employees will be conducted in accordance with the requirements of the Occupational Safety and Health Administration (OSHA) 29 Code of Federal Regulations (CFR) 1910.120(f), 29 CFR 1910.134(b)(10) and other established guidelines. Personnel to be included in the Medical Surveillance Program will be those who perform hazardous waste operations that may potentially expose the worker to hazardous substances or other significant safety and health threats. All personnel on the project site will participate in the Medical Surveillance Program. Visitors desiring entry into the work area must participate in their employer's Medical Surveillance Program and must have a current physician's statement prior to entry.

6.1 BASELINE HEALTH ASSESSMENT PHYSICAL OR ANNUAL PHYSICAL

A baseline health assessment physical or annual physical will be conducted prior to participating in site operations, to determine the worker's ability to perform hazardous waste operations in a safe and healthful manner. The PM, in conjunction with the CHSM, will ensure that all health assessments address the site-specific health hazards to which workers may be exposed.

Physicals will be scheduled through the CHSM, who will contract the services of a board certified occupational medicine physician in the vicinity of the employee's home or job site. The designated physician will perform the medical assessments and review medical examination results to determine each worker's ability to perform his assigned hazardous waste duties. The physician will also be responsible for determining if supplemental or follow-up examinations are required, and for maintaining medical and exposure records in accordance with OSHA 29 CFR 1910.120(d).

The purpose of the Medical Surveillance Program is to:

- Assess the individual's health status prior to participation in hazardous waste operations
- Determine the individual's ability to perform work assignments that require the use of PPE
- Establish baseline data for comparison to future medical data in order to provide a means of monitoring a worker's health status
- Establish facilities and procedures for emergency and non-emergency medical treatment
- Establish procedures for maintenance and storage of medical and exposure records

The following information is provided to the examining physician:

- Description of the employee's duties
- Anticipated hazardous exposures and levels
- Description of the PPE commonly used
- Information from previous medical exams

The medical surveillance provided to the employees includes a judgment by the medical examiner of the ability of the employee to use either positive or negative pressure respiratory equipment in accordance with 29 CFR 1910.134. Any employee found to have a medical condition that could directly or indirectly be aggravated by exposure to chemical substances or by the use of respiratory equipment will not be employed for the project requiring clearance under the Respiratory Protection Program. A copy of the medical examination is provided at the employee's request.

The employee will be informed of any medical conditions that would result in work restriction or that would prevent him or her from working at hazardous waste sites.

Parsons and its subcontractors will certify that all their employees have successfully completed a physical examination by a qualified occupational health physician and will supply certification of medical clearance for each on-site employee. All divers will have a current dive physical.

6.2 PHYSICIAN'S STATEMENT

The results of this examination will be made available to the employee and a written physician's statement will be sent to the employer (Parsons or USA). A copy of the physician's statement will be kept in each employee's file at the project site for the duration of site operations. The physician's statement will include the following information:

- The physician's opinion regarding any conditions that would place the employee at an increased risk from working in hazardous waste operations
- The physician's recommended limitations upon the employee's assigned work, if any
- A statement that the employee has been informed by the physician of the results of the examination, and any conditions that may require further examination or treatment.

6.3 SUPPLEMENTAL EXAMINATION

Any site worker who has: been injured; received health impairment; developed signs or symptoms from possible over-exposure; or received a documented over-exposure without the use of respiratory protection, will undergo a supplemental examination. The contents of this examination will be based upon the type of injury, illness, signs or symptoms of exposure involved and will be determined by the physician. Prior to reassignment to site activities, the physician will certify that the employee is fit to return to work. If necessary, the physician will specify in writing any activity restrictions or additional tests that may be required.

6.4 FOLLOW-UP HEALTH ASSESSMENTS

If, during any pre-assignment, annual or supplemental examination, a condition is detected that requires follow-up tests, the physician will notify the employer (Parsons or USA whichever is applicable) and the employee as to the nature of the follow-up health assessment. The physician will determine the schedule and content of the follow-up health assessment. A statement outlining the employee's fitness for work will be provided to USA and the employee upon conclusion of the follow-up health assessment.

6.5 EMERGENCY AND NON-EMERGENCY MEDICAL TREATMENT

Parsons/USA will have at least two personnel on site who are certified in First Aid/Cardiopulmonary Resuscitation (CPR). They will act as First Responders to any accidental injury or illness. The UXOQCS/UXOSO will be contacted whenever an incident occurs. The UXOQCS/UXOSO will summon the First Responders, who will handle any first aid cases, or will stabilize the victim until professional medical assistance arrives. If professional medical assistance is required, the UXOQCS/UXOSO will ask the Captain to return to the nearest safe harbor and summon the ambulance to meet the boat at the dock and take the victim to the nearest hospital for treatment, which is the Culebra Health Clinic.

The nearest hospital and a map with directions from the sites to the hospital are included in the APP in Attachment 3. The map and directions, as well as the emergency telephone numbers, will be kept in each site vehicle and with each telephone and radio. Emergency equipment will also be kept in each site vehicle and boat, to include a first aid kit, a blood-borne pathogens kit, and emergency eyewash kit.

6.6 MEDICAL RESTRICTION

Should an occupational injury or illness occur that restricts an employee's ability to function at full capacity, Parsons and USA maintain a policy of providing these employees with restricted duty assignments whenever possible to allow them to continue to be productive.

6.7 RECORDKEEPING

Parsons will retain and maintain copies of all physician statements, exposure records, and associated information for employees involved in hazardous waste operations, in accordance with the requirements of 29 CFR 1910.120(f). These records will be kept at the project site for the duration of site operations. When the site work is complete, the records will be retained by their employer (Parsons or USA) at the Corporate Office. Examining physicians will be responsible for maintaining records related to laboratory analyses and other tests for each employee examined. All records, whether maintained by Parsons or USA or by the examining physician, will be kept on file for a period of 30 years beyond an employee's termination.

7.0 EXPOSURE MONITORING/AIR SAMPLING PROGRAM

Air monitoring is not expected to be required, as no significant exposure to hazardous chemicals at these sites is expected. Noise in excess of the action level is not expected to occur, but could potentially occur due to the boat's motor and generator operations. If so, noise monitoring will be conducted. Workers on this site will normally be in Level D PPE; however, heat stress monitoring is likely if work occurs during times when the temperature reaches 75 ºF or higher. Heat stress monitoring is addressed in paragraph 2.4.3.4 above.

7.1 METEOROLOGICAL MONITORING

Rain can constitute a safety hazard to field operations at this site. The UXOQCS/UXOSO will be responsible for monitoring the weather closely. If an area becomes wet, muddy, or slippery such that an unacceptable level of risk exists for personnel who are working in proximity to MEC items and on the water, then site operations will cease until the UXOSO determines the area as safe to continue.

No site operations will take place if an electrical storm is within 10 miles of the site. An electrical storm detection device will be used to determine if an electrical storm is approaching. Site operations will cease when an electrical storm is within 10 miles of the site, and will not resume again until the UXOQCS/UXOSO determines that the electrical storm is at least 10 miles away from the site. When an electrical storm is approaching, personnel will assemble on the boat and travel to the nearest safe harbor for shelter until the storm has passed and the UXOQCS/UXOSO has determined it is safe to resume operations.

7.2 PERIMETER MONITORING

No perimeter monitoring of operations will be required on this site.

8.0 HEAT STRESS

See Section 2.4.3 above for mitigation measures related to heat stress.

9.0 STANDARD OPERATING SAFETY PROCEDURES, ENGINEERING CONTROLS, AND WORK PRACTICES

Using common sense and following safe practices can reduce hazards. Personnel must keep the prudent guidelines listed below in mind when conducting field activities.

- Hazard assessment is a continuous process. Personnel must be aware of their surroundings and constantly be aware of MEC, chemical, and physical hazards that are or may be present.
- The number of personnel in the work area will be the minimum number necessary to perform work tasks in a safe and efficient manner.
- Team members will be familiar with the boat and the site, including wind direction and the location of communication devices and safety/emergency equipment.
- Site personnel are to report any other unusual or potentially hazardous condition to the UXOQCS/UXOSO for investigation and/or corrective action.

9.1 SITE RULES/PROHIBITIONS

All personnel on site will be required to follow the safe work practices contained in this Plan, as they relate to the hazards encountered during site activities. All site personnel will be required to read, understand, and comply with the provisions of this SSHP. If new tasks or hazards are identified during site operations, which pose additional hazards, the SSHP will be amended by the CHSM to include additional safe work practices and other control methods, as needed.

9.1.1 SAFE PRACTICES

Safe practices can reduce hazards associated with normal site activities. Personnel must keep the prudent guidelines listed below in mind when conducting field activities. General personnel requirements include the following:

- Horseplay or fighting is prohibited.
- Climbing on or over obstacles is prohibited. Stacks of materials can be unstable and could cause injury.
- Open flames of any type are prohibited.
- Bringing defective or unsafe equipment on site is prohibited.

Only authorized employees may enter the boat and travel to the work site. Visitors must check in with the UXOQCS/UXOSO and receive an appropriate safety briefing.

9.1.2 BUDDY SYSTEM

The buddy system is a safety practice in which each individual is concerned with the health and well being of co-workers. The buddy system will be implemented during all on-site activities and will be incorporated when workers may be isolated or as determined by the UXOSO. The UXOSO will assign "buddies" to ensure accounting of all site personnel. The following additional procedures will be implemented.

- At no time will an individual desert his "buddy" unless his "buddy" goes down, and it is considered too hazardous to render assistance. "Buddies" will enter and exit the work area together and frequently monitor one another for signs of fatigue, heat stress, cold stress, and any other problems. In such cases, the worker in danger may not be aware he/she is having a problem. The "buddy" must always be alert to changes in the behavior of his "buddy" so that he can remove him/her from the situation immediately.
- "Buddies" should frequently inspect each other's equipment, including PPE, to ensure that it is adequate and in proper working order.

9.2 WORK PERMIT REQUIREMENTS

At this time, permits for the work associated with this project are not anticipated. There are no requirements for hot work (welding), excavations, or confined spaces, so permitting will not be required.

9.3 MATERIAL HANDLING PROCEDURES

Many types of objects are handled in normal day-to-day operations. Care will be taken and training will be provided to all personnel for lifting and handling heavy or bulky items, as this is the cause of many joint and back injuries. The following fundamentals address the proper lifting of materials to avoid joint and back injuries.

- The size, shape, and weight of the object to be lifted must be considered. Site personnel will not lift more than they can handle comfortably.
- A firm grip on the object is essential; therefore, the hands and object will be free of oil, grease, and water, which might prevent a firm grip.
- The hands, and especially the fingers, will be kept away from any points that may cause them to be pinched or crushed, especially when setting the object down.
- The item will be inspected for metal slivers, jagged edges, burrs, rough or slippery surfaces, and pinch points, and gloves will be used, if necessary, to protect the hands.
- The feet will be placed far enough apart for good balance and stability.
- Personnel will ensure that solid footing is available prior to lifting the object.
- When lifting, get as close to the load as possible, bend the legs at the knees, making sure that the back is kept as straight as possible.
- To lift the object, the legs are straightened from their bending position.
- Never carry a load that cannot be seen over or around.
- When placing an object down, the stance and position are identical to that for lifting, with the back kept straight, the legs bent at the knees, and the object lowered.
- If the item to be lifted is too large, bulky, or heavy (over 50 lb) for one person to safely lift, ask a co-worker for assistance. If a piece of material handling equipment is available that can do the job, the employee should use the equipment instead of trying to lift the object himself/herself.
- When two or more people are required to handle an object, coordination is essential to ensure that the load is lifted uniformly and that the weight is equally divided between the individuals carrying the load. When carrying the object, each person, if possible, will face the direction in which the object is being carried.

Major spills are not expected on this site. Hazardous materials, where necessary, are being brought to the site in small quantity containers. This will minimize the amount of material involved, should a spill occur, as well as reduce the amount of hazardous material on hand to the minimum amount consistent with efficient operations. Hazardous materials anticipated for use on this project would be fuels and lubricants for equipment. If a small amount of liquid hazardous material is spilled, it will be cleaned up with absorbent material by site personnel wearing appropriate chemical-resistant gloves. It will then be containerized, labeled, and sent for disposal at an approved facility.

9.4 DRUM, CONTAINER, AND TANK HANDLING

Drum, container, and tank handling are not anticipated under this PWS.

9.5 COMPREHENSIVE ACTIVITY HAZARD ANALYSIS OF TREATMENT TECHNOLOGIES

Treatment technologies are not expected to be used on this project.

10.0 SITE CONTROL MEASURES

Site control measures are used to prevent or minimize the potential for site hazards. The site control measures, as well as all requirements of this SSHP, are mandatory for all personnel working on this project site. Authorized Government personnel will undergo the mobilization training, along with all field personnel and any subcontractors who may be required to work on this project, which includes a briefing in all of the requirements of this SSHP. All personnel receiving this training must sign a statement that they were trained and fully understand the requirements of this SSHP.

10.1 SITE MAP

A site map will be utilized by the UXOQCS/UXOSO during the Tailgate Safety Briefing to inform the workers of the location of hazardous areas on the site, the assembly areas (safe harbors) to be used in the event of site evacuation, and any other information relevant to the day's activities. The site map of each particular site will be provided in an Addendum to this SSHP. The site map will include the following information:

- Site work zones
- Location of unusual/hazardous areas
- Prevailing winds
- Ingress and egress corridors
- Evacuation routes and assembly points
- Location of emergency supplies.

10.2 WORK AREA DELINEATION AND ACCESS POINTS

Site work areas will be established by the UXOQCS/UXOSO prior to initiating operations to control site access. Establishment of site work areas are based upon site, activities, and exposure potentials. A site work area will be set up, which includes the footprint of the area where work will take place.

10.3 SITE ACCESS CONTROL

The UXOQCS/UXOSO will control access to each work area and will ensure that all site workers and visitors have received the proper training and medical surveillance required to enter a specific area. Access will be denied to any potential entrant not meeting these requirements. The site work areas are the specific areas where the Phase 2 and 3 operations will take place. Should unauthorized entry to the site occur by other vessels, they will be directed to leave the area.

Site access control will be implemented by Parsons and will be accomplished through a program that limits movement and activities of people and equipment at the project site. This control will be based on site-specific characteristics, to include:

- Expected weather conditions
- Planned site activities.

The degree of site access control will include the following.

- Escort of visitors – Visitors will be briefed on site hazards, PPE requirements, and emergency procedures.
- PPE requirements – PPE requirements have been established based on the site hazards. Personnel working in areas requiring PPE will wear required PPE for the duration of the operation. Visitors to the area will be required to have the required PPE for the area they will be visiting.

10.4 ON- AND OFF-SITE COMMUNICATION SYSTEM

On-site communication will generally be verbal, as most personnel will be working on the boat. There will also be an alarm signal used to summon divers/snorkelers to the boat for the purposes of site evacuation. Communications systems will also be established with divers/snorkeling teams to signal them to return to the boat for an evacuation of the site, if required.

Off-site communication will be by Puerto Rican cellular telephone and radio. Cellular telephones from the U.S. mainland will not work in this location.

11.0 PERSONNEL HYGIENE AND DECONTAMINATION

Sanitation facilities will be provided on the boat so that employees can wash prior to eating, drinking, smoking, or engaging in any other hand-to-face activities. Paper towels will be provided for drying. A trash receptacle will be provided for discarded paper towels. An eyewash kit will be located in each site vehicle, and with the First Aid kit on the boat. As chemical contamination is not expected to be an issue at this site, basic washing of equipment and standard hygiene practices are the minimum requirements. Site sanitation will be established and maintained in accordance with OSHA 29 CFR 1910.120(n) and USACE EM 385-1-1, Section 2.

General work practices include the following:

- Safe work practices will be implemented when possible to eliminate or reduce the potential for employee exposure.
- Employees will wash their hands immediately or as soon as feasible after removal of gloves or other PPE.
- Employees will wash hands and any other skin with soap and water, or flush mucous membranes with water immediately following contact with blood or potentially infectious materials.
- Eating, drinking, smoking, applying cosmetics or lip balm, handling of contact lenses, or storage/handling of food are prohibited in all areas where potentially infectious materials are present.
- Equipment that has become contaminated will be decontaminated prior to servicing or storage, unless decontamination is not feasible, in which case the equipment will be disposed of properly.

12.0 EQUIPMENT DECONTAMINATION

Because chemical contamination is not anticipated at this site, basic washing of equipment is all that will be required.

13.0 EMERGENCY EQUIPMENT AND FIRST AID

Emergency equipment will be maintained on site for the duration of site operations. An approved emergency first aid kit, blood-borne pathogen kit, and eyewash kit will be kept in each site vehicle, and on the boat. First aid kits are assigned by the UXOQCS/UXOSO. The UXOQCS/UXOSO will be charged with providing regular inspections of the emergency supplies, replacing any items that are used, and maintaining readiness.

A 1-A:10-B:C fire extinguisher will be kept in each field vehicle and two will be kept on the boat for emergency use. This equipment will be inspected on a weekly basis to ensure it is maintained and ready to use. Any used items will be replaced immediately.

Fire extinguishers will be stored where they are well marked and readily accessible. Fire extinguishers shall be protected from the damaging effects of environmental elements. The UXOQCS/UXOSO is responsible for ensuring that all fire extinguishers are visually inspected weekly and that these inspections are documented. All site personnel will be familiar with the locations of fire extinguishers and will be trained in their use.

14.0 EMERGENCY RESPONSE AND CONTINGENCY PROCEDURES

The Emergency Response Plan and contingency procedures address emergencies that could occur during site operations, and outline the appropriate response actions. This information can be found in Section 16.2, Emergency Response Plan, of the APP and under Section 15, Emergency Response Plan, below.

15.0 EMERGENCY RESPONSE PLAN

15.1 POTENTIAL SITE EMERGENCIES

There are several emergencies which could reasonably be anticipated during project activities, including:

- Thermal stress
- Worker injuries; slips, trips, or falls; and/or illness
- Employees falling overboard or drowning
- Fires and explosions
- Diving related illnesses

15.2 PRE-EMERGENCY PLANNING

Pre-emergency planning is covered in Section 16.2 of the APP.

15.3 PERSONNEL ROLES, LINES OF AUTHORITY, TRAINING, AND COMMUNICATION

In the event of an emergency, the UXOQCS/UXOSO will be designated as the On-Scene Incident Commander and will have the overall responsibility for implementation of the ERPCP and coordination with responding off-site emergency services. In the event of a medical emergency, the UXOQCS/UXOSO will summon site personnel which will be the first responders to assist the victim. The UXOQCS/UXOSO will make the determination as to whether professional medical assistance is required and will direct the boat to return to the closest safe harbor, and will summon the ambulance to meet the boat at the pier, if required. The UXOQCS/UXOSO may also direct personnel to assist the emergency rescue personnel.

Specific responsibilities of the UXOQCS/UXOSO include, but are not limited to, the following:

- Notifying local police, fire department, and other off-site emergency units, as required
- Notifying the SUXOS, and providing updates as conditions change. (The SUXOS will notify the Project Manager, who will be responsible for informing the Corps of Engineers Contracting Officer and Project Manager.)
- Directing off-site emergency response personnel to the scene and providing assistance
- Site control
- Completing any follow-up reports
- Rescuing personnel
- Accounting for all site personnel and visitors
- Providing emergency first aid
- Preventing further injury of personnel
- Providing current status of the incident to the CHSM
- Ensuring that on-site emergency response personnel don the proper PPE, if needed
- Assisting on-site emergency response personnel with treatment and transport of sick/injured
- Providing medical background information on the sick/injured, and applicable site health and safety information, to the off-site emergency medical responders
- Accompanying sick/injured personnel to the hospital.

If the emergency involves employee injury, the UXOQCS/UXOSO will complete the Accident Report. The CHSM will be responsible for notifying applicable Federal, state, and local authorities/agencies. Once the emergency has been resolved, the UXOQCS/UXOSO, Project Manager, and CHSM will conduct a follow-up investigation and critique. Actions will be taken to prevent recurrence.

All RI field personnel and visitors will be responsible for:

- Reporting any site emergencies to the SUXOS or UXOQCS/UXOSO
- Knowing the emergency response procedures, including correct usage of fire extinguishers
- Assisting emergency response personnel, as requested.

In the event of an evacuation of the project site, the Captain of the boat will proceed to the nearest safe harbor, where all personnel will assemble for further instructions.

15.4 EMERGENCY RECOGNITION AND PREVENTION

An emergency is an unplanned event that threatens the safety of any personnel. Compliance with this APP can assist in the prevention of anticipated site emergencies. These emergency situations can easily be recognized by visual observations, worker complaints, or monitoring instruments.

Prevention of emergencies will be aided by the effective implementation of this APP and its accompanying SSHP, personnel awareness, contingency planning, and on-site safety meetings. Anticipated emergencies may include physical injury, illness, fire, explosion, chemical spill or release, inclement weather, and natural disasters. The UXOQCS/UXOSO will use the site-specific briefing and/or the Tailgate Safety Briefings to inform site workers of the recognition, prevention, and response procedures for each anticipated emergency.

15.5 SAFE DISTANCES AND PLACES OF REFUGE

The UXOQCS/UXOSO will determine safe distances and places of refuge. Prior to the start of each work day, the UXOQCS/UXOSO or SUXOS (as applicable) will hold a safety meeting with all personnel and discuss the following:

- Evacuation routes from work areas
- The assembly point to be used in the event of an emergency
- Locations of the nearest fire extinguishers and spill containment equipment
- Discussion of specific health and safety concerns of personnel.

15.6 SITE SECURITY AND CONTROL

See Section 10 of this SSHP.

15.7 EVACUATION ROUTES AND PROCEDURES

The UXOQCS/UXOSO will establish evacuation routes. Evacuation notification will be direct verbal communication. If evacuation is necessary, all personnel are to:

- Gather equipment to the extent safely possible
- The boat will prepare to move to the nearest safe harbor.

15.8 DECONTAMINATION

It is not anticipated that hazardous waste decontamination will be required during any activities under the PWS. This determination has been made based upon available knowledge of past activities conducted at the site and the type of work taking place. Basic cleaning and disinfection is all that will be required prior to most types of treatment. If a worker is accidentally injured using chemicals brought onto the site, the first aid procedures described in the SDS are followed by the First Responders to clean as much of the chemical off as possible before treatment. The SDS is taken with the victim to the medical treatment facility for treatment.

15.9 EMERGENCY MEDICAL TREATMENT AND FIRST AID

Any person(s) who become ill or injured during work activities must immediately inform the UXOQCS/UXOSO regardless of the severity of the illness or injury. The victim(s) will be assisted by the First Responders, at the direction of the UXOQCS/UXOSO. The UXOQCS/UXOSO will make the determination if professional medical assistance is required, and will summon the ambulance if necessary, asking the ambulance to meet the boat at the nearest safe harbor.

If the medical emergency is not severe, the victim will be treated on-site by the First Responders, with additional treatment at the medical treatment facility, if required. If the medical emergency is serious, the boat will transport the victim to the pier and the victim will be brought via ambulance (air or ground) to the medical treatment facility for treatment.

15.9.1.1 Emergency Medical Facilities

For most anticipated types of on-site injuries, site personnel will report to the UXOQCS/UXOSO, who will have the First Responders examine the injury and provide first aid treatment. In cases of more serious injuries or illnesses, the victim will still report to the UXOQCS/UXOSO, or the UXOQCS/UXOSO will come to the victim, and will examine the victim and determine if further medical treatment is indicated. If required, the UXOQCS/UXOSO will ask the Captain of the boat to head back to the dock and summon an ambulance to meet the boat at the pier, to transport the victim to the nearest hospital. Diving related injuries or illness will be reported immediately to the Diving Supervisor; this includes if symptoms present themselves after working hours.

The nearest medical treatment facility is the Culebra Health Clinic at (787) 742-3511. See Attachment 3 of this APP for directions to the medical treatment facility.

The nearest recompression chamber is the Puerto Rico Medical Center, Centro Medico, San Juan, Puerto Rico. The alternate chamber is Schneider Regional Medical Center, St. Thomas, Virgin Islands.

15.10 EMERGENCY ALERTING AND RESPONSE PROCEDURES

In the event of an emergency, site personnel will be notified by either an alarm or verbal communication. Personnel will be notified to:

- Stop work activities
- Begin emergency procedures
- Notify off-site emergency response organizations.

After evacuation, the UXOQCS/UXOSO will account for all personnel, ascertain information about the emergency, and advise responding on-site personnel. The UXOQCS/UXOSO will contact, advise, and coordinate with responding off-site emergency personnel, if deemed necessary by the situation.

In all situations that require evacuation, personnel will not re-enter the work area until:

- The conditions causing the emergency have been corrected
- The hazard has been reassessed
- The SSHP has been revised and reviewed with on-site personnel, if needed
- Instructions have been given for authorized re-entry by the UXOQCS/UXOSO.

15.11 SAFETY DATA SHEETS

As part of the Hazard Communication Program, an SDS binder will be maintained on site, which includes copies of SDSs for all hazardous materials brought onto the site. It will be kept at the project site during operations. This SDS binder will be available on request to all site personnel during all working hours of the site. If site workers have further questions about any of the hazardous materials they come into contact with, the UXOQCS/UXOSO or the CHSM will locate the required information and pass it on to the employee. If an employee is injured as a result of exposure to a chemical on site, that SDS will be retrieved and given to the medical providers. SDSs for chemicals expected to be used on this site are included as Attachment 5 to this APP; however, if additional materials are purchased for use on the site, these MSDSs will be added to the site SDS binder.

Chemical Inventory sheets will be prepared by the UXOQCS/UXOSO after mobilization to the site, and will be maintained on site for the duration of project activities. As chemicals are brought to the site, or are used, the inventory will be updated accordingly.

15.12 CRITIQUE OF RESPONSE AND FOLLOW-UP

After the emergency situation has been controlled and eliminated, or has passed, the Project Manager, UXOQCS/UXOSO, and CHSM will review the way the emergency was handled and change procedures if necessary.

15.13 PERSONAL PROTECTIVE EQUIPMENT

See Section D.15 of the APP.

16.0 EMERGENCY RESPONSE TEAM

In the event of an accident, the following parties will have the responsibilities detailed below.

16.1 RESPONSIBILITIES

- Locate all victims, assess their conditions, and make an on-scene determination of the resources needed to stabilize and transport.
- Request emergency response by outside agencies, if required.

- Assess the situation and determine the existing hazards, potential for additional hazards, and need for additional response. Supervisors must ensure the hazardous condition is stabilized, eliminated, or permanently fixed. If personnel or properties are jeopardized, a determination must be made to alert the local community.
- Remove injured personnel from the area.

16.2 UXOQCS/UXOSO

The overall responsibility during emergencies rests with the UXOQCS/UXOSO. In case of emergency, the UXOQCS/UXOSO will implement the site emergency procedures. The UXOQCS/UXOSO is specifically responsible for the following:

- Implementing the site Emergency Response Plan, including ordering site evacuations, coordinating firefighting efforts, and directing spill control and cleanup.
- Supervising site evacuation and decontamination procedures.
- Contacting emergency services such as the fire department, ambulance and security services, as may be required as requested by the Emergency Rescue Team.
- Assisting in providing first aid services and medical support or evacuation for injured or exposed personnel.
- Determining the cause of the incident and ways to prevent future occurrences.
- Preparing a written incident report for submission to the CESAJ and USAESCH Project Managers.

16.3 ALL ONSITE PERSONNEL

Onsite personnel are responsible for reporting emergencies immediately to their supervisors, alerting other employees, helping injured personnel, and assisting as directed to mitigate the incident.

16.4 EMERGENCY TRAINING

Prior to initiating the field operations, the following training will occur under the direction of the UXOQCS/UXOSO and CHSM:

- Hazard communication;
- Emergency procedures;
- MEC-specific health and safety; and
- Donning/Doffing of PPE

Training in emergency procedures will be accomplished by performing drills. After any drill or real emergency scenario, the Project Manager, CHSM, and UXOQCS/UXOSO will evaluate the situation and determine any potential areas for improvement in the procedures. Procedures will be updated accordingly.

17.0 CONFINED SPACE ENTRY

Because of the nature of this PWS, confined spaces are not expected to be an issue on these sites.

18.0 LOGS, RECORDKEEPING, AND REPORTS

Parson will perform and document safety inspections, as well as maintain a site visitor log. Personnel records will be kept on-site, with document medical surveillance and appropriate training certifications. In

addition, accident reports and site monitoring reports will also be maintained on-site. All site logs, documents, and records will be included in the final report.

18.1 RECORD KEEPING PROCEDURES

18.1.1 TRAINING LOGS

Each person on the site will have an individual file folder, which contains a copy of the following items:

- 40-hr HAZWOPER Certificate
- Current 8-hr HAZWOPER Annual Refresher Certificate
- 8-hr HAZWOPER Supervisor Certificate, if applicable
- EOD Training Certificate
- Diver training certificate
- Any other applicable training certificates.

Personnel folders will be maintained by the UXOSO on site for the duration of site activities. A Training/Tailgate Safety Briefing record will be completed for all on-site daily training. The UXOSO will maintain the file, which will be made available for the client as requested.

18.1.2 DAILY SAFETY INSPECTION LOGS

The UXOQCS/UXOSO will perform, and document daily and weekly, safety inspections of all site operations on a scheduled and non-scheduled basis. The UXOQCS/UXOSO will conduct non-scheduled safety and health inspections as deemed appropriate, based upon the ongoing site activities. Scheduled safety and health inspections will be conducted as outlined in

Table . When discrepancies are observed, follow-up will be documented in the UXOQCS/UXOSO log until the corrective actions required have been completed.

Table 4: Inspection Type and Frequency

Area	Frequency
Sanitation	Daily
Medical and First Aid	Daily
Temporary Facilities	Weekly
Personal Protective and Safety Equipment	Daily
Hazardous Substances, Agents, and Environments	Weekly
Lighting	Monthly
Accident Prevention Signs, Tags, Labels, and Signals and Piping System Identification	Monthly
Fire Prevention and Protection	Weekly
Hand and Power Tools	Daily, if applicable
Material Handling, Storage and Disposal	Weekly
Machinery and Mechanized Equipment	Daily, if applicable
Boat	Daily
Motor Vehicles	Daily
Safe Access and Fall Protection	Weekly, if applicable
HTRW	Daily, if applicable

18.1.3 VISITOR'S LOG

The Visitor's Log will be maintained by the UXOQCS/UXOSO and will document the visitor's name, company name, date, time, and reason for visit. There will also be documentation that the visitor was given a safety briefing prior to being permitted to enter the site.

18.1.4 MEDICAL SURVEILLANCE RECORDS AND CERTIFICATIONS

A copy of the Physician Statement from a licensed physician who is certified in Occupational Medicine by the American Board of Preventive Medicine, regarding the current annual HAZWOPER physical examination, will be maintained in the individual folder with the HAZWOPER certificates. The Physician Statements will remain in the individual's file on the project site for the duration of site operations.

18.1.5 ACCIDENT REPORTING RECORDS

Should an accident occur on the site, all reports and records will be documented. Copies will be maintained on-site for the duration of site activities. A permanent copy will be maintained in the Parsons corporate office.

18.1.6 SITE MONITORING RESULTS

All site monitoring results will be documented. These results will be kept in a file at the project site for reference, and will become a part of the permanent site record at the conclusion of site activities.

18.2 FINAL REPORT

Parsons will develop, retain, and submit, as part of the final report, all visitor registration logs, training logs, and daily safety inspection logs as part of the daily quality control reports.

APPENDIX D, ATTACHMENT 5
SAFETY DATA SHEETS

This attachment contains a copy of the following applicable Safety Data Sheets to be used on this project:

- Diesel Fuel #2
- Hydraulic Fluid
- Unleaded Gas.

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1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Material Identity
Product Name: DIESEL FUEL #2
General or Generic ID: HYDROCARBON

Company
The Valvoline Company
P.O. Box 14000
Lexington, KY 40512

Telephone Numbers
Emergency: 1-800-274-5263
Information: 1-859-357-7206

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2. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient(s)	CAS Number	% (by weight)
ALIPHATIC & AROMATIC HYDROCARBONS	68476-34-6	100.0

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3. HAZARDS IDENTIFICATION

Potential Health Effects

Eye
May cause mild eye irritation.

Skin
May cause mild skin irritation. Prolonged or repeated contact may dry and crack the skin. Passage of this material into the body through the skin is possible, but it is unlikely that this would result in harmful effects during safe handling and use.

Swallowing
Swallowing small amounts of this material during normal handling is not likely to cause harmful effects. This material can get into the lungs during swallowing or vomiting. This results in lung inflammation and other lung injury.

Inhalation
It is possible to breathe this material under certain conditions of handling and use (for example, during heating, spraying, or stirring). Breathing small amounts of this material during normal handling is not likely to cause harmful effects. Breathing large amounts may be harmful.

Symptoms of Exposure
Signs and symptoms of exposure to this material through breathing, swallowing, and/or passage of the material through the skin may include: stomach or intestinal upset (nausea, vomiting, diarrhea) irritation (nose, throat, airways), central nervous system depression (dizziness, drowsiness, weakness, fatigue, nausea, headache, unconsciousness), loss of coordination, liver damage.

Target Organ Effects

Exposure to this material (or a component) has been found to cause kidney damage in male rats. The mechanism by which this toxicity occurs is specific to the male rat and the kidney effects are not expected to occur in humans. Overexposure to this material (or its components) has been suggested as a cause of the following effects in laboratory animals, and may aggravate preexisting disorders of these organs in humans: anemia, lung damage.

Developmental Information

Based on the available information, risk to the fetus from maternal exposure to this material cannot be assessed.

Cancer Information

Diesel engine exhaust is listed as carcinogenic by the International Agency for Research on Cancer (IARC). Excess lung and bladder cancers have been reported in workers exposed to these emissions. In addition, exposure to diesel exhaust particulates is listed as carcinogenic by the National Toxicology Program. This product (or a component) is a petroleum-derived material. Similar materials and certain compounds occurring naturally in petroleum oils have been shown to cause skin cancer in laboratory animals following repeated exposure without washing or removal.

Other Health Effects

No data

Primary Route(s) of Entry

Inhalation, Skin absorption, Skin contact, Eye contact, Ingestion.

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4. FIRST AID MEASURES

Eyes

If symptoms develop, move individual away from exposure and into fresh air. Flush eyes gently with water while holding eyelids apart. If symptoms persist or there is any visual difficulty, seek medical attention.

Skin

Remove contaminated clothing. Wash exposed area with soap and water. If symptoms persist, seek medical attention. Launder clothing before reuse.

Swallowing

Seek medical attention. If individual is drowsy or unconscious, do not give anything by mouth; place individual on the left side with the head down. Contact a physician, medical facility, or poison control center for advice about whether to induce vomiting. If possible, do not leave individual unattended.

Inhalation

If symptoms develop, move individual away from exposure and into fresh air. If symptoms persist, seek medical attention. If breathing is difficult, administer oxygen. Keep person warm and quiet; seek immediate medical attention.

Note to Physicians

This material is an aspiration hazard. Potential danger from aspiration must be weighed against possible oral toxicity (See Section 3 - Swallowing) when deciding whether to induce vomiting. Preexisting disorders of the following organs (or organ systems) may be aggravated by exposure to this material: skin, lung (for

example, asthma-like conditions), liver, Exposure to this material may aggravate any pre-existing condition sensitive to a decrease in available oxygen, such as chronic lung disease, coronary artery disease or anemias.

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5. FIRE FIGHTING MEASURES

Flash Point
> 135.0 F (57.2 C)

Explosive Limit
No data

Autoignition Temperature
No data

Hazardous Products of Combustion
May form: carbon dioxide and carbon monoxide, various hydrocarbons.

Fire and Explosion Hazards
Vapors are heavier than air and may travel along the ground or be moved by ventilation and ignited by heat, pilot lights, other flames and ignition sources at locations distant from material handling point. Never use welding or cutting torch on or near drum (even empty) because product (even just residue) can ignite explosively.

Extinguishing Media
regular foam, carbon dioxide, dry chemical.

Fire Fighting Instructions
Water or foam may cause frothing which can be violent and possibly endanger the life of the firefighter. Wear a self-contained breathing apparatus with a full facepiece operated in the positive pressure demand mode with appropriate turn-out gear and chemical resistant personal protective equipment. Refer to the personal protective equipment section of this MSDS.

NFPA Rating
Health - 1, Flammability - 2, Reactivity - 0

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6. ACCIDENTAL RELEASE MEASURES

Small Spill
Eliminate all sources of ignition such as flares, flames (including pilot lights), and electrical sparks. Absorb liquid on vermiculite, floor absorbent or other absorbent material.

Large Spill
Eliminate all ignition sources(flares, flames, including pilot lights, electrical sparks). Persons not wearing protectivve equipment should be excluded from the area of the spill until clean-up has been completed. Contain spill to the smallest area possible. Dike area to prevent spreading. Prevent from entering drains, sewers, streams or other bodies of water. Recover as much of the product as possible by methods such as vacuuming and use of absorbant. Transfer contaminated absorbent, soil and other materials in proper containers for ultimate disposal.

7. HANDLING AND STORAGE

Handling

Containers of this material may be hazardous when emptied. Since emptied containers retain product residues (vapor, liquid, and/or solid), all hazard precautions given in the data sheet must be observed. All five gallon pails and larger metal containers including tank cars and tank trucks should be grounded and/or bonded when material is transferred.

Storage

Not applicable

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Eye Protection

Chemical splash goggles in compliance with OSHA regulations are advised; however, OSHA regulations also permit other type safety glasses. Consult your safety representative.

Skin Protection

Wear resistant gloves such as: neoprene, nitrile rubber, To prevent repeated or prolonged skin contact, wear impervious clothing and boots.

Respiratory Protections

If workplace exposure limit(s) of product or any component is exceeded (See Exposure Guidelines), a NIOSH/MSHA approved air supplied respirator is advised in absence of proper environmental control. OSHA regulations also permit other NIOSH/MSHA respirators (negative pressure type) under specified conditions (consult your industrial hygienist). Engineering or administrative controls should be implemented to reduce exposure.

Engineering Controls

Provide sufficient mechanical (general and/or local exhaust) ventilation to maintain exposure below TLV(s).

Exposure Guidelines

Component

ALIPHATIC & AROMATIC HYDROCARBONS (68476-34-6)
No exposure limits established

9. PHYSICAL AND CHEMICAL PROPERTIES

Boiling Point

(for product) 320.0 - 400.0 F (160.0 - 204.4 C) @ 760.00 mmHg

Vapor Pressure

(for product) < 1.000 mmHg @ 68.00 F

Specific Vapor Density

> 5.000 @ AIR=1

Specific Gravity
.876 @ 60.00 F

Liquid Density
7.296 lbs/gal @ 60.00 F
.876 kg/l @ 15.60 C

Percent Volatiles (Including Water)
No data

Evaporation Rate
SLOWER THAN ETHYL ETHER

Appearance
No data

State
LIQUID

Physical Form
HOMOGENEOUS SOLUTION

Color
RED, DYED LIQUID

Odor
No data

pH
Not applicable

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10. STABILITY AND REACTIVITY

Hazardous Polymerization
Product will not undergo hazardous polymerization.

Hazardous Decomposition
May form: carbon dioxide and carbon monoxide, various hydrocarbons.

Chemical Stability
Stable.

Incompatibility
Avoid contact with: strong oxidizing agents.

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11. TOXICOLOGICAL INFORMATION

Mutagenicity
This material (or a component) caused mutations in cells in culture and in laboratory animals. The relevance of this finding to human health is uncertain.

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12. ECOLOGICAL INFORMATION

No data

13. DISPOSAL CONSIDERATION

Waste Management Information

Dispose of in accordance with all applicable local, state and federal regulations.

14. TRANSPORT INFORMATION

DOT Information - 49 CFR 172.101

DOT Description:

Not Regulated

Container/Mode:

No data

NOS Component:

None

RQ (Reportable Quantity) - 49 CFR 172.101

Not applicable

15. REGULATORY INFORMATION

US Federal Regulations

TSCA (Toxic Substances Control Act) Status

TSCA (UNITED STATES) The intentional ingredients of this product are listed.

CERCLA RQ - 40 CFR 302.4

None

SARA 302 Components - 40 CFR 355 Appendix A

None

Section 311/312 Hazard Class - 40 CFR 370.2

Immediate(X) Delayed(X) Fire(X) Reactive( ) Sudden Release of Pressure( )

SARA 313 Components - 40 CFR 372.65

None

International Regulations

Inventory Status

AICS (AUSTRALIA) The intentional ingredients of this product are listed.
DSL (CANADA) The intentional ingredients of this product are listed.
ECL (SOUTH KOREA) The intentional ingredients of this product are listed.
EINECS (EUROPE) The intentional ingredients of this product are listed.
ENCS (JAPAN) The intentional ingredients of this product are listed.

State and Local Regulations

California Proposition 65

None

16. OTHER INFORMATION

The information accumulated herein is believed to be accurate but is not warranted to be whether originating with the company or not. Recipients are advised to confirm in advance of need that the information is current, applicable, and suitable to their circumstances.

Last page

MSDS
HYDRAULIC FLUID

*** IDENTIFICATION ***

MSDS RECORD NUMBER : 480541
PRODUCT NAME(S): HYDRAULIC FLUID
DATE OF MSDS : 1991-07-15
EMERGENCY TELEPHONE NO.:
303-623-5716 800-424-9300 (CHEMTREC)

*** MATERIAL SAFETY DATA ***

MATERIAL SAFETY DATA SHEET
307-766 REV. C
Issued: 8-30-91 Supersedes Rev., Dated: 6-18-86

SECTION I - PRODUCT IDENTIFICATION AND USE

PRODUCT IDENTIFIER HYDRAULIC FLUID

PRODUCT IDENTIFICATION NUMBER (PIN) UN

PRODUCT USE Hydraulic fluid used in hydraulic motors and hydraulic power supplies.

CHEMICAL NAME AND SYNONYMS
Industrial oils
CHEMICAL FAMILY Petroleum hydrocarbons

SECTION II - HAZARDOUS INGREDIENTS

HAZARDOUS INGREDIENTS & CAS # % BY WEIGHT EXPOSURE LIMITS

Petroleum hydrocarbon industrial mixture
100 NE
oil (CAS# Unavailable)
LD50 (SPECIES & ROUTE): NE
LC50 (SPECIES): NE
Oil mist, if generated (mineral)
5 mg/m3 (1, 2)
(CAS# 64742-65-0)
10 mg/m3 (3)
LD50 (SPECIES & ROUTE): NE
LC50 (SPECIES): NE

EXPLOSION DATA Heat from fire may cause

Sara (40 CFR 372), Title III, Section 313
Reportable Chemicals: None
Product does not meet classification criteria of WHMIS and is not a controlled product.
NOTES: (1) ACGIH TLV (TWA); (2) OSHA PEL (TWA); (3) ACGIH STEL; (4) OSHA STEL; (5) MFR./SUPPLIER TLV; c=Ceiling value LD50 Values are via Oral Route unless otherwise indicated.

SECTION III - PHYSICAL DATA

PHYSICAL STATE Liquid
VAPOR PRESSURE (mm Hg) NE
VAPOR DENSITY (Air=1) >1
% VOLATILE AT ROOM TEMP. DEG C Negligible
EVAPORATION RATE (N-BUTYL ACETATE=1) <1
APPEARANCE Clear, yellow
SOLUBILITY IN WATER Negligible
SPECIFIC GRAVITY (WATER=1) 0.88 - 0.89
BOILING POINT DEG C 316
FREEZING POINT DEG C NA
ODOR Characteristic petroleum odor
ODOR THRESHOLD NE
pH NA
COEFFICIENT OF WATER/OIL DISTRIBUTION NE
OTHER NA

SECTION IV - FIRE AND EXPLOSION DATA

FLAMMABLE YES [ ] NO [X]
IF YES, UNDER WHAT CONDITIONS? This material will burn, but will not readily ignite.
FLASH POINT DEG C (METHOD) 210 (COC)
UPPER FLAMMABLE LIMIT (%) NE
LOWER FLAMMABLE LIMIT (%) NE
AUTOIGNITION TEMP. DEG C UN
METHOD OF EXTINCTION Dry chemical, CO2, water spray, foam, sand or earth. Water and foam may cause frothing.
SPECIAL PROCEDURES Water spray may minimize vapors and cool containers exposed to heat and flame. Avoid spreading burning liquid with water used for cooling purposes. containers to explode.

MSDS
HYDRAULIC FLUID

HAZARDOUS COMBUSTION PROD. Oxides of carbon, nitrogen, sulfur

SECTION V - REACTIVITY DATA

CHEMICAL STABILITY YES [X] NO [ ]
AVOID Extended exposure to high temperatures
DECOMPOSITION PRODUCTS See Section IV.
INCOMPATIBILITY WITH OTHER SUBSTANCES Strong oxidizing agents
HAZARDOUS POLYMERIZATION Will not occur.

SECTION VI - TOXICOLOGICAL PROPERTIES

ROUTES OF ENTRY
SKIN CONTACT [Yes] SKIN ABSORPTION [NA] EYE CONTACT [Yes]
INHALATION [Yes] INGESTION [Yes]
EFFECTS OF ACUTE EXPOSURE TO PRODUCT
This material may cause eye and skin irritation. Direct eye contact may result in burning, tearing and redness. Exposure to mists, or prolonged or repeated exposure to fumes or vapors that may be generated if this material is heated, may cause irritation of nose and throat.
EFFECTS OF CHRONIC EXPOSURE TO PRODUCT
Prolonged or repeated skin contact may cause redness, burning anddermatitis.
IRRITANCY OF PRODUCT Eye, skin - slight
SENSITIZATION TO PRODUCT None anticipated
SYNERGISTIC MATERIALS None known
CARCINOGENICITY NA
SOURCE NA
REPRODUCTIVE TOXICITY NA
TERATOGENICITY NA
MUTAGENICITY NA

SECTION VII - PREVENTIVE MEASURES
PERSONAL PROTECTIVE EQUIPMENT (SPECIFY APPROPRIATE SELECTIONS FOR EACH CATEGORY)
EYES If irritation or redness develops, move victim to fresh air. Flush eyes with clean water.
GLOVES/CLOTHING Wear gloves impermeable to petroleum hydrocarbons to prevent skin contact and possible irritation.
EYE Chemical safety goggles.
RESPIRATORY If TLV is exceeded or for symptoms of overexposure wear a NIOSH-approved respirator.
OTHER An eyewash and safety shower is recommended to be available in the workplace.
ENGINEERING CONTROLS If current ventilation practices are not adequate in maintaining airborne concentrations below the established exposure limits, additional ventilation or exhaust systems may be required.
LEAK/SPILL PROCEDURES Collect leaking liquid in sealable containers. Absorb spilled liquid in sand or inert absorbant.
WASTE DISPOSAL Dispose of product in accordance with local, county, state, provincial, and federal regulations.
HANDLING PROCEDURES/EQUIPMENT AND STORAGE REQUIREMENTS Store in cool, dry location. Keep away from incompatible materials (Section V). Avoid generating oil mists while handling. Avoid prolonged or repeated skin contact. Wash thoroughly after handling. Do not wear oil-soaked clothing or shoes.
SPECIAL SHIPPING INFORMATION
Product is not DOT or TDG regulated. The CHEMTREC emergency telephone number is to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure, or accident involving chemicals.

SECTION VIII - FIRST AID MEASURES

INHALATION If irritation of nose or throat develops, move away from source of exposure and into fresh air. Seek medical attention if irritation persists.
SKIN Wipe material from skin and remove contaminated clothing. Wash affected area(s) thoroughly using mild soap and water and, if necessary, a waterless skin cleanser. Seek medical attention if irritation develops or persists.
Seek medical attention if irritation persists.
INGESTION Contact physician or local poison

control center immediately.

GENERAL ADVICE/SPECIAL NOTES TO PHYSICIAN

Acute aspiration of large amounts of oil laden material may produce a serious aspiration pneumonia. Repeated aspiration of small quantities of mineral oil can produce chronic inflammation of the lung.

MSDS
UNLEADED GASOLINE

*** IDENTIFICATION ***

MSDS RECORD NUMBER : 802164
PRODUCT NAME(S) : CFR 40-86-96 RON UNLEADED GASOLINE + 15% MTBE
PRODUCT IDENTIFICATION : PRODUCT CODE R00000573200
DATE OF MSDS : 1994-09-13

SYNONYMS..... : UNLEADED PREMIUM GASOLINE
CAS REGISTRY NO: SEE SEC. 2
CAS NAME..... : NO CLASSIFICATION - MIXTURE
CHEMICAL FAMILY: MOTOR FUEL.

EMERGENCY PHONE NUMBERS (AFTER NORMAL BUSINESS HOURS)
CHEMTREC. 1-800-424-9300

*** MATERIAL SAFETY DATA ***

PRIMARY APPLICATION- MOTOR FUEL

2. COMPOSITION / INFORMATION ON INGREDIENTS

EXPOSURE GUIDELINES

COMPONENT/CAS NO.	LO%	HI%	OSHA TWA	OSHA STEL	ACGIH TWA	ACGIH STEL	UNIT
LIMITS FOR THE PRODUCT:			300	500	300	500	PPM
XYLENE							
1330-20-7	.00	25.00	100	150	100	150	PPM
TERT-BUTYL ALCOHOL							
75-65-0	.00	10.00	100	150	100	150	PPM
MTBE							
1634-04-4	15.00	20.00			100	150	PPM
TOLUENE							
108-88-3	.00	30.00	100	150	50		PPM
BENZENE							
71-43-2	.10	4.90	1	5	10		PPM
LIGHT PETROLEUM DISTILLATE							
8006-61-9	.00	84.00	300	500	300	500	PPM
CUMENE							
98-82-8	.00	1.00	50		50		PPM
ETHYL BENZENE							
100-41-4	.00	5.00	100	125	100	125	PPM
N-HEXANE							
110-54-3	.00	5.00	50		50		PPM
NAPHTHALENE							
91-20-3	.00	5.00	10	15	10	15	PPM
CYCLOHEXANE							
110-82-7	.00	9.00	300		300		PPM
1,2,4-TRIMETHYLBENZENE							
95-63-6	.00	5.00	25		25		PPM

ADDITIONAL EXPOSURE LIMITS
OTHER LIMIT- LIMIT IS DEPENDENT ON BENZENE, SEE SECTION 10

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW
DANGER EXTREMELY FLAMMABLE

LIQUID & VAPOR - VAPOR MAY CAUSE FLASH FIRE.

HARMFUL IF INHALED. HIGH VAPOR CONCENTRATIONS MAY CAUSE DIZZINESS. MAY CAUSE SKIN IRRITATION.

HARMFUL OR FATAL IF SWALLOWED. PULMONARY ASPIRATION HAZARD-CAN ENTER LUNGS AND CAUSE DAMAGE. CONTAINS MATERIAL
WHICH CAN CAUSE CANCER.

APPEARANCE-- COLORLESS LIQUID. ODOR-- GASOLINE ODOR

POTENTIAL HEALTH EFFECTS

PRIMARY ROUTES OF ENTRY- INHALATION(X) SKIN(X) EYE(X) INGESTION(X)

INHALATION: EXCESSIVE EXPOSURES MAY CAUSE IRRITATION TO EYES, NOSE, THROAT AND LUNGS. RESPIRATORY TRACT; CENTRAL NERVOUS SYSTEM (BRAIN) EFFECTS;
HEADACHES, NAUSEA; DIZZINESS, LOSS OF BALANCE AND COORDINATION;
UNCONSCIOUSNESS, COMA; RESPIRATORY FAILURE AND DEATH. REPEATED EXCESSIVE
EXPOSURES MAY CAUSE BLOOD DISORDERS SUCH AS ANEMIA & LEUKEMIA. CONTAINS A MATERIAL WHICH HAS BEEN RELATED TO CANCER IN HUMANS.

SKIN
SKIN ABSORPTION OF MATERIAL MAY PRODUCE SYSTEMIC TOXICITY. MAY CAUSE MODERATE IRRITATION WITH PROLONGED OR REPEATED CONTACT.

EYE
CONTACT WITH THE EYE MAY CAUSE MILD IRRITATION.
DO NOT INDUCE VOMITING] DO NOT GIVE LIQUIDS] OBTAIN EMERGENCY MEDICAL ATTENTION. SMALL AMOUNTS WHICH ACCIDENTALLY ENTER MOUTH SHOULD

INGESTION
HARMFUL OR FATAL IF SWALLOWED. INGESTION OF THIS MATERIAL MAY CAUSE ABDOMINAL PAIN; PULMONARY ASPIRATION HAZARD IF SWALLOWED AND/OR VOMITING OCCURS - CAN ENTER LUNGS AND CAUSE DAMAGE. CONTAINS MATERIAL THAT HAS
BEEN RELATED TO CANCER IN HUMANS.

CARCINOGEN LISTED BY-IARC(YES) NTP(NO) OSHA(YES) ACGIH(NO) OTHER(NO)

PRE-EXISTING MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE-
DISORDERS AND DISEASES OF THE SKIN, EYE, BLOOD FORMING ORGANS,
NERVOUS SYSTEM AND OR PULMONARY SYSTEM, LUNG (E.G. ASTHMA-LIKE CONDITIONS).

4. FIRST AID MEASURES

INHALATION
MOVE PERSON TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION, OBTAIN MEDICAL ASSISTANCE.

SKIN
WASH WITH SOAP AND WATER UNTIL NO ODOR REMAINS. IF REDNESS OR SWELLING DEVELOPS, OBTAIN MEDICAL ASSISTANCE. IMMEDIATELY REMOVE SOAKED CLOTHING.
WASH CLOTHING BEFORE REUSE.

EYE
FLUSH WITH WATER FOR AT LEAST 15 MINUTES. IF IRRITATION PERSISTS, OBTAIN MEDICAL ASSISTANCE.

INGESTION

BE RINSED
OUT UNTIL TASTE OF IT IS GONE.

5. FIRE FIGHTING MEASURES

FLASH POINT: -40 CLOSED CUP (DEG. F); -40 CLOSED CUP (DEG. C)
AUTOIGNITION TEMP.: APPROX. 750 (DEG. F); APPROX. 400 (DEG. C)

---FLAMMABLE LIMITS IN AIR---
LOWER EXPLOSIVE LIMIT (LEL): 1.5 % VOLUME
UPPER EXPLOSIVE LIMIT (UEL): 7.6 % VOLUME

FIRE AND EXPLOSION HAZARDS
EXTREMELY FLAMMABLE LIQUID (FLASH POINT LESS THAN 20F)

EXTINGUISHING-MEDIA
WATER SPRAY. REGULAR FOAM. DRY CHEMICAL. CARBON DIOXIDE.

SPECIAL FIRE FIGHTING INSTRUCTIONS
COOL TANK/ CONTAINER. WEAR SELF-CONTAINED BREATHING APPARATUS. WEARSTRUCTURAL FIREFIGHTERS PROTECTIVE CLOTHING.

NFPA/HMIS CLASSIFICATION
HAZARD RATING
HEALTH - 1 / 1 FIRE - 3 / 3

0=LEAST 1=SLIGHT 2=MODERATE
3=HIGH 4=EXTREME

REACTIVITY - 0 / 0
PERSONAL PROTECTION INDEX - X

SPECIFIC HAZARD: FLAMMABLE

6. ACCIDENTAL RELEASE MEASURES
PREVENT IGNITION; STOP LEAK; VENTILATE AREA. CONTAIN SPILL. USE WATER SPRAY TO DISPERSE VAPORS. PROTECTIVE GLOVES RECOMMENDED TO PROTECT AGAINST CONTACT WITH PRODUCT. THE FOLLOWING GLOVE MATERIALS ARE ACCEPTABLE: POLYETHYLENE; NEOPRENE;
NITRILE; POLYVINYL ALCOHOL; VITON;
KEEP UPWIND OF LEAK. FOR LARGE SPILL, LEAK OR RELEASE. USE PERSONAL PROTECTIVE EQUIPMENT STATED IN SECTION 8. ADVISE EPA; STATE AGENCY IF REQUIRED. ABSORB ON INERT MATERIAL. SHOVEL, SWEEP
OR VACUUM SPILL.

7. HANDLING AND STORAGE
KEEP AWAY FROM HEAT, SPARKS AND FLAME. KEEP CONTAINER TIGHTLY CLOSED. KEEP IN WELL VENTILATED SPACE. NFPA CLASS IA STORAGE. CONSULT NFPA AND OSHA CODES. TRANSFER OPERATIONS MUST BE ELECTRICALLY GROUNDED TO
DISSIPATE STATIC BUILDUP. AVOID PROLONGED BREATHING OF MIST OR VAPOR. AVOID PROLONGED OR REPEATED CONTACT WITH SKIN. AVOID CONTACT WITH EYES.
WASH THOROUGHLY AFTER HANDLING. NEVER SIPHON BY MOUTH.

8. EXPOSURE CONTROL / PERSONAL PROTECTION
CONSULT WITH A HEALTH/SAFETY PROFESSIONAL FOR SPECIFIC SELECTION.

VENTILATION
USE ONLY WITH ADEQUATE VENTILATION. EXPLOSION PROOF VENTILATION EQUIPMENT REQUIRED.

PERSONAL PROTECTIVE EQUIPMENT

EYE
SPLASH PROOF CHEMICAL GOGGLES OR FULL FACE SHIELD RECOMMENDED TO PROTECT AGAINST SPLASH OF PRODUCT.

GLOVES
RESPIRATOR
CONCENTRATION-IN-AIR DETERMINES PROTECTION NEEDED. USE ONLY NIOSH CERTIFIED RESPIRATORY PROTECTION. HALF-MASK AIR PURIFYING RESPIRATOR WITH ORGANIC VAPOR CARTRIDGES IS ACCEPTABLE TO 10 TIMES THE EXPOSURE

LIMIT. FULL-FACE AIR PURIFYING RESPIRATOR WITH ORGANIC VAPOR CARTRIDGES
IS ACCEPTABLE TO 50 TIMES THE EXPOSURE LIMIT NOT TO EXCEED THE CARTRIDGE LIMIT OF 1000 PPM. PROTECTION BY AIR PURIFYING RESPIRATORS IS LIMITED. USE A POSITIVE PRESSURE-DEMAND FULL-FACE SUPPLIED AIR RESPIRATOR OR SCBA FOR EXPOSURES ABOVE 50X THE EXPOSURE LIMIT. IF EXPOSURE IS ABOVE IDLH(IMMEDIATELY DANGEROUS TO LIFE & HEALTH) OR THERE IS THE POSSIBILITY OF AN UNCONTROLLED RELEASE OR EXPOSURE LEVELS ARE UNKNOWN THEN USE A POSITIVE PRESSURE-DEMAND FULL-FACE SUPPLIED AIR RESPIRATOR WITH ESCAPE BOTTLE OR SCBA.

OTHER
IF CONTACT IS UNAVOIDABLE, WEAR CHEMICAL RESISTANT CLOTHING. THE FOLLOWING MATERIALS ARE ACCEPTABLE AS PROTECTIVE CLOTHING MATERIALS:
POLYETHYLENE; POLYVINYL ALCOHOL(PVA); NEOPRENE; NITRILE; VITON; POLYURETHANE; SAFETY SHOWER AND EYE WASH AVAILABILITY RECOMMENDED.
LAUNDER SOILED CLOTHES. FOR NON-FIRE EMERGENCIES, POSITIVE PRESSURE SELF-CONTAINED BREATHING APPARATUS (SCBA) & STRUCTURAL FIREFIGHTERS'
PROTECTIVE CLOTHING WILL PROVIDE LIMITED PROTECTION.

9. PHYSICAL AND CHEMICAL PROPERTIES

BOILING POINT..... : <100 - 435 (DEG. F) <38 - 223 (DEG. C)
MELTING POINT..... : N/A
SPECIFIC GRAVITY... : 0.74 (WATER=1)
PACKING DENSITY.... : N/A (KG/M3)
VAPOR PRESSURE..... : 325 TO 525 (MM HG @ 20 DEG C)
VAPOR DENSITY..... : 4 (AIR=1)
SOLUBILITY IN WATER.: SLIGHT (% BY VOLUME)
PH INFORMATION..... : N/A AT CONC. N/A G/L H2O
% VOLATILES BY VOL..: 100
EVAPORATION RATE... : RAPID & VARIES (ETHYL ETHER=1)
OCTANOL/WATER COEFF.: N.D.
APPEARANCE..... : COLORLESS LIQUID.
ODOR..... : GASOLINE ODOR
ODOR THRESHOLD..... : 15(EST) (PPM)
VISCOSITY..... : N.D. SUS @ N.D DEG F ... N.D. CST @ N.D DEG C
MOLECULAR WEIGHT... : N.D. (G/MOLE)

10. STABILITY AND REACTIVITY

STABILITY
STABLE. CONDITIONS TO AVOID-
SOURCES OF IGNITION.
INCOMPATIBLE MATERIALS
STRONG OXIDIZERS
HAZARDOUS DECOMPOSITION
CARBON MONOXIDE AND ASPHYXIANTS ARE PRODUCED BY FIRE IGNITION

POLYMERIZATION
WILL NOT OCCUR.

11. TOXICOLOGICAL INFORMATION

FOR THE PRODUCT

INHALATION: OVEREXPOSURE MAY CAUSE EYE & RESPIRATORY TRACT IRRITATION, CNS (BRAIN) EFFECTS, DIZZINESS, LOSS OF BALANCE & COORDINATION, COMA, UNCONSCIOUSNESS, DEATH. CONTAINS

BENZENE: PROLONGED/REPEATED OVER-EXPOSURE TO BENZENE CAN CAUSE BLOOD DISORDERS RANGING FROM ANEMIA TO LEUKEMIA. SKIN: PROLONGED/WIDESPREAD CONTACT MAY CAUSE ADVERSE EFFECT, IRRITATION. EYE: MILD IRRITANT.

ORAL: HARMFUL/FATAL IF SWALLOWED. ASPIRATION HAZARD--CAN ENTER LUNGS & CAUSE DAMAGE. LIFETIME

INHALATION CAUSED LIVER TUMORS (FEMALE MICE)--API STUDY ON AN UNLEADED GASOLINE.
GASOLINE ENGINE EXHAUST CLASSIFIED AS POSSIBLE (IARC 2B) CARCINOGEN (INADEQUATE EVIDENCE EXISTS IN ANIMALS & HUMANS).

XYLENE (COMPONENT) INHALATION: VAPOR HARMFUL] OVEREXPOSURE TO HIGH CONCENTRATIONS CAN CAUSE EYE, NOSE, THROAT, LUNG IRRITATION; CNS (BRAIN) EFFECTS,
DIZZINESS, DIFFICULTY IN BREATHING, UNCONSCIOUSNESS, COMA AND DEATH.
REPORTS OF HEART IRREGULARITIES FROM MASSIVE EXPOSURES.
PROLONGED OVEREXPOSURES CAN CAUSE BRAIN, LIVER, KIDNEY EFFECTS/DAMAGE.

SKIN: CAN BE ABSORBED. REPEATED/PROLONGED CONTACT IS IRRITATING. EYES:
IRRITANT. ORAL: HARMFUL OR FATAL IF SWALLOWED. PULMONARY ASPIRATION HAZARD-CAN ENTER LUNGS AND CAUSE DAMAGE. IN RATS, PROLONGED BREATHING OF 500 PPM-FETAL EFFECTS BUT NO BIRTH DEFECTS; NO EFFECTS AT 400 PPM.
HIGH ORAL DOSE WAS TOXIC TO PREGNANT MICE; CLEFT PALATE IN FETUSES.

EYE CONTACT: IRRITATION. ORAL: MODERATE ACUTE TOXICITY. HARMFUL OR FATAL IF SWALLOWED AND/OR VOMITING OCCURS BECAUSE IT CAN ENTER LUNGS AND CAUSE DAMAGE--PULMONARY ASPIRATION HAZARD. LIFETIME OVEREXPOSURES
AT HIGH CONCENTRATIONS: 3000 PPM & HIGHER--RATS: DEATH, KIDNEY DAMAGE, AND KIDNEY TUMORS (MALES); AT 8000 PPM-- LIVER TUMORS IN FEMALE MICE.
MICE: MATERNAL TOXICITY & FETAL EFFECTS AT 4000 PPM. HUMAN EXPOSURES AT THESE HIGH CONCENTRATIONS ARE HIGHLY

TERT-BUTYL ALCOHOL (COMPONENT)
INHALATION: VAPOR HARMFUL] OVEREXPOSURE TO HIGH CONCENTRATIONS MAY CAUSE EYE, NOSE, THROAT, LUNG IRRITATION; CNS (BRAIN) EFFECTS, HEADACHE, NAUSEA, DIZZINESS, DROWSINESS, VOMITING, FATIGUE, BLURRED VISION, LOSS OF BALANCE, UNCONSCIOUSNESS.

SKIN: SLIGHT IRRITANT.

EYES: SEVERE IRRITATION WITH CONTACT.

ORAL: MODERATELY TOXIC.
SYMPTOMS SIMILAR TO INHALATION. HARMFUL OR FATAL IF SWALLOWED.
PULMONARY ASPIRATION HAZARD IF SWALLOWED AND/OR VOMITING OCCURS - CAN ENTER LUNGS AND CAUSE DAMAGE. CAUSED TOXICITY/DAMAGE TO FETUS WHEN
REPEATEDLY FED AT VERY HIGH CONCENTRATIONS TO PREGNANT MICE.

MTBE (COMPONENT) INHALATION: MAY CAUSE EYE & RESPIRATORY TRACT IRRITATION, COUGHING,
SHORTNESS OF BREATH, CNS (BRAIN) EFFECTS, HEADACHE, NAUSEA, DIZZINESS, INCOORDINATION. SKIN: PROLONGED/REPEATED CONTACT MAY CAUSE IRRITATION.

UNLIKELY.

TOLUENE (COMPONENT) INH: VAPOR HARMFUL] OVEREXPOSURE TO HIGH CONCENTRATIONS: EYE, NOSE, THROAT, LUNG IRRITATION; CNS (BRAIN) EFFECTS, DIZZINESS, DIFFICULTY IN BREATHING, COMA, DEATH. REPORTS OF HEART BEAT IRREGULARITIES FROM MASSIVE EXPOSURE. PROLONGED OVEREXPOSURE CAN CAUSE BRAIN, LIVER, KIDNEY EFFECTS/DAMAGE. SKIN: CAN BE ABSORBED. PROLONGED CONTACT IS IRRITATING.

EYE: IRRITATION.

ORAL: HARMFUL OR FATAL IF SWALLOWED. PULMONARY ASPIRATION HAZARD-CAN ENTER LUNG & CAUSE DAMAGE. PREG: MAY CAUSE MENTAL AND/OR GROWTH RETARDATION IN CHILDREN OF FEMALE SOLVENT ABUSERS (SNIFFERS); IN RATS PROLONGED BREATHING WAS TOXIC TO FETUSES & MOTHERS - 1500 PPM; NO BIRTH DEFECTS - 5000 PPM. NO EFFECTS - 750 PPM.

BENZENE (COMPONENT) INHALATION: VAPOR HARMFUL] OVEREXPOSURE TO HIGH CONCENTRATIONS CAN CAUSE CENTRAL NERVOUS SYSTEM (BRAIN) EFFECTS, HEADACHE, DIZZINESS, DIFFICULTY IN BREATHING, UNCONSCIOUSNESS, COMA, DEATH. THERE ARE REPORTS OF HEART IRREGULARITIES FROM MASSIVE EXPOSURES. IARC GROUP 1- HUMAN CANCER HAZARD. REPEATED PROLONGED INHALATION CAN CAUSE BLOOD DISORDERS-ANEMIA TO LEUKEMIA. CANCER-ANIMAL STUDIES. CHANGES IN CHROMOSOMES. FETAL EFFECTS IN ANIMAL STUDIES AT REPEATED/PROLONGED EXPOSURES.

SKIN: CAN BE ABSORBED; IRRITATING. INCOORDINATION, UNCONSCIOUSNESS, DEATH. SKIN: LOW ACUTE TOXICITY. CAN BE ABSORBED. MODERATE IRRITATION. EYE: MILD IRRITANT.

ORAL: MODERATE ACUTE TOXICITY. HARMFUL OR FATAL IF SWALLOWED. PULMONARY ASPIRATION HAZARD - CAN ENTER LUNGS AND CAUSE DAMAGE. OVEREXPOSURE BY INHALATION/INGESTION MAY CAUSE LIVER, KIDNEY, SPLEEN AND LUNG EFFECTS/DAMAGE. EQUIVOCAL RESULTS IN ANIMAL STUDY REPORTING BIRTH DEFECTS & EMBRYONAL MORTALITY. CONFLICTING RESULTS IN GENETIC TESTS.

EYE: SEVERE IRRITATION POSSIBLE.

ORAL: POISON] HARMFUL OR FATAL IF SWALLOWED. PULMONARY ASPIRATION HAZARD- CAN ENTER LUNGS AND CAUSE DAMAGE.

LIGHT PETROLEUM DISTILLATE (COMPONENT) INHALATION: OVEREXPOSURE MAY CAUSE EYE, NOSE, THROAT, RESPIRATORY TRACT IRRITATION; CNS (BRAIN) EFFECTS, NAUSEA, DIZZINESS, UNCONSCIOUSNESS, COMA, RESPIRATORY FAILURE, DEATH. SKIN: IRRITATION WITH PROLONGED AND REPEATED CONTACT.

EYE: MILD TO MODERATE IRRITATION. ORAL: HARMFUL OR FATAL IF SWALLOWED DUE TO A PULMONARY ASPIRATION HAZARD IF SWALLOWED AND/OR VOMITING OCCURS - CAN ENTER LUNGS AND CAUSE DAMAGE.

CUMENE (COMPONENT) INHALATION: VAPOR HARMFUL] OVEREXPOSURE TO HIGH CONCENTRATIONS CAN CAUSE EYE, NOSE, THROAT, RESPIRATORY TRACT IRRITATION, CNS (BRAIN) EFFECTS, NAUSEA, HEADACHE, DIZZINESS, DIFFICULTY IN BREATHING,

ETHYL BENZENE (COMPONENT)

INHALATION: OVEREXPOSURE TO HIGH CONCENTRATIONS CAN CAUSE EYE, NOSE, THROAT & RESPIRATORY IRRITATION, CENTRAL NERVOUS SYSTEM (BRAIN) EFFECTS, DIZZINESS, LOSS OF BALANCE & COORDINATION, UNCONSCIOUSNESS, RESPIRATORY FAILURE & DEATH. PROLONGED BREATHING CAN CAUSE LIVER AND KIDNEY EFFECTS.

SKIN: LOW ACUTE TOXICITY. ABSORBABLE THROUGH SKIN. MODERATE IRRITATION.

EYE: MODERATE IRRITANT.

ORAL: HARMFUL OR FATAL IF SWALLOWED. PULMONARY ASPIRATION HAZARD IF SWALLOWED AND/OR VOMITING OCCURS-CAN ENTER LUNGS AND CAUSE DAMAGE. PROLONGED OVEREXPOSURE OF 1000 PPM CAUSED MATERNAL AND FETAL TOXICITY.

N-HEXANE (COMPONENT)
INHALATION: OVEREXPOSURE TO HIGH CONCENTRATIONS CAN CAUSE EYE, NOSE, THROAT, RESPIRATORY TRACT IRRITATION; CNS (BRAIN) EFFECTS, DIZZINESS, CONFUSION, COMA.

SKIN: CAN BE ABSORBED. PROLONGED AND REPEATED CONTACT MAY CAUSE IRRITATION, BURNING SENSATION, ITCHING, BLISTERS.

EYE: IRRITATING; REPEATED EXPOSURE MAY CAUSE VISUAL DISTURBANCE.

INGESTION: ASPIRATION HAZARD IF SWALLOWED AND/OR VOMITING OCCURS - CAN ENTER LUNGS AND CAUSE DAMAGE. PROLONGED EXPOSURES KIDNEY INJURY MAY ALSO OCCUR. MAY CAUSE GASTROINTESTINAL IRRITATION, VOMITING, AND DIARRHEA.

CYCLOHEXANE (COMPONENT)
INHALATION: OVEREXPOSURE TO HIGH CONCENTRATIONS CAN CAUSE EYE, NOSE, THROAT, RESPIRATORY IRRITATION; CNS (BRAIN) EFFECTS, HEADACHE, DIZZINESS, EXCITEMENT, DIFFICULTY BREATHING, FATIGUE, INCOORDINATION, ANESTHESIA, UNCONSCIOUSNESS, DEATH.

SKIN: LOW ACUTE TOXICITY. MAY BE IRRITATING WITH PROLONGED AND REPEATED CONTACT.

EYE: MAY CAUSE MILD IRRITATION WITH CONTACT.

CAUSE HARM TO THE CENTRAL NERVOUS SYSTEM PRODUCING A LACK OF FEELING IN EXTREMITIES (HANDS AND FEET) AND MORE SEVEE NERVE DAMAGE (PERIPHERAL NEUROPATHY).

NAPHTHALENE (COMPONENT)
INHALATION: VAPORS MAY CAUSE RESPIRATORY TRACT IRRITATION, HEADACHE, CONFUSION, EXCITEMENT, PROFUSE SWEATING, ABDOMINAL PAIN, VOMITING, DIARRHEA.

SKIN: MAY BE ABSORBED THROUGH THE SKIN. MAY CAUSE IRRITATION AND DERMATITIS. CAN CAUSE ALLERGIC SKIN REACTION.

EYE: VAPOR CAUSES IRRITATION AT 15 PPM. CONTACT MAY CAUSE IRRITATION, CONJUNCTIVITIS, CORNEAL OPACITY. REPORTED TO CAUSE CATARACTS.

ORAL: MODERATELY TOXIC IF SWALLOWED . BLOOD EFFECTS (HEMOLYSIS), LIVER &

ORAL: MODERATE ACUTE TOXICITY. INGESTION OF LARGE QUANTITIES MAY CAUSE EFFECTS SIMILIAR TO INHALATION. HARMFUL OR FATAL IF SWALLOWED AND/OR VOMITING OCCURS BECAUSE IT CAN ENTER LUNGS AND CAUSE DAMAGE--PULMONARY ASPIRATION HAZARD.

1,2,4-TRIMETHYLBENZENE (COMPONENT)
INHALATION: MODERATELY TOXIC. VAPOR OR MIST IRRITATES THE EYES, MUCOUS MEMBRANES, RESPIRATORY TRACT. OVEREXPOSURE MAY CAUSE CENTRAL NERVOUS SYTEM (BRAIN) EFFECTS, NARCOTIC EFFECTS, NAUSEA, HEADACHE, DIZZINESS, INCOORDINATION, UNCONSCIOUSNESS, COMA, DEATH.

SKIN: CAN BE ABSORBED. CONTACT MAY

CAUSE IRRITATION AND DERMATITIS. EYE: IRRITATING

INGESTION: MODERATELY TOXIC. SYMPTOMS SIMILAR TO INHALATION. HARMFUL OR FATAL IF SWALLOWED. PULMONARY ASPIRATION HAZARD- HARMFUL OR FATAL BECAUSE IT CAN ENTER THE LUNGS AND CAUSE DAMAGE.

12. ECOLOGICAL INFORMATION

AQUATIC TOXICITY: GASOLINE SPILLS ARE TOXIC TO FISH AND AQUATIC FLORA.

13. DISPOSAL CONSIDERATIONS

FOLLOW FEDERAL, STATE AND LOCAL REGULATIONS. RCRA HAZARDOUS WASTE. DO NOT FLUSH TO DRAIN/ STORM SEWER. CONTRACT TO AUTHORIZED DISPOSAL SERVICE.

14. TRANSPORTATION INFORMATION

WHEN A PRODUCT AND/OR COMPONENT IS LISTED BELOW, THE REGULATORY LIST ON WHICH IT APPEARS IS INDICATED.

FOR THE PRODUCT - FL MA MN NJ 03 04
XYLENE - FL IL MA ME MN NJ PA RI 01 07
TERT-BUTYL ALCOHOL - FL MA MN NJ PA 01
MTBE - MA NJ PA 01 07
TOLUENE - CA FL MA MN NJ PA 01 07
BENZENE - CA FL MA MN NJ PA 01 03 04 06 07 10
LIGHT PETROLEUM DISTILLATE - FL MA MN NJ
CUMENE - FL MA MN NJ PA 01 07
ETHYL BENZENE - FL MA MN NJ PA 01 07
N-HEXANE - FL MA MN NJ PA
NAPHTHALENE - FL MA MN NJ PA 01 07
CYCLOHEXANE - FL MA MN NJ PA 01 07
1,2,4-TRIMETHYLBENZENE - MA NJ PA 01

01=SARA 313
02=SARA 302/304
03=IARC CARCINOGEN
04=OSHA CARCINOGEN

DOT- PROPER SHIPPING NAME- GASOLINE
HAZARD CLASS- 3 (FLAMMABLE LIQUID)
IDENTIFICATION NUMBER- UN1203
LABEL REQUIRED- PG II, PLACARD; FLAMMABLE LIQUID
IMDG- PROPER SHIPPING NAME- GASOLINE
IATA- PROPER SHIPPING NAME- GASOLINE

15. REGULATORY INFORMATION

SARA 302 THRESHOLD PLANNING QUANTITY. N/A

SARA 304 REPORTABLE QUANTITY ..... 204 POUNDS

SARA 311 CATEGORIES- IMMEDIATE (ACUTE) HEALTH EFFECTS.. Y
DELAYED (CHRONIC) HEALTH EFFECTS.. Y
FIRE HAZARD ..... Y
SUDDEN RELEASE OF PRESSURE HAZARD. N
REACTIVITY HAZARD ..... N

05=ACGIH CARCINOGEN
06=NTP CARCINOGEN
07=CERCLA 302.4
08=WHMIS CONTROLLED PROD.
10=OTHER CARCINOGEN

THIS PRODUCT OR ALL COMPONENTS OF THIS PRODUCT ARE LISTED ON THE U.S. TSCA INVENTORY.

16. OTHER INFORMATION

PRECAUTIONARY LABELING FOR PUMPS, PORTABLE CONTAINERS, AND DRUMS IS REQUIRED. A "HAZARDOUS WHEN EMPTY" PICTOGRAM AND D.O.T. FLAMMABLE LIQUID LABEL ARE ALSO REQUIRED FOR DRUMS. BECAUSE BENZENE IS PRESENT IN THIS PRODUCT ABOVE 0.1%, THE OSHA STANDARD
FOR BENZENE IS APPLICABLE TO WORK LOCATIONS UPSTREAM OF FINAL DISCHARGE FROM TERMINALS. CONSULT 29CFR1910.1028 FOR DETAILS. PROLONGED AND REPEATED EXCESSIVE EXPOSURES TO BENZENE CAN RESULT IN BLOOD

DISORDERS
RANGING FROM ANEMIA TO LEUKEMIA. RECOMMEND THAT EXPOSURES TO BENZENE BE KEPT BELOW 1.0 PPM FOR 8-HOURS; 5.0 PPM FOR 15-MIN. NORMAL SERVICE STATION OPERATIONS ARE BELOW THESE VALUES. FOR USE AS A MOTOR
FUEL ONLY. DO NOT USE FOR ANY OTHER PURPOSE.

APPENDIX E. SAMPLING AND ANALYSIS PLAN

This plan will be provided in the Intrusive Phase Work Plan (Phase 3).

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APPENDIX F. FORMS

This appendix contains the following project forms:

- Plan Acceptance Form – Site Safety and Health Plan
- Daily Site Training Outline
- Daily Status Report
- Parsons Daily Quality Control Inspection, Audit, and Production Log
- Root Cause Analysis
- Safety Inspection
- Site Specific Training Form
- Safety Meeting Attendance Log
- Safety Suggestion Form
- Safety/Quality Compliance Checklist
- DD Form 626 (Motor Vehicle Inspection)
- Site Visitors Log
- Notice of Subcontractor Violation
- Notice of Non-Compliance
- Accident Investigation Report (ENG Form 3394)
- Accident Report Form
- Accident Report Follow-up
- Order for Work-Related Injury/Illness Eval/Treatment
- Doctor's Work Status Report
- Parsons Risk Mitigation Two-Week Look-ahead Form
- DGM (Phase 2) Prep Initial and Follow-up
- Daily Observer Log Sheet

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PLAN ACCEPTANCE FORM
SITE SAFETY AND HEALTH PLAN

Instructions: This form is to be completed by each person to work on the subject project work site and returned to the Site Safety and Health Officer.

I have read and agree to abide by the contents of the Site Safety and Health Plan for the following project:

Phase 2 RI/FS, MRS 07 Culebrita Artillery Impact Area Water Acreage and All Cayos of MRS 02

_____

_____
Name (print)

_____
Signature

_____
Date

Return to Site Safety and Health Officer before starting work at the site.

DAILY SITE TRAINING OUTLINE

Non-Intrusive/Mobilization

MRS 07 Culebrita Artillery Impact Area Water Acreage and All Cayos of MRS 02

Phase 2 Underwater RI/FS

Topics Covered:	**Completed/Initials**
Personnel responsible for health and safety	_____
• – Site Safety&Health Officer	
• – CEHNC On Site Safety	
• – SUXOS	
• – Project Manager	
• – Site Manager	
Heat/Cold Injuries	_____
• Heat Stress	
• Exhaustion	
• Stroke	
• Hypothermia	
Slips, trips, falls	_____
• Animal Burrows	
• Steep Inclines	
• Partially buried fencing/barbed wire	
• Muddy/Wet Surfaces	
Health and safety procedures	_____

Topics Covered:	**Completed / Initials**
Safe work practices	_____
• Equipment Spotters	
• Recognized hand signals	
Engineering controls	_____
Emergency procedures/Rally Point	_____
• Emergency Signal (3-5sec blasts)	
• Rally Point	
Biological Hazards	_____
• Poison Ivy/Oak/Sumac	
• Snakes	
• Bees/Wasps	
Radios/Cellular Phones/GPS	_____
• Channel Frequency	
• Cellular Phones (List of assigned numbers)	
• GPS	
• Communications Checks (Twice all site elements)	
Vehicle/Heavy Equip traffic	_____
• Use of Seat Belts	
• Sound Horn prior to backing vehicles without warning device	
• Vehicle speeds on the roads	
MSDS Logs/Records	_____
• Located at Operations/CP	

Topics Covered: **Completed / Initials**

Personnel Protective Equipment _____

- Safety Glasses
- Leather Work Gloves
- First Aid Kit (per vehicle)
- Fire Extinguisher (per vehicle)
- Maps and Grid Sheets
- Remote Operations/First Aid Handout

Hospital/Routes

- **All Site Related Injuries** _____

  Team will transport to closest Medical Facility

- List those facilities/phone numbers/provide maps
    - **After Hours – Site personnel will go to XXXX**

Today's operations (-Site Manager's) _____

_____

SSHO's Signature/Date

DAILY STATUS REPORT

1.0 GENERAL

Contract: W912DY-09-D-0062

Task Order: 0010

Project Location: Phase 2, Underwater RI/FS MRSs 02 and 07
Culebra, Puerto Rico

Date:

REPORT NUMBER:

CONTRACTING OFFICER – Janice Jamar, USAESCH

USAESCH PROJECT MANAGER – Roland Belew

CESAJ PROJECT MANAGER – Wilberto Cubero-Deltoro

PROGRAM/PROJECT MANAGER – Patti Berry, PARSONS

TECHNICAL DIRECTOR – Tom Bourque, USA Environmental

SITE MANAGER/SUXOS – TBD, PARSONS

UXO SAFETY/QC – TBD, PARSONS

2.0 FIELD INFORMATION

2.1 Statistical Data:

Site	Category	Total	Completed Today	Cumulative No.	Percent Completed	Comments/QC

MD – Munitions Debris
MEC – Munitions and Explosives of Concern
OD – Other Debris
QC – Quality Control

2.2 Weather:

Weather Delays or Significant Comments:

2.3 Detailed MEC Listing (includes comments relating to type of OE located during the week by grid/transect its locations (coordinates), depth, orientation, and disposition. Include a summary of all MEC recovered to date by type.

2.4 Results of Daily Inspections

2.5 Operations Planned for Next Work Day

2.6 Personnel on Site (excluding Visitors)

Name	Position	Organization	Comments

2.7 Summary of Vehicles and Equipment (list trailers, backhoes, trucks for Parsons, subs, government agencies, etc.) *May be recorded weekly.

Vehicles - Week Ending 7-Jun-2013

Vehicle Type	Source	Days used this week	VIN/Boat Number	Miles/Hours this week	Assigned to:

Equipment

Equipment	Number on site	Assigned to:	Rental Cost	Date on Site	Date off Site

2.8 Demolition Materials Accounting

2.9 Site Visitors

Name	Organization	Purpose of Visit	Date of Safety Brief

3.0 EXPOSURE DATA

Week Ending:

Organization & # of Staff on Site	Man-hours Weekly	Man-hours to Date	Vehicle Miles/ Hours Weekly	Total Miles/ Hours to date	# of Accidents to date

3.1 Incidents/Accidents/Near Misses:

4.0 DAILY QUALITY CONTROL REPORT (DQCR) FOR ENVIRONMENTAL SAMPLING

4.1 Daily Events:

4.2 Departures from the Field Sampling and Analysis Plan

5.0 INSTRUCTIONS FROM GOVERNMENT PERSONNEL

6.0 SITE ACTIVITIES

Activity	Area	Site Location

Site Manager
Parsons

PARSONS DAILY QC INSPECTION,
AUDIT, AND PRODUCTION LOG

Date:

Contract Number: **W912DY-07-D-0062** **Delivery Order: 0010**

Location: MRS 07 Culebrita Artillery Impact Area Water Acreage and All Cayos of MRS 02

MEC/UXO Items Destroyed

QTY	ITEM DESCRIPTION	QTY	ITEM DESCRIPTION

Total MEC/UXO items destroyed today: _____

The following grids have received a Quality Control check and are ready for QA:
Comments (Include any discrepancies or Project Non-Conformance)

Site UXOQCS

ROOT CAUSE ANALYSIS

Project:	
Subject:	
Date:	

Description of Condition Found:
Actual Cause:
Action Taken to Correct Condition: (Corrective Action should address root cause, not the symptom)
Action Taken to Prevent Recurrence:
Action Taken to Monitor Effectiveness of Corrective Action: (Generate data as proof. State the monitoring method put in place and who is responsible for reviewing data.)

Preparer	*Project Title/Role*	*Date*
Lead Technical Representative	*Project Title/Role*	*Date*
Parsons Approver	*Project Manager*	*Date*

Safety Inspection

Date:	Time:	Contract Number:	W912DY-07-D-0062
Task Order Number:	0010	Location:	MRS 07 Culebrita Artillery Impact Area Water Acreage and all Cayos of MRS 02
Weather Conditions:			
Type of Inspections:	Daily	Weekly	Special / Re-inspection
Location inspected: (List by grid number, coordinates, or description)			
Activity inspected:			

II. Inspection Requirement	Satisfactory	Unsatisfactory	N/A
Safe Access			
Safe Workspace			
Evacuation Technique			
Personal Protection Equipment			
Work Practices			
Site Control			
First Aid Equipment			
Fire Fighting Equipment			
Heavy Equipment			
Site Mobilization/Demobilization			
Sanitation			
Training			

Overall Inspection Results: Satisfactory Unsatisfactory

III. Comments:

	• Work stopped due to safety violation:	Yes No
	• Safety violations noted:	
	• Personnel involved:	
	• Corrective Measures:	
	• Site Visitors and Purpose:	

IV. Signatures:

_____ _____

Site Safety and Health Officer Site Manager/Project Manager

Site Specific Training Form

Instructions: This form is to be completed by each person to work on the subject project work site and returned to the safety manager.

I have attended and been briefed on the Site Specific Training on

_____

for the following project:

Site Location: MRS 07 Culebrita Artillery Impact Area Water Acreage and all Cayos of MRS 02

Contract Number: W912DY-07-D-0062, TASK ORDER: 0010

Print Name: _____

Company: _____

Signature: _____

Date: _____

Return to:

Site Safety and Health Officer

Safety Meeting Attendance Log

Date:	**Time:**	**Contract Number: W912DY-07-D-0062**
Delivery Order Number: 0010	**Location:**	
Weather Conditions: (Low/High Temp, Wind/Speed/Dir) (Severe Weather)		
Safety Meeting Topic (Briefly describe)		
Attendees:		

Name	Signature	Company

Attendees:		
Name	**Signature**	**Company**

_____

Site Safety and Health Officer

SAFETY SUGGESTION FORM

This form is for use by employees who wish to provide a safety suggestion or report an unsafe workplace condition or practice.

Description of unsafe condition or practice _____

_____

_____

_____

Causes or other contributing factors _____

_____

_____

_____

Employee's suggestion for improving safety _____

_____

_____

_____

Has this matter been reported to the area supervisor? _____

Employee Name (optional) _____

Department _____ Date: _____

Employees are advised that use of this form or other reports of unsafe conditions or practices are protected by law. It would be illegal for the employer to take any action against an employee in reprisal for exercising rights to participate in communication involving safety.

The employer will investigate any report or question as required by the Injury and Illness Prevention Program Standard and advise the employee who provided the information or the workers in the area of the employer's response.

SAFETY/QUALITY COMPLIANCE CHECK LIST

LOCATION: MRS 07 Culebrita Artillery Impact Area Water Acreage and all Cayos of MRS 02

DATE:

1. Review Scope of Work & WP	Yes	No	N/A	COMMENTS
a. Check for Modifications/Changes & Up To Date				
b. Proper Depth of Clearance Identified				
c. Corrective Action Standards Established				
d. Proper Target Ordnance Identified/Test Sources/Test Plot Established				
e. Most Probable Munitions (MPM) Identified				
f. MSD/MFGD Established				
g. Standards for Turn-In of Recovered MPPEH and Range-Related Debris				
h. Exclusion Zone (EZ) identified in WP				
2. Documentation Requirements/Publications	**Yes**	**No**	**N/A**	**COMMENTS**
a. Notice to Proceed from KO				
b. Approval Letter for Work Plan				
c. Contractor Qualifications, Approval Letter for All UXO Personnel Identified by Name & Position				
d. Certificate of Grounding, Lightning Protection (if Required)				
e. Explosive Safety Submission (ESS) (if Required)				
f. Delivery Order & All Modifications & Change Orders				
g. Explosives Permits/License (If Required)				
h. GFE Inventory/Transfer Documentation (If Required)				
i. Dig Permits for Utilities (If Required)				
j. Rites of Entry (ROE) (If Required)				
k. OE Sector SOPs				
l. Other Reference Publications/Materials				

3. QC Files Established	Yes	No	N/A	COMMENTS
a. Daily/Weekly QC Reports/Audits				
b. Approval Letter's, NTP, for Parsons Operations				
c. Weekly/Monthly Reports (If Provided)				
d. CEHNC Form 948 (Copies)				
4. Accident Prevention Plan (APP)/Site-Specific Safety & Health Plan (SSHP)	**Yes**	**No**	**N/A**	**COMMENTS**
a. Hazard Analysis & Risk Assessment for All Task & Equipment				
b. Training, General Site Workers HAZWOPER Qualified & Current 8-Hour Refresher				
c. Personnel Protective Equipment (PPE)				
d. First Aid Equipment Shall be Immediately Available				
e. Emergency Eye-washes/Showers Comply with ANSI Standards				
f. Fire Extinguishers (Specify Type, Size, and Location)				
g. Visitor Safety Briefing				
h. Emergency Notification List Posted & Available				
i. Emergency Routes/Maps Available & Issued to Each Team				
j. Work Task Identified in Hazard Analysis (APP)				
k. MSDS(s) On-Site. APP				
k. Hazard Analysis for Each Piece of Equipment/Operations				
l. Minimum of Two Personnel On-Site 1st Aid/CPR Trained, EM 385-1-1, Section 3, Page 19, Para 03.A.02				
m. 16-Unit 1st Aid Kits Approved by a competent 1st Aid person in the Ratio of 1 for every 25 personnel or less. EM 385-1-1, Section 3, Page 19, Para 03.B.03.a				
n. Site Emergency Procedures (Wild Fires/Severe Weather)				
o. Adequate Means of Reporting Accidents/Near Misses to Parsons, & Clients				
5. Facilities. Reference EM 385-1-1	**Yes**	**No**	**N/A**	**COMMENTS**
a. Adequate Work Space & Facilities (Restrooms, etc.)				

b. Good Housekeeping (No Fire Hazards, Tripping Hazards, etc.)				
c. Approved and Suitable Containers for Flammable, Toxic, or Explosive Materials				
d. Approved/Adequate Explosive Storage Facilities				
e. Fire/Emergency Exits Clear & Unbarred. Fire extinguisher location(s), and route of escape posted as appropriate in facility				
f. Personnel Limits Maintained				
g. Site Security Adequate				
h. Toilets IAW EM 385-1-1, Section 2, Page 21, Para 02.B				
i. Washing Facilities IAW EM 385-1-1, Section 2, Page 23, Para 02.D				
6. Equipment. Reference Approved WP/Manufacturers Operators Manual	**Yes**	**No**	**N/A**	**COMMENTS**
a. Tools Appropriate and Serviceable				
b. Personnel Protective Equipment (PPE) Present, Serviceable & Utilized				
c. Equipment Calibrated (Last Cal. Date _____ Next Cal Date _____)				
d. Survey Equipment Inspected & Serviceable				
e. Heavy Equipment Inspected & Serviceable IAW EM 385-1-1, Section 16.B.01, to include back up alarm				
f. Heavy Equipment w/at least 1 Dry Cell or C02 Fire Extinguisher w/a minimum rating of 5-BC				
g. Two Separate Means of Communications, Radio(s)/Cell Phone, Land Line(s)				
h. Geophysical Equipment on-Hand & Serviceable				
i. Site Vehicles Are Equipped With 1sd Aid Kits & 5-BC Fire Extinguisher IAW EM 385-1-1, Section 18A.02(10)				
j. Competent Person Identified to Inspect & Accept Heavy Equipment IAW EM 385-1-1, Section 16.A.01				
7. Explosive Storage/Receipt/Transportation Requirements. Reference EP 1110-1-18	**Yes**	**No**	**N/A**	**COMMENTS**
a. Proper Storage Containers Type 2 Magazines Conforming to Standards Set froth in Section 55.206 of ATFP 5400.7,				
b. Placards will be displayed on the magazine(s) IAW w/DOD 6055.9-STD, Chapter 2 & 3 for Hazard Division stored in the magazine(s)				

c. Explosive Compatibility Groups Segregated Into Appropriate Hazards Divisions listed in Chapter 3, DOD 6055.9-STD				
d. Security Locks for the Magazines Shall Meet the Requirements Listed in Section 55.208 (a) (4), ATFP 5400.7				
e. Key control will be documented in the WP				
d. Lightning Protection System Serviceable & Tested (Test Date _____)				
e. Fire Fighting Placarding Will be Posted on the Fence IAW DOD 6055.9-STD, Chapter 8 & DA PAM 385-64, Chapter 3 for Hazard Division stored in the magazine(s)				
f. Fire Protection Consisting of Extinguishers, 10-BC or Larger Located at Magazine Area & Vegetation & Trash Cleared in & Around Magazine Area.				
g. Quantity Distance From Magazine IAW WP & Explosive Safety Submission (ESS)				
h. Accountability Records Maintained IAW 55.125, ATFP 5400.7				
i. Explosive NEW Limits Do Not Exceed Limits Stated In the WP & ESS j. Licenses/Permits (If Required)				
k. Initial Receipt Procedures & Documentation On-Site				
l. Procedures for Transportation of Explosives IAW EM 385-1-1, Section 29.B				
m. Pre-Operational Checks of Vehicle Transporting Explosives Using Checklist				
n. Cargo Properly Segregated, Blocked, & in Approved Containers.				
o. Receipt Procedures Accounting for Each Item of Explosives/Documentation On-Site				
p. Individuals Authorized to Receive, Issue, and Transport Identified				
q. Final Disposition Procedures Documented				
r. Reconciliation, Lost/Stolen Receipt Documents/Procedures On-site				
s. Inventory Conducted Weekly @ Minimum				
9. MEC Operational Plan. Reference Approved WP & EP 1110-1-18	**Yes**	**No**	**N/A**	**COMMENTS**
a. Contractor Following Methodology Defined in WP				
1) Daily Safety Meeting Conducted by UXOSO				

b. Detection Equipment Used				
1) Pre-Operational Checks Performed Prior to Sweep Operations				
2) Operational Condition Annotated in Log Book				
3) Team Composition				
4) Quality Control				
5) Quality Control Documentation				
c. Operational Teams Operating IAW WP				
1) UXO Supervisor conducted Physical Check Prior to Operation				
2) Pre-Operational/Safety Brief Conducted				
3) Individual Sweep Lanes Marked IAW WP				
4) Contacts Marked & Investigated Properly				
5) Results of Sweep Operation Recorded				
6) All MEC ,Munitions Debris, & MPPEH is Examined & Positively Identified by at Least Two UXO Qualified Personnel				
7) Actions Taken When MEC Items Identified Are Not Consistent With WP				
8)All MEC/UXO Clearly Marked				
d. QC Operations IAW WP				
e. Other Material Being Collected (as Required)				
f. MPPEH Inspected/Vented/Segregated				
g. Geophysical Test Grids Appropriate and IAW SOW				
h. Project Data Base & PDA Entries Are Consistent With Intrusive operations				
10. Disposal Operations IAW WP and 60-1-1-31	**Yes**	**No**	**N/A**	**COMMENTS**
a. Disposal Method IAW WP				
b. Adequate Security For Disposal Operation				
c. Disposal Notification List Available				
d. All Necessary Notifications Made				
e. Movement of MEC Items, or is MEC Consolidation Feasible				

f. Protective Measures/Tamping Being Used/Appropriate for MEC Being Destroyed				
g. Disposal Procedures IAW 60A-1-1-31/WP				
1) Misfire Procedures Properly Performed				
h. Conducted Complete Demolition Briefing				
11. Location Survey & Mapping Plan	**Yes**	**No**	**N/A**	**COMMENTS**
a. Registered Land Surveyor				
b. Surveyors Received Site Specific Training				
c. UXO Escort Provided				
d. Grid Stake, Locations Swept With Geophysical Equipment Prior to Driving Stakes				
e. Survey Notes Being Recorded				
12. Quality Control Plan	**Yes**	**No**	**N/A**	**COMMENTS**
a. QC Operational/Checks Being Conducted IAW WP				
b. QC Grid Sweep Pattern Adequate				
c. Results of QC Checks Being Recorded				
d. Nonconformance reports issued if QC checks show discrepancies, or for QA failures				
e. Intrusive Results/Data Base/PDA Entries Are QC'd				
13. Vegetation Removal	**Yes**	**No**	**N/A**	**COMMENTS**
a. Equipment Operated To Prevent Impact With Possible Surface MEC				
b. Cutting Does Not Present Implement Hazard				
c. UXO Personnel Monitoring Cutting Operation				
d. MEC Discovered Marked/Handled Appropriately				
e. Equipment Being Operated Safely & IAW Operators Manual				

SIGNATURE: _____

COMMENTS: See attached audit memorandum.

MOTOR VEHICLE INSPECTION (TRANSPORTING HAZARDOUS MATERIALS)

(Read Instructions before completing this form.)

This form applies to all vehicles which must be marked or placarded in accordance with Title 49 CFR.	1. GOVERNMENT BILL OF LADING/TRANSPORTATION CONTROL NUMBER

SECTION 1 - DOCUMENTATION	ORIGIN a.	DESTINATION b.
2. CARRIER/GOVERNMENT ORGANIZATION		
3. DATE/TIME OF INSPECTION		
4. LOCATION OF INSPECTION		
5. OPERATOR(S) NAME(S)		
6. OPERATOR(S) LICENSE NUMBER(S)		
7. MEDICAL EXAMINER'S CERTIFICATE*		

8. (X if satisfactory at origin)

								9. CVSA DECAL DISPLAYED ON COMMERCIAL EQUIPMENT*	YES	NO
a. MILITARY HAZMAT ENDORSEMENT		d. ERG OR EQUIVALENT COMMERCIAL:		YES		NO		a. TRUCK/TRACTOR		
b. VALID LEASE*		e. DRIVER'S VEHICLE INSPECTION REPORT*						b. TRAILER		
c. ROUTE PLAN		f. COPY OF 49 CFR PART 397								

SECTION 11 - MECHANICAL INSPECTION

All items shag be checked on empty equipment prior to loading. Items with an asterisk shag be checked on all incoming loaded equipment.

10. TYPE OF VEHICLE(S)	1 1. VEHICLE NUMBER(S)

12. PART INSPECTED *(X as applicable)*	ORIGIN (1) SAT	ORIGIN (1) UNSAT	DESTINATION (2) SAT	DESTINATION (2) UNSA I		ORIGIN (1) SAT	ORIGIN (1) UNSAT	DESTINATION (2) SAT	DESTINATION (2) UNSAT	COMMENTS (3)
a. SPARE ELECTRICAL FUSES					k EXHAUST SYSTEM					
b. HORN OPERATIVE					1. BRAKE SYSTEM*					
c. STEERING SYSTEM					rn. SUSPENSION					
d. WINDSHIELD/WIPERS					n. COUPLING DEVICES					
e. MIRRORS					o. CARGO SPACE					
f. WARNING EQUIPMENT					p. LANDING GEAR*					
g. FIRE EXTINGUISHER*					q. TIRES, WHEELS, RIMS					
h. ELECTRICAL WIRING					r. TAILGATE/DOORS*					
i. LIGHTS AND REFLECTORS					s. TARPAULIN*					
j. FUEL SYSTEM*					t. OTHER (Specify)					

13. INSPECTION RESULTS (X *one)* ACCEPTED ☐ REJECTED ☐

(If rejected give reason under "Remarks ". Equipment will be approved if deficiencies are corrected prior to loading.)

14. SATELLITE MOTOR SURVEILLANCE SYSTEM: (X *one)* ACCEPTED ☐ REJECTED ☐

15. REMARKS

16. INSPECTOR SIGNATURE *(Origin)*	17. INSPECTOR SIGNATURE *(Destination)*

SECTION III - POST LOADING INSPECTION

This section applies to Commercial and Govern ment/Military vehicles. All items will be checked prior to release of loaded equipment and shall be checked on all incoming loaded equipment.

	ORIGIN (1) SAT	ORIGIN (1) UNSAT	DESTINATION (2) SAT	DESTINATION (2) UNSAT	COMMENTS (3)
18. LOADED IAW APPLICABLE SEGREGATION/COMPATIBILITY TABLE OF 49 CIFIR					
19. LOAD PROPERLY SECURED TO PREVENT MOVEMENT					
20. SEALS APPLIED TO CLOSED VEHICLE; TARPAULIN APPLIED ON OPEN EQUIPMENT					
21. PROPER PLACARDS APPLIED					
22. SHIPPING PAPERS/DD FORM 836 FOR GOVERNMENT VEHICLE SHIPMENTS					
23. COPY OF DID FORM 626 FOR DRIVER					
24. SHIPPED UNDER DOT EXEMPTION 868					

25. INSPECTOR SIGNATURE *(Origin)*	26. DRIVER(S) SIGNATURE *(Origln)*
27. INSPECTOR SIGNATURE *(Destination)*	28. DRIVER(S) SIGNATURE *(Destination)*

Designed using Perform Pro, WHS/D10R, Sep 98

Reset

INSTRUCTIONS

SECTION I - DOCUMENTATION

General Instructions.

All items (2 through 9) will be checked at origin prior to loading. Items with an asterisk (*) apply to commercial operators or equipment only. Only Items 2 through 7 are required to be checked at destination.

Items 1 through 5. Self explanatory.

Item 6. Enter operator's Commercial Driver's License (CDL) number or Military OF-346 License Number. CDL and OF-346 must have the HAZMAT and other appropriate endorsements IAW Part 383.

Item 7. *Enter the expiration date listed on the Medical Examiner's Certificate.

Item 8.a. APPLIES TO MILITARY OPERATORS ONLY. Military Hazardous Materials Certification. In accordance with applicable service regulations, ensure operator has been certified to transport hazardous materials.

b. *Valid Lease. Shipper will ensure a copy of the appropriate contract of lease is carried in all leased vehicles and is available for inspection. (Defense Transportation Regulation (DTR) requirement.)

c. Route Plan. Prior to loading any Hazard Class/Division 1 . 1 , 1 .2, or 1 .3 (Explosives) for shipment, ensure that the operator possesses a written route plan in accordance with 49 CFR Part 397. Route Plan requirements for Hazard Class 7 (Radioactive) materials are found in 49 CFR 397. 1 0 1.

d. Emergency Response Guidebook (ERG) or Equivalent. Commercial operators must be in possession of an ERG or equivalent document. Shipper will provide applicable ERG page(s) to military operators.

e. *Driver's Vehicle Inspection Report. Review the operator's Vehicle Inspection Report. Ensure that there are no defects listed on the report that would affect the safe operation of the vehicle.

f. Copy of 49 CFR Part 397. Operators are required by regulation to have in their possession a copy of 49 CFR Part 397 (Hazardous Materials Driving and Parking Rules). If military operators do not possess this document, shipper may provide a copy to operator.

Item 9. *Commercial Vehicle Safety Alliance (CVSA) Decal. Check to see if equipment has a current CVSA decal and mark applicable box. Vehicles without CVSA, check documentation of the last vehicle periodic inspection.

SECTION 11 - MECHANICAL INSPECTION

General Instructions.

All items (12.a. through 12.t.) will be checked on all incoming empty equipment prior to loading. All UNSATISFACTORY conditions must be corrected prior to loading. Items with an asterisk (*) shall be checked on all incoming loaded equipment. Unsatisfactory conditions that would affect the safe off-loading of the equipment must be corrected prior to unloading.

SECTION 11 *(Continued)*

Item 12.a. Spare Electrical Fuses. Check to ensure that at least one spare fuse for each type of installed fuse is carried on the vehicle as a spare or vehicle is equipped with an overload protection device (circuit breaker). (49 CFR 393.95)

b. Horn Operative. Ensure that horn is securely mounted and of sufficient volume to serve purpose. (49 CFR 393.8 1)

c. Steering System. The steering wheel shall be secure and must not have any spokes cracked through or missing. The steering column must be securely fastened. Universal joints shall not be worn, faulty or repaired by welding. The steering gear box shall not have loose or missing mounting bolts or cracks in the gear box mounting brackets. The pitman arm on the steering gear output shaft shall not be loose. Steering wheel shall turn freely through the limit of travel in both directions. All components of a power steering system must be in operating condition. No parts shall be loose or broken. Belts shall not be frayed, cracked or slipping. The power steering system shall not be leaking. (49 CFR 396 Appendix G)

d. Windshield/Wipers. Inspect to ensure that windshield is free from breaks, cracks or defects that would make operation of the vehicle unsafe; that the view of the driver is not obscured and that the windshield wipers are operational and wiper blades are in serviceable condition. Defroster must be operative when conditions require. (49 CFR 393.60, 393.78 and 393.79)

e. Mirrors. Every vehicle must be equipped with two rear vision mirrors located so as to reflect to the driver a view of the highway to the rear along both sides of the vehicle. Mirrors shall not be cracked or dirty. (49 CFR 393.80)

f. Warning Equipment. Equipment must include three bidirectional emergency reflective triangles that conform to the requirements of FMVSS No. 125. FLAME PRODUCING DEVICES ARE PROHIBITED. (49 CFR 393.95)

g. Fire Extinguisher. Military vehicles must be equipped with two serviceable fire extinguishers with an Underwriters Laboratories rating of 10 BC or more. (Commercial motor vehicles must be equipped with one serviceable 10 BC Fire Extinguisher). Fire extinguisher(s) must be located so that it is readily accessible for use and securely mounted on the vehicle. The fire extinguisher must be designed, constructed and maintained to permit visual determination of whether it is fully charged. (49 CFR 393.95)

h. Electrical Wiring: Electrical wiring must be clean and properly secured. Insulation must not be frayed, cracked or otherwise in poor condition. There shall be no uninsulated wires, improper splices or connections. Wires and electrical fixtures inside the cargo area must be protected from the lading. (49 CFR 393.28, 393.32, 393.33)

SECTION 11 *(Continued)*

i. Lights/Reflectors. (Head, tail, turn signal, brake, clearance, marker and identification lights, Emergency Flashers). Inspect to see that all lighting devices and reflectors required are operable, of proper color and properly mounted. Ensure that lights and reflectors are not obscured by dirt or grease or have broken lenses. High/Low beam switch must be operative. Emergency Flashers must be operative on both the front and rear of vehicle. (49 CFR 393)

j. Fuel System. Inspect fuel tank and lines to ensure that they are in serviceable condition, free from leaks, or evidence of leakage and securely mounted. Ensure that fuel tank filler cap is not missing. Examine cap for defective gasket or plugged vent. Inspect filler necks to see that they are in completely serviceable condition and not leaking at joints. (49 CFR 393.83 and 396 Appendix G)

k. Exhaust System. Exhaust system shall discharge to the atmosphere at a location to the rear of the cab or if the exhaust projects above the cab, at a location near the rear of the cab. Exhaust system shall not be leaking at a point forward of or directly below the driver compartment. No part of the exhaust system shall be located where it will burn, char or damage electrical wiring, fuel system or any other part of the vehicle. No part of the exhaust system shall be temporarily repaired with wrap or patches. (49 CFR 393.83 and 396 Appendix G)

1. Brake System (to include hand brakes, parking brakes and Low Air Warning devices). Check to ensure that brakes are operational and properly adjusted. Check for audible air leaks **around air brake components and air lines. Check for fluid leaks, cracked or damaged lines in hydraulic brake systems. Ensure that parking brake is operational and properly adjusted. Low Air Warning devices must be operative. (49 CFR 396 Appendix G)**

m. Suspension. Inspect for indications of misaligned, shifted or cracked springs, loosened shackles, missing bolts, spring hangers unsecured at frame and cracked or loose U-bolts. Inspect for any unsecured axle positioning parts, and sign of axle misalignment, broken torsion bar springs (if so equipped). (49 CFR 396 Appendix G)

n. Coupling Devices (Inspect without uncoupling). Fifth Wheels: Inspect for unsecured mounting to frame or any missing or damaged parts. Inspect for any visible space between upper and lower fifth wheel plates. Ensure that the locking jaws are around the shank and not the head of the kingpin. Ensure that the release lever is seated properly and safety latch is engaged. Pintle Hook, Drawbar, Towbar Eye and Tongue and Safety Devices: Inspect for unsecured mounting, cracks, missing or ineffective fasteners (welded repairs to pintle hook is prohibited). Ensure safety devices (chains, hooks, cables) are in serviceable condition and properly attached. (49 CFT 396 Appendix G)

o. Cargo Space. Inspect to ensure that cargo space is clean and free from exposed bolts, nuts, screws, nails or inwardly projecting parts that could damage the lading. Check floor to ensure it is tight and free from holes. Floor shall not be permeated with oil or other substances. (49 CFR 177.815(e)(1) and 398.94)

p. Landing Gear. Inspect to ensure that landing gear and assembly are in serviceable condition, correctly assembled, adequately lubricated and properly mounted.

SECTION 11 *(Continued)*

q. Tires, Wheels and Rims: Inspect to ensure that tires are properly inflated. Flat or leaking tires are unacceptable. Inspect tires for cuts, bruises, breaks and blisters. Tires with cuts that extend into the cord body are unacceptable. Thread depth shall not be less than: 4/32 inches for tires on a steering axle of a power unit, and 2/32 inches for all other tires. Mixing bias and radial on the steering axle is prohibited. Inspect wheels and rims for cracks, unseated locking rings, broken, loose, damaged or missing lug nuts or elongated stud holes. (49 CFR 396 Appendix G)

r. Tailgate/Doors. Inspect to see that all hinges are tight in body. Check for broken latches and safety chains. Doors must close securely. (49 CFR 177.835(h))

s. Tarpaulin. If shipment is made on open equipment, ensure that lading is properly covered with fire and water resistant tarpaulin. (49 CFR 177.835(h))

t. Other Unsatisfactory Condition. Note any other condition which would prohibit the vehicle from being loaded with hazardous materials.

Item 14. For AA&E and other shipments requiring satellite surveillance, ensure that the Satellite Motor Surveillance System is operable. Shipper will instruct the driver to send a "test" emergency message to DTTS by having the driver activate the "emergency (panic) button". Shipper will contact DTTS at 1-800-826-0794 to verify that test message was received. Message must be received by DTTS for system to be considered operational.

SECTION III - POST LOADING INSPECTION

General Instructions.

All items will be checked prior to the release of loaded equipment. Shipment will not be released until deficiencies are corrected. All items will be checked on incoming loaded equipment. Deficiencies will be reported in accordance with applicable service regulations.

Item 18. Check to ensure shipment is loaded in accordance with 49 CFR Part 177.848 and the applicable Segregation or Compatibility Table of 49 CFR 177.848.

Item 19. **Check to ensure the load is secured from movement in accordance with applicable service outload drawings.**

Item 20. Check to ensure seal(s) have been applied to closed equipment; fire and water resistant tarpaulin applied on open equipment.

Item 2 1. Check to ensure each transport vehicle has been properly placarded in accordance with 49 CFR Part 172 Subpart F.

Item 22. Check to ensure operator has been provided shipping papers that comply with 49 CFR Part 172 Subpart C. For shipments transported by Government vehicle, shipping paper will be DD Form 836.

Item 23. Ensure operator(s) sign DD Form 626, are given a copy and understand the hazards associated with the shipment.

Item 24. **Applies to Commercial Shipments Only. If shipment is made under DOT Exemption 868, ensure that shipping papers are properly** annotated and copy of Exemption 868 is with shipping papers.

Site Visitors Log

Contract#: W912DY-07-D-0062
Delivery Order#: 0010

MRS 07 Culebrita Artillery Impact Area Water Acreage and all Cayos of MRS 02

Page ____ of ____ Pages

Week Ending: _____

Name (Print)	Signature	Company	Escort Required (Yes/No) & Who	Date Time In	Date Time Out	On Site Safety Brief (Date)

PARSONS

Notice of Subcontractor Violation of Safety and Health Regulations

Date: _____

Contractor Name: _____

Address: _____

_____

_____

Attention: _____

This letter officially notifies you that you have been found to be in violation of the following Safety Regulations:

_____

on (date) _____, by _____.

Confined Space Entry	___	Lockout/Tagout	___	Hot Work	___	Personal Protective Equipment	___
Knowledge of the environment	___	Awareness of warning alarms	___	Evacuation routes	___	Back-up Alarms	___
Assembly locations	___	Fall Protection	___	Scaffolding	___	Environmental/Hazardous Material Storage	___
Trenching	___	Safe Work Practices	___	Security Practices	___		___

Other: _____

_____

_____

This/These violations occurred at the following locations: _____

_____

at the following times _____ and dates _____

The name of the employees was/were _____

under the supervision of _____.

PARSONS

Notice of Noncompliance with Safety and Health Regulations

Under conditions of this enforcement procedure, check all items that apply:

_____ 1. You are being notified of this violation and should take corrective action to prevent a reoccurrence. The corrective action shall be documented to the Parsons Construction Management representative immediately.

_____ 2. You must submit a plan for compliance to your Parsons Construction Management representative and the Construction Safety Manager within two days of receipt of this letter. The compliance plan must include the means or methods of compliance and the date that the requirements for compliance will be completed. Once compliance has been achieved, a follow up letter must be sent to the Parsons Construction Management representative and Construction Safety Manager. Failure to comply will result in disciplinary action against your Company.

_____ 3. You are required to review the stated procedures with your Parsons Construction Management representative. Work may not commence on the site until the review is complete and the Subcontractor responds formally that the procedure is understood and will comply.

_____ 4. You are required to review the stated procedures with your Parsons Construction Management representative. Work may not commence on the site until the review is complete and you must confirm formally the disciplinary action to be taken against the supervisor and employees.

_____ 5. All work on the site will stop until the Parsons Construction Management representative reviews all the facts with the Subcontractor and determines if the contract between the parties will be terminated.

Sincerely,

_____
Parsons Representative

cc: Issuing Construction Manager Representative
Job File
GBU Safety Manager
Project Manager

(For Safety Staff only)	REPORT NO.	EROC CODE	**UNITED STATES ARMY CORPS OF ENGINEERS ACCIDENT INVESTIGATION REPORT** *(For Use of this Form See Help Menu and USACE Suppl to AR 385-40)*	**REQUIREMENT CONTROL SYMBOL: CEEC-S-8(R2)**

1. **ACCIDENT CLASSIFICATION**

PERSONNEL CLASSIFICATION	INJURY/ILLNESS/FATAL	PROPERTY DAMAGE	MOTOR VEHICLE INVOLVED	DIVING
GOVERNMENT ☐ CIVILIAN ☐ MILITARY	☐	☐ FIRE INVOLVED ☐ OTHER	☐	☐
☐ CONTRACTOR	☐	☐ FIRE INVOLVED ☐ OTHER	☐	☐
☐ PUBLIC	☐ FATAL ☐ OTHER		☐	

2. **PERSONAL DATA**

a. Name *(Last, First, MI)*	b. AGE	c. SEX ☐ MALE ☐ FEMALE	d. SOCIAL SECURITY NUMBER	e. GRADE

f. JOB SERIES/TITLE	g. DUTY STATUS AT TIME OF ACCIDENT	h. EMPLOYMENT STATUS AT TIME OF ACCIDENT
	☐ ON DUTY ☐ TDY ☐ OFF DUTY	☐ ARMY ACTIVE ☐ ARMY RESERVE ☐ VOLUNTEER ☐ PERMANENT ☐ FOREIGN NATIONAL ☐ SEASONAL ☐ TEMPORARY ☐ STUDENT ☐ OTHER *(Specify)*

3. **GENERAL INFORMATION**

a. DATE OF ACCIDENT *(month/day/year)*	b. TIME OF ACCIDENT *(Military time)* hrs	c. EXACT LOCATION OF ACCIDENT	d. CONTRACTOR'S NAME (1) PRIME: (2) SUBCONTRACTOR:

e. CONTRACT NUMBER	f. TYPE OF CONTRACT	g. HAZARDOUS/TOXIC WASTE ACTIVITY
☐ CIVIL WORKS ☐ MILITARY ☐ OTHER *(Specify)*	☐ CONSTRUCTION ☐ SERVICE ☐ A/E ☐ DREDGE ☐ OTHER *(Specify)*	☐ SUPERFUND ☐ DERP ☐ IRP ☐ OTHER *(Specify)*

4. **CONSTRUCTION ACTIVITIES ONLY** *(Fill in line and corresponding code number in box from list - see help menu)*

a. CONSTRUCTION ACTIVITY	(CODE) #	b. TYPE OF CONSTRUCTION EQUIPMENT	(CODE) #

5. INJURY/ILLNESS INFORMATION *(Include name on line and corresponding code number in box for items e, f & g - see help menu)*

a. SEVERITY OF ILLNESS/INJURY	(CODE) #	b. ESTIMATED DAYS LOST	c. ESTIMATED DAYS HOSPITALIZED	d. ESTIMATED DAYS RESTRICTED DUTY

e. BODY PART AFFECTED	(CODE) #	g. TYPE AND SOURCE OF INJURY/ILLNESS	(CODE) #
PRIMARY		TYPE	
SECONDARY		SOURCE	
f. NATURE OF ILLNESS/INJURY			

6. PUBLIC FATALITY *(Fill in line and correspondence code number in box - see help menu)*

a. ACTIVITY AT TIME OF ACCIDENT	(CODE) #	b. PERSONAL FLOATATION DEVICE USED?
		☐ YES ☐ NO ☐ N/A

7. MOTOR VEHICLE ACCIDENT

a. TYPE OF VEHICLE	b. TYPE OF COLLISION	c. SEAT BELTS	USED	NOT USED	NOT AVAILABLE
☐☐ PICKUP/VAN ☐☐ AUTOMOBILE ☐☐ TRUCK ☐☐ OTHER *(Specify)*	☐ SIDE SWIPE ☐ HEAD ON ☐ REAR END ☐ BROADSIDE ☐ ROLL OVER ☐ BACKING ☐ OTHER *(Specify)*	(1) FRONT SEAT			
		(2) REAR SEAT			

8. PROPERTY/MATERIAL INVOLVED

a. NAME OF ITEM	b. OWNERSHIP	c. $ AMOUNT OF DAMAGE
(1)		
(2)		
(3)		

9. VESSEL/FLOATING PLANT ACCIDENT *(Fill in line and correspondence code number in box from list - see help menu)*

a. TYPE OF VESSEL/FLOATING PLANT	(CODE) #	b. TYPE OF COLLISION/MISHAP	(CODE) #

10. ACCIDENT DESCRIPTION *(Use additional paper, if necessary)*

11. **CAUSAL FACTOR(S)** *(Read Instruction Before Completing)*

a. (Explain YES answers in item 13)	YES	NO
DESIGN: Was design of facility, workplace or equipment a factor?	☐	☐
INSPECTION/MAINTENANCE: Were inspection & maintenance procedures a factor?	☐	☐
PERSON'S PHYSICAL CONDITION: In your opinion, was the physical condition of the person a factor?	☐	☐
OPERATING PROCEDURES: Were operating procedures a factor?	☐	☐
JOB PRACTICES: Were any job safety/health practices not followed when the accident occurred?	☐	☐
HUMAN FACTORS: Did any human factors such as, size or strength of person, etc., contribute to accident?	☐	☐
ENVIRONMENTAL FACTORS: Did heat, cold, dust, sun, glare, etc., contribute to the accident?	☐	☐

a. *(CONTINUED)*	YES	NO
CHEMICAL AND PHYSICAL AGENT FACTORS: Did exposure to chemical agents, such as dust, fumes, mists, vapors or physical agents, such as, noise, radiation, etc., contribute to accident?	☐	☐
OFFICE FACTORS: Did office setting such as, lifting office furniture, carrying, stooping, etc., contribute to the accident?	☐	☐
SUPPORT FACTORS: Were inappropriate tools/resources provided to properly perform the activity/task?	☐	☐
PERSONAL PROTECTIVE EQUIPMENT: Did the improper selection, use or maintenance of personal protective equipment contribute to the accident?	☐	☐
DRUGS/ALCOHOL: In your opinion, was drugs or alcohol a factor to the accident	☐	☐

b. WAS A WRITTEN JOB/ACTIVITY HAZARD ANALYSIS COMPLETED FOR TASK BEING PERFORMED AT TIME OF ACCIDENT?

☐ YES *(If yes, attach a copy.)* ☐ NO

12. **TRAINING**

a. WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK?	b. TYPE OF TRAINING.	c. DATE OF MOST RECENT FORMAL TRAINING.
☐ YES ☐ NO	☐ CLASSROOM ☐ ON JOB	(Month) (Day) (Year)

13. **FULLY EXPLAIN WHAT ALLOWED OR CAUSED THE ACCIDENT; INCLUDE DIRECT AND INDIRECT CAUSES** *(See instruction for definition of direct and indirect causes.) (Use additional paper, if necessary)*

a. DIRECT CAUSE

b. INDIRECT CAUSE(S)

14. **ACTION(S) TAKEN, ANTICIPATED OR RECOMMENDED TO ELIMINATE CAUSE(S).**

DESCRIBE FULLY:

15. **DATES FOR ACTIONS IDENTIFIED IN BLOCK 14.**

a. BEGINNING (Month/Day/Year)	b. ANTICIPATED COMPLETION (Month/Day/Year)		
c. SIGNATURE AND TITLE OF SUPERVISOR COMPLETING REPORT CORPS _____ CONTRACTOR _____	d. DATE *(Mo/Da/Yr)*	e. ORGANIZATION IDENTIFIER *(Div, Br, Sect)*	f. OFFICE SYMBOL

16. **MANAGEMENT REVIEW** *(1st)*

a. ☐ CONCUR b. ☐ NON CONCUR c. COMMENTS

SIGNATURE	TITLE	DATE

17. **MANAGEMENT REVIEW** *(2nd - Chief Operations, Construction, Engineering, etc.)*

a. ☐ CONCUR b. ☐ NON CONCUR c. COMMENTS

SIGNATURE	TITLE	DATE

18. **SAFETY AND OCCUPATIONAL HEALTH OFFICE REVIEW**

a. ☐ CONCUR b. ☐ NON CONCUR c. ADDITIONAL ACTIONS/COMMENTS

SIGNATURE	TITLE	DATE

19. **COMMAND APPROVAL**

COMMENTS

COMMANDER SIGNATURE	DATE

*U.S. GOVERNMENT PRINTING OFFICE: 1993-0-791-757

10. ACCIDENT DESCRIPTION ***(Continuation)***

13a. DIRECT CAUSE ***(Continuation)***

13b. INDIRECT CAUSES *(Continuation)*

14. ACTION(S) TAKEN, ANTICIPATED, OR RECOMMENDED TO ELIMINATE CAUSE(S) *(Continuation)*

ACCIDENT REPORT FORM

EMPLOYER

1. Name: _____

2. Mail Address: _____
   (No. and Street) (City or Town) (State and Zip)

3. Location :_____
   (if different from mail address)

INJURED OR ILL EMPLOYEE

4. Name:_____Social Sec. No.:_____
   (first) (middle) (last) Employee No:_____

5. Home Address: _____
   (No. and Street) (City or Town) (State and Zip)

6. Age:_____ 7. Sex: male ( ) female ( )

8. Date of injury or illness: _____ Time of accident:_____

9. Occupation: _____
   (specific job title, not the specific activity employee was performing at time of injury)

10. Department: _____
    (enter name of department in which injured person is employed, even though they may have been temporarily working in another department at the time of injury)

THE ACCIDENT OR OCCUPATIONAL ILLNESS

11. Place of accident of exposure:_____
    (No. and Street) (City or Town) (State and Zip)

12. Project: _____

13. Was place of accident or exposure on employer's premises? Yes ( ) No ( )

14 How did the accident occur? _____
   (describe fully the events that resulted in the injury or occupational illness.

   _____
   Tell what happened and how. Name objects and substances involved. Give details on all factors that led to

   _____
   accident. Use separate sheet for additional space).

ACCIDENT REPORT FORM

15. What was the employee doing when injured? _____
(be specific--was employee using tools or equipment

_____
or handling material?)

_____

16 WITNESS TO ACCIDENT _____
(Name) (Affiliation) (Phone No.)

_____
(Name) (Affiliation) (Phone No.)

17 Name the object or substance that directly injured the employee. _____
(for example, object that struck

_____
employee; the vapor or poison inhaled or swallowed; the chemical or radiation that irritated the skin; or in

_____
cases of strains, hernias, etc., the object the employee was lifting, pulling, etc.)

18. Did the accident result in employee fatality? Yes ( ) No ( )

19. Number of lost days ____/restricted workdays ____ resulting from injury or illness?

OTHER

20. Name and address of physician:_____
(No. and Street) (City or Town) (State and Zip)

21. If hospitalized, name and address:_____
(No. and Street) (City or Town) (State and Zip)

22. Initial diagnosis of injury/occupational illness: _____
Date of report: _____ Prepared by:_____
Official position:_____

23. Treatment rendered: r first aid r medical treatment

_____

_____

ACCIDENT REPORT FOLLOW-UP

Employee: _____ Date of injury or illness: _____

ANALYSIS - What caused the accident. Why did it happen:

Primary cause:

_____
_____
_____
_____
_____
_____

Contributing factors:

_____
_____
_____
_____
_____
_____

PREVENTIVE/CORRECTIVE ACTION - State what will be done to prevent re-occurrence.

Immediate action:

_____
_____
_____
_____
_____
_____

Who is responsible_____ Completion date(s):_____

Long-term action:

_____
_____
_____
_____
_____

Who is responsible_____ Completion date(s):_____

Closed by _____

Facility Health and Safety Representative date

PARSONS

100 West Walnut Street • Pasadena, California 91124 • (661) 904-0978 • Fax: (866) 293-0114 • www.parsons.com

ORDER FOR WORK-RELATED INJURY/ILLNESS EVAL/TREATMENT

_____ _____ of Parsons
(Employee Name) (Occupation)

is authorized to go to _____ for the following service(s):
(Name of Medical Provider)

Treatment for a Work-Related Injury/Illness for Date of Injury: _____.

In the event the above medical provider determines this injury or condition NOT TO BE WORK RELATED, the employee and Parsons understand that this employee may then be referred by the above medical provider to his/her personal medical doctor.

Employer Information:	Parsons 100 West Walnut Street Pasadena, CA 91124
Workers' compensation carrier:	**Insurance Information:** TPA/WC Carrier: Chartis (Except for the monopolistic states), underwritten by the Insurance Company of the State of Pennsylvania WC policies, effective 1/1/12-1/1/13: All other states: WC 214-175-96; California: WC 214-175-95 Florida: WC 214-175-97; MA/WI: WC214-175-98
Adjusting Office and Telephone No.:	

Comments to Provider: Parsons attempts to provide any modified, alternate, light duty recommended._____

_____

_____ _____ _____
Authorized Employer Signature Print Name Date

661-904-0978 866-293-0114
Phone Number Fax Number

Disability slips and return-to-work notifications: Immediately fax to Parsons ***and*** provide copy to employee at conclusion of every evaluation/treatment.

Attention Emergency Department: After acute care, please refer patient back to a _____ for followup treatment.
(Medical provider—to be completed by Parsons—where permitted by law.)

PARSONS

Clinic Protocol Guidelines and WorkCare

- Parsons uses WorkCare as our Corporate Medical Director and Occupational Health Consultant. Parsons is committed to the health and well being of its employees. WorkCare's role is to ensure that Parsons employees receive timely, appropriate, high-quality medical care and that necessary work restrictions are accommodated.

- WorkCare must be contacted when a Parsons employee comes to the clinic, prior to treatment in all non-emergency cases. WorkCare will make every effort to also call the clinic prior to the employee's arrival. If you have not been contacted by WorkCare, please call 1-888-449-7787 and identify what clinic you are from, the nature of your concern, and ask to speak to a WorkCare clinician.

- Please note that Parsons expects WorkCare to assist in the process of developing a course of treatment.

- Please also note that you may receive calls from both Parsons and WorkCare.

- A "Doctor's Work Status Report" form is attached so that you can make recommendations regarding the injured employee's work capacity. The medical provider's role is to identify any activity restrictions that will allow the injured body part to heal. These activity restrictions should be adhered to 24/7. Parsons responsibility is to determine what work can be done safely with these activity restrictions. Parsons is committed to providing temporary modified duty (transitional work) for those employees who are unable to return to work on full duty. **WorkCare requests that Parsons employees return-to-work unless their injury is so severe that they are confined to bed rest with no activity permitted.**

- Parsons is also committed to reducing OSHA recordable injuries. We request that you keep these OSHA recordability guidelines in mind when treating Parsons employees. We are not in any way encouraging under treatment of employees but at the same time, over treatment should be avoided. For example, use of steri-strips instead of sutures is preferred if such treatment is proper for a given laceration. Use of over-the-counter (OTC) medications at OTC dosages is also preferred if deemed adequate for treatment. Provide prescription level medication to employees if it is required for proper medical treatment

- IMMEDIATELY upon conclusion of EVERY medical evaluation (initial and all follow-up evaluations), place phone call and/or email and/or fax to Donna Miller to provide diagnosis and return-to-work restrictions. Also, provide copy to injured worker.

- WorkCare is available 24/7, 365 days a year at: 1-888-449-7787

- Parsons Workers' Compensation Analyst
  Donna P. Miller
  Office Telephone No. and Cell No.: (661) 904-0978
  Fax No.: (866) 293-0114
  100 West Walnut Street
  Pasadena, CA 91124
  Email: donna.miller@parsons.com

PARSONS

Parsons
100 West Walnut Street
Pasadena, CA 91124

Doctor's Work Status Report

◆ Please Fax to Donna Miller (866) 293-0114 and Provide Copy to Employee ◆

Note: Job duties assigned to this employee will match the capabilities you define.

Employee Name:	Claim Number:	
Diagnosis:	Date of Injury:	_____/_____/_____ (mm / dd /yyyy)

RETURN TO WORK STATUS

☐ May return to regular work (Date): / /
☐ Released to full duty with intention given not to aggravate injury (Date): / /
☐ May return to modified work (Date): / /
☐ May not return to work until (Estimated Date): / /
Estimated Duration of Modified Work:

PHYSICAL LIMITATIONS: I certify the employee can perform duties within the capabilities defined as follows:

☐ Without any restrictions.

OTE: In terms of an 8 hour workday, Occas. (Occasionally) equals 1–33%; Freq. (Frequently) equals 34–66%; Contin. (Continuously) equals 67–100%

Capabilities	Never	Occas.	Freq.	Contin.	Lifting\Carrying	Never	Occas.	Freq.	Contin.
Bend	☐	☐	☐	☐	0–5 lbs	☐	☐	☐	☐
Squat	☐	☐	☐	☐	6–10 lbs	☐	☐	☐	☐
Crawl	☐	☐	☐	☐	11–20 lbs	☐	☐	☐	☐
Reach above shoulders	☐	☐	☐	☐	21–25 lbs	☐	☐	☐	☐
Kneel	☐	☐	☐	☐	26–50 lbs	☐	☐	☐	☐
Stoop	☐	☐	☐	☐	51–100 lbs	☐	☐	☐	☐
Climb stairs, steps and step stools	☐	☐	☐	☐	Repeated push/pull	☐	☐	☐	☐
Climb ladders	☐	☐	☐	☐	Repeated simple grasp	☐	☐	☐	☐
Walk on uneven ground	☐	☐	☐	☐	Repeated fine manipulation	☐	☐	☐	☐
Other (Specify):	☐	☐	☐	☐	Other (Specify):	☐	☐	☐	☐

Restrictions of Activities	None	Mild	Moderate	Total	Comments
Unprotected heights	☐	☐	☐	☐	
Be around moving machinery	☐	☐	☐	☐	
Exposure to changes in temperature and humidity	☐	☐	☐	☐	
Driving automotive equipment	☐	☐	☐	☐	
Exposure to dust, fumes, and gases	☐	☐	☐	☐	

In an 8 hour workday, Worker can: (CHECK full capacity for each activity)

Total at One Time (Hours)											Total During Entire 8-Hour Day (Hours)										
Hours	0	1/2	1	2	3	4	5	6	7	8	Hours	0	1/2	1	2	3	4	5	6	7	8
Sit	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Sit	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Stand	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Stand	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Walk	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Walk	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

☐ Job duties were explained to me by (Name/Title): On (Date): / /

☐ I have received a written list of job tasks.

☐ I have NOT received a written list of job tasks, BUT I AGREE THAT DUTIES MAY BE ASSIGNED AND/OR CHANGED, SO LONG AS THEY MATCH THE LIMITS DEFINED BY ME ABOVE. ☐ No ☐ Yes

PROGNOSIS

Permanent Restrictions Likely? ☐ No ☐ Yes ☐ Unknown at this time

Medically Stationary? ☐ No ☐ Yes Date: / /

Physician Name (PRINT):	Telephone No.:
Signature:	Date: / /

PARSONS

Risk Mitigation Two-Week Look-Ahead Form

Safety plan for week ending:	_____	Subcontractor:	_____
Project/ Location:	_____	Meeting date:	_____
Plan Prepared by:	_____	Dated:	_____

Next Two Weeks Scope of Work:

Identified Risks/Exposures/Hazards:

Control Measures:

Additional Activity Hazards Analysis Required:

Subcontractors Mobilizing/Demobilizing:

Audit/Inspections Scheduled:

Competent Person Changes:

Planned Orientation/Training:

Recommendations/Comments/Concerns:

Note: This information should be incorporated into the meeting minutes.

PREPARATORY, INITIAL, FOLLOW-UP QC SURVEILLANCE FORM

W912DY-09-D-0062, Task Order No. 0010, Culebra Phase 2 RI/FS MRSs 02 and 07

DGM Phase (Phase 2)

TEAM INFORMATION		
Team:	**Location:**	**Date:**
Team Leader:		
Personnel Present:		
Phase of Inspection (Circle): ***Preparatory (P); Initial (I); Follow-Up (F)***		

Check List

Definable Feature of Work	Reference	Audit Procedures	QC Phase	Frequency of Audit	Pass/Fail Criteria	Pass	Fail	N/A	/
Mobilization & Site Specific Training	WP Sec- 3.5; Sec 4.9.2 Personnel Qualification Letter Site Specific Training Form	Visual Observation and Document Review	PP/IP/FP	Once, and follow-up as required	All personnel required for the work activities have been identified, are available, and meet the requirements and qualifications for the positions, or waivers from the USAESCH have been obtained.				Document deficiency and report to SM/SUXOS and PM for resolution, follow-up to verify compliance before personnel are assigned project tasks
	WP Sec- 4.9.2	Visual Observation and Document Review	PP/IP/FP	Once, and follow-up as required	All personnel are properly trained and certified to operate equipment and machinery.				Document deficiency and report to SM/SUXOS for resolution, follow-up to verify compliance before personnel

Check List

Definable Feature of Work	Reference	Audit Procedures	QC Phase	Frequency of Audit	Pass/Fail Criteria	Pass	Fail	N/A	/
									operate equipment and machinery
	WP and APP	Document Review	PP/IP/FP	Once, and follow-up as required	All field personnel have reviewed the WP and APP.				Document deficiency and report to UXOQCS and SM/SUXOS for resolution, follow-up to verify compliance before personnel commence assigned project tasks
	APP App. F: Daily Safety Briefing Attendance Form	Document Review	PP/IP/FP	Once, and follow-up as required	All personnel have signed the Employee Sign-off Forms for the SSHP, the Certificate of Personal Protective Equipment (PPE) training and all AHAs have been completed.				Document deficiency and report to UXOQCS and SM/SUXOS for resolution, follow-up to verify compliance before personnel commence assigned project tasks
	APP	Document Review	PP/IP/FP	Once, and follow-up as Material is Introduced to Project	Material Safety Data Sheets are available on-site for all hazardous materials used or encountered onsite				Document deficiency and report to UXOQCS and SM/SUXOS for resolution, follow-up to verify compliance before personnel are exposed to the hazardous material of concern
	WP Sec- 2.6 Project Schedule	Visual Observation and Document Review	PP/IP/FP	Once and Follow-up as Required	All equipment is received on island as needed to support the project schedule.				Document deficiency and report to SM/SUXOS for resolution

Check List

Definable Feature of Work	Reference	Audit Procedures	QC Phase	Frequency of Audit	Pass/Fail Criteria	Pass	Fail	N/A	/
	WP Sec- 2.2	Document Review	PP/IP/FP	Once	Coordination is performed with personnel on Culebra, FWS, DNER, PREQB, the U.S. Coast Guard, FAA and USAESCH.				Document deficiency and report to SM/SUXOS for resolution prior to initiating project tasks
	SSHP	Visual Observation and Document Review	PP/IP/FP	Daily	Work zones and exclusion zones are properly established.				Document deficiency and report to SM/SUXOS for resolution prior to initiating project tasks
	SSHP	Visual Observation and Document Review	PP/IP/FP	Weekly	Break and rest areas established in accordance with reference.				Document deficiency and report to SM/SUXOS for resolution prior to initiating project tasks
	App K Final Supplemental SOPs for Endangered Species Conservation and their Critical Habitat (CESAJ February 2014)	Visual Observation and Document Review	PP/IP/FP	Once and Follow-up as Required	All field personnel have received a review of the SOP from the team biologist or other qualified (USFWS, NOAA specialists, etc.)				Document deficiency and report to SM/SUXOS for resolution prior to initiating project tasks

Check List

Definable Feature of Work	Reference	Audit Procedures	QC Phase	Frequency of Audit	Pass/Fail Criteria	Pass	Fail	N/A	/
IVS Installation	WP Sec 3.2.2.4	Visual Observation and Document Review	PP/IP/FP	Each Occurrence	Water Depth and proper site selection for the IVS for the DGM Platform the IVS is intended for. Pre-survey of the IVS site location The capture of GPS Coordinates for ISOs				Document deficiency and report to SM/SUXOS/Project Geophysicist for resolution. DGM survey will not be initiated until the deficiency has been resolved.
IVS Certification	WP Sec-3.2.2.4 & 3.2.2.5	Visual observation	PP/IP/FP	Daily as required	Detect all ISOs at IVS				Deficiency will be reported to SM/SUXOS and personnel/equipment will undergo remedial training and certification
	WP Sec-3.2.2.5 App. L, App. K: Forms DGM (Phase 2) Prep, Initial, Follow-up	Visual observation	PP/IP/FP	Daily as required	DGPS checked at a known location and indicates accurate position				Deficiency will be reported to SM/SUXOS and personnel/equipment will undergo remedial training and certification
Snorkeling Operations	WP Sec-3.2 App. L	Document review	PP/IP/FP	Daily as required	Snorkeler maintains the small EM Float Platform on the transect line and ensures the EM coil is maintained as close to the bottom as possible without impacting corals or consolidated hardbottom				Deficiency will be reported to SM/SUXOS and personnel/equipment will undergo remedial training and certification

Check List

Definable Feature of Work	Reference	Audit Procedures	QC Phase	Frequency of Audit	Pass/Fail Criteria	Pass	Fail	N/A	/
DGM Survey	WP Sec-3.2.2.5 and Table 3-3 Appendix F: Forms DGM (Phase 2) Prep, Initial, and Follow-up	Visual Observation and Document Review	PP/IP/FP	Daily as Required	Pre-operations checks performed on detection equipment and ROV equipment.				Deficiency will be reported to SM/SUXOS and personnel/equipment will undergo remedial training and certification Data may be re-collected depending on the results of the Root Cause Analysis (RCA)
	WP Sec-3.2.2.7	Visual Observation, Document Review	IP/FP	Daily as required	Locations of suspected MPPEH discovered by (Snorkelers-Small Float EM 61, EM 61 ROV Camera) recorded and reported to USACE.				Deficiency will be reported to SM/SUXOS. UXOQC will verify resolution procedure Data may be re-collected depending on the results of the RCA
	WP Table 3-1	DGM Data Review	IP/FP	Daily (upon completion of a Transect)	Completed DGM Transects results were with the WP Parameters • Speed • Transect Offset • Along line • Altitude (as applicable)				Project Geophysicist will report deficiencies to SM/SUXOS. Site Geophysicist will propose resolution to deficiency and will be concurred with by Project Geophysicist, approved by SM/SUXOS.

Check List

Definable Feature of Work	Reference	Audit Procedures	QC Phase	Frequency of Audit	Pass/Fail Criteria	Pass	Fail	N/A	/
Small Boat Operations	WP Sec-3.2.2.8, Sec-6, App. K	Visual Observation	IP/FP	Daily as Required	Vessel operating in a manner to protect natural resources but remains functional in field operations				Deficiency will be reported to SM/SUXOS and boat operator will perform remedial training and certification.
Monitoring for marine mammals and sea turtles during water borne operations	App K Final Supplemental SOPs for Endangered Species Conservation and their Critical Habitat (CESAJ February 2014) App F: Form "Daily Observer Log" WP Sec – 6.3.4	Visual Observation and Document Review	IP/FP	Daily as Required	Daily Observer Log Sheet is completed and submitted daily following the parameters described in the listed SOP.				Deficiency will be reported to SM/SUXOS and personnel will undergo remedial training on completing and maintain the logs.

FINDINGS	
Item	**Comments**

Conducted By: _____ **Reviewed By:** _____

DAILY OBSERVER LOG SHEET
DERP-FUDS PROPERTY NO. I02PR0068
CULEBRA, PUERTO RICO

PROJECT INFORMATION	
Contractor: Parsons	Munitions ResponseSite#:
USACE Contract#: W912DY-09-D-0062, TO 0010	Project Location: Culebra, Puerto Rico
Observer Name (and Company):	Observer Location:
Date: Time:	Shift Start: Shift End:
Sunrise: Sunset:	Crew:

Weather and Visibility Information

Location	Time	Glare	Water Clarity	Seas (wave height)	Visibility	Wind Speed and Direction	Conditions on Land	Estimated % Cloud Cover

Sighting Log

Time	Location Coordinates	Species	Total Number	Adults	Juveniles	Closest Distance to Vessel	Activity or Behavoir and Direct of Movement	Time Last Seen

Daily Summary

Species	Total Number	Total Number Outside 50 feet	Total Number Inside 50 feet	Action Taken

Remarks:

_____

_____

Observer Signature: _____

APPENDIX G. RISK ASSESSMENT WORK PLAN

This plan will be provided in the Intrusive Phase Work Plan (Phase 3).

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APPENDIX H. RESUMES

This appendix contains resumes for the following Parsons and USA personnel:

- Berry, P.
- Grunwald, E.
- Bourque, T.
- Crownover, R.
- Crandall, A.
- Lewis, J.
- Skubin, B.
- Soler, R.
- Padover, M.

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PARSONS
3577 Parkway Lane • Suite 100 • Norcross, Georgia 30092 • (770) 446-4900 • Fax: (770) 446-4910 • www.parsons.com

May 5, 2015

U.S. Army Engineering & Support Center, Huntsville
ATTN: CEHNC-OED (Mr. Roland Belew)
4820 University Square
Huntsville, AL 35816-1822
256-895-9525

Subject: Certification of Personnel for MRS 07 Culebrita Artillery Impact Area Water Acreage and All Cayos of MRS 2, EM Survey Work Plan, May 2014

Dear Mr. Belew,

I certify that the following personnel meet or exceed the contract requirements for the functions they will perform under the Culebrita Task Order. Resumes that verify experience and training are attached in Appendix H of the Work Plan.

Name	Company	Job Title
Patricia Berry	Parsons	Project Manager
Edward Grunwald	Parsons	Certified Industrial Hygienist
Tom Bourque	USA	Project Manager
Robert Crownover	USA	Project QC Manager
Al Crandall	USA	Project Geophysicist
Jeffery Lewis	USA	GIS Manager
Brian Skubin	USA	Project Engineer
Rolando Soler		Marine Wildlife Observer
Mark Padover	ASI	Lead Field Scientist/ Site Geophysicist

If you have any questions or comments, please contact me at (678) 969-2410.

Sincerely,
Parsons
Patricia T Berry

Patricia T. Berry
Project Manager

Patricia T. Berry
Project Manager

Experience Summary

Patti Berry has over 28 years experience as a project manager and technical leader with the Federal Government and private industry. Duties have included preparation of proposals, management of projects including client communications and correspondence, tracking of budgets, review of invoices, and writing and editing reports and policy documents. She is currently managing Remedial Investigation/Feasibility Studies (RI/FS) and Remedial/Removal Actions for the U.S. Army Corps of Engineers (USACE) Client. Ms. Berry was the project manager for several Engineering Evaluation/Cost Analyses (EE/CA) and preparation of munitions related policy documents during her Government career.

Years of Experience

28

Years with Parsons

3 years

Education

M.S., Management, 2000, University of Alabama, Huntsville

B.S., Engineering Science and Mechanics, 1984, Virginia Tech

Certifications

Level III Certified, Program Management, Defense Acquisition Workforce Improvement Act, 2009

Experience Record

Parsons Project Manager. As a Parsons Certified Project Manager, Ms. Berry is/was responsible for managing the following RI/FS and Remedial Action projects:

- Camp Sibert Site 2A CACM Removal and RI/FS. Serves as PM for this project beginning with the preparation of the Site Specific Final Report for the CACM Removal and preparation of the RI Report for the RI/FS tasks. This project investigated the nature and extent of munitions and explosives of concern/chemical warfare materiel, and munitions constituents at a number of MRSs at former Camp Sibert in Alabama.
- Camp Sibert Remedial/Removal Action. Serves as PM for the removal of MEC at five MRSs at former Camp Sibert in Alabama. Successfully implemented UXO Classification at two MRSs during the execution of this project.
- Culebra RI/FS. Serves as Parsons PM in support of USA Environmental (Prime) in development of the Risk Assessment for several MRSs at Culebra, Puerto Rico. Parsons' responsibilities include groundwater survey support, oversight of monitoring well installation and GW sampling, marine sediment lab analysis and data validation, and preparation of the Risk Assessment for the RI Report.
- Northwest Peninsula of Culebra Site Inspection. Managed all aspects of the NWP of Culebra project for the final delivery of a SI Report to Congress. Work included TPP, work plan, DGM/Intrusive investigations, and SI Report tasks. Project successfully closed out on time and within budget.
- Camp Sibert RI/FS. Managed completion of the project from preparation of the RI/FS Report through closeout, to include preparation of Proposed Plans and Decision Documents. This project investigated the nature and extent of munitions and explosives of concern/chemical warfare materiel, and munitions constituents at a number of MRSs at former Camp Sibert in Alabama.

- Bushnell AAF Chemical Agent RI/FS. Served as Parsons PM in support of USA Environmental (Prime) in development of the TPP materials, work plan, RI Report, Public Involvement Plan, and execution of the field work for the investigation of Chemical Agent/MC contaminated soil. Project successfully closed out on time and within budget.

Parsons Technical Leader. As technical leader, Ms. Berry has led the development of work plans and reports to include the following:

- Orlando Range and Chemical Yard RI/FS. Led development of the work plan for the investigation of two munitions response sites (MRSs) and one area of interest that have been affected by the demonstration of munitions as part of Army Air Corps training during World War II.
- Withlacoochee Chemical Warfare Service Field Trials and Air-to-Ground Bombing and Gunnery Range, FL RI/FS. Assisted in preparing Technical Project Planning materials, the work plan, and Chemical Safety Submission for the project.
- Pinecastle Jeep Range, FL RI/FS. Reviewed Proposed Plan and Decision Documents for technical adequacy.

USAESCH Project Manager. Ms. Berry managed several munitions related projects while employed by the OE Design Center, USAESCH. Specific projects are:

- EE/CA, Conway Bombing and Gunnery Range, SC (FUDS)
- EE/CA, Camp Croft, SC (FUDS)
- EE/CA, Waikoloa Maneuver Area, HI (FUDS)
- EE/CCA, Camp Bonneville, WA (BRAC)
- EE/CA, Savanna Army Depot, IL (BRAC)
- EE/CA, Fort Ord, CA (BRAC)
- EE/CA, Joliet Army Ammunition Plan, IL (BRAC)

In addition, Ms. Berry co-authored or managed the preparation of the following policy documents while employed by the USACE MM CX:

- ER 200-3-1, Environmental Quality - Formerly Used Defense Sites (FUDS) Program Policy
- ER 1110-1-8153, Military Munitions Support Services
- EM 1110-1-4009, Engineering and Design, Military Munitions Response
- EP 1110-1-17, Establishing a Temporary Open Burn and Open Detonation Site for Conventional Ordnance and Explosives Projects
- EP 1110-1-18, OE Response

As a USACE employee, Ms. Berry temporarily served as the Special Assistant to the USACE SES Member, Environmental Programs, for the Military Munitions Support Services Program (January – April 2007). In this capacity, she served on the USACE's Senior Leader Advisory Board for the MMRP and provided guidance and direction to USACE offices for strategic management of MMRP services. Ms. Berry led the Advisory Board meetings in the absence of the SES member. Ms. Berry promoted USACE MMRP services to DoD and other Government agencies through development of publications and pamphlets, magazine articles, and capabilities briefings.

Ms. Berry also served as a Team Leader for the MM CX Mentoring Program, coordinating all aspects of the Engineering workshops to mentor USACE Districts in executing MMRP projects. Topics included work plan and report preparation requirements, use of engineering controls, and geophysical investigation procedures, and processes.

EDWARD L. GRUNWALD, C.I.H.
Industrial Hygiene/Construction Safety Specialist

Experience Summary

Extensive experience in the development and management of safety and health programs.

Years of Experience

29

Years with Parsons

27

Education

MS, Public Health (Toxicology Specialization), 1982, University of Massachusetts, Amherst, Massachusetts

BS, Bacteriology, 1978, Ohio Wesleyan University, Delaware, Ohio

Experience Record

Sector Safety Manager (2011-Present). Responsible for the development and implementation of safety initiatives within the Environmental Services Sector of the Parsons Government Services GBU. Responsibilities entail:

- Developing sector safety goals and communicating goals and expectations to sector personnel
- Developing and implementing safety training initiatives
- Managing the Parsons Occupational medical Program
- Reviewing and approving project health and safety plans
- Providing IH and ambient air monitoring support to the projects
- Developing SOPS and AHAs for field and office operations
- Establishing a safety audit program (develop audit schedule, perform inspections, issue audit reports, review and track corrective actions, and close-out audit)
- Participating in weekly conference calls with Sector project managers
- Participating in proposal development process (Develop safety section write-up for proposal , provide safety statistics to answer client questionnaires, and prepare EPR safety section write-up)
- Investigating incidents and developing corrective measures to prevent recurrence

Corporate Health and Safety Manager (1996-2002). Responsible for the development, standardization, and implementation of health, safety, and training programs throughout Parsons Infrastructure and Technology (Parsons I&T). Authored the Parsons I&T Health and Safety Policies and Procedures Manual, the Health and Safety Training Manual for Hazardous Waste Operations, the Construction Safety Training Manual, the Laboratory Safety Training Manual, and the Health and Safety Training Manual for Supervisors.

Specific duties included:

- Updating the Parsons I&T Health and Safety Manual to comply with new regulations or policies.
- Developing and implementing safety training programs for employees.
- Managing the occupational medical monitoring program.

- Performing audits of Parsons I&T facilities and projects to verify compliance with established policies, procedures, and plans.
- Investigating accidents and incidents and develop corrective actions.
- Establishing procedures to evaluate the safety programs of subcontractors prior to hiring.
- Supervising facility health and safety representatives.
- Publishing monthly safety newsletter to notify personnel of new OSHA regulations or corporate requirements.
- Developing health and safety plans for projects.

Project Health and Safety Manager-E3200 block building assessment, Aberdeen, Md (2013). The objective of this $1.8million task order was to perform an environmental characterization of 14 buildings located within the E3200 Block of Aberdeen Proving Grounds (APG). . Characterization involved identification of the presence of chemical agent (CA), biological agent (BA), radiological constituents, and other regulated materials (ORM) which consist of asbestos, lead-based paint, polychlorinated biphenyls (PCBs), and mercury. Responsibilities involved:

- Developing Accident Prevention Program, Site Safety and Health Plan, AHAs, and project-specific SOPs (Radiation protection, medical surveillance, Heat stress prevention, etc)
- Providing site-specific orientation training for the field team and prepping team for Huntsville pre-op survey
- Performing audits to verify that project control documents and USACE requirements (EM 385-1-1)
- Investigating any incident and developing corrective actions to prevent recurrence
-

Project Health and Safety Manager-South Cobb Tunnel, Austell, GA (2008-present). The $305 million project includes 6 miles of tunnel and a 160 MGD lift station to provide Cobb County Georgia with conveyance and equalization of wastewater flows to meet projected demand through 2040. My responsibilities include:

- Developing and revising the H&S plan for Parsons/Jacobs Construction Management team
- Reviewing and commenting on the Shea/Traylor (General Contractors) health and safety submittals
- Performing periodic audits to verify that Shea/Traylor personnel and their subcontractors are complying with applicable plans ad requirements (i.e. The Shea/Traylor H&S Program, Contract Documents and applicable OSHA and State requirements.)
- Investigating accidents, injuries, and near-misses
- Providing training (10hr OSHA outreach construction, 30-hr OSHA outreach construction, emergency response and self-rescue training, First aid/CPR, HAZCOM, etc)
- Validating through industrial hygiene compliance sampling that the OSHA PEL for crystalline silica is not being exceeded during tunneling operations (tunneling through granite containing 20% quartz).
- Participating in progress meetings with client

Project Health and Safety Manager-Spring Valley Formerly Used Defense Site, Washington D.C. (2006-present) This project involved the investigation of sites in downtown D.C. for chemical warfare materiel (CWM), munitions and explosives of concern (MEC), and

munitions constituents (MC). My responsibilities included:

- Developing program H&S, APP, and chemical submission plans
- Reviewing and approving site specific H&S and APP plans
- Participating in monthly partnering meetings with EPA, Huntsville COE, Baltimore COE, American University, and neighborhood groups
- Conducting audits of site operations for compliance with project plans and SHARP requirements
- Conduct Industrial hygiene monitoring: Evaluate noise levels associated with field operations for compliance with OSHA noise std and determine is neighborhood noise ordinances are being met; perform IH monitoring to evaluate employee exposures to mercury and lead.
- Providing assistance to Huntsville COE (for example, evaluating and providing recommendations on instrumentation to use for monitoring low levels of arsine)
- Responding to comments from COE, EPA, and American University
- Providing assistance to field and management personnel on health and safety issues.

Program Health and Safety Manager-Army Corps of Engineers Munitions Response Services Program (2004-2013). The object of this contract is to provide conventional and Recovered Chemical Warfare materiel (RCWM) Munitions Responses and other munitions related services at various FUD sites, active DOD installations, BRAC sites, and other federally controlled sites that have been impacted by Munitions and Explosives of Concern (MEC). Responsibilities included:

- Developing program H&S plan/APP
- Reviewing and approving site specific H&S plans (over 50 to date)
- Providing training (8-hr HAZWOPER, 10-hr OSHA construction outreach, CPR/First aid, site specific, CWM/Ordnance recognition, confined space, etc)
- Enrolling personnel into medical surveillance program
- Developing a database to track personnel training/ medical monitoring experience(over 75 Parsons employees work on this program)
- Conducting audits for compliance with H&S plan requirements
- Providing assistance to field and management personnel on health and safety issues.

Program Health and Safety Manager- Snap finger and Pole bridge WWTP expansion program (2008-2012). This program entails the design and construction of two WWTP and a biosolids facility in Dekalb County, GA. This construction value is $500M. My responsibilities included:

- Performing safety review of design drawings
- Communicating program safety goals with 17 subcontractors
- Reviewing subcontractor safety plans for compliance safety specs and requirements
- Chairing Project H&S committee
- Developing and revising as necessary the program H&S plan
- Conducting period audits to verify compliance with specs and plans
- Performing safety training for Parsons and subcontract employees
- Participating in monthly partnering meetings

Program Industrial Hygienist-BP Near Shore Skimming Operations (2010)-Developed air monitoring protocol and a heat stress prevention program for the nearly 600 Parsons employees performing oil skimming operations at 28 location along the Alabama, Mississippi, and Florida coasts.

Project H&S Manager-Haiti Debris Removal and Operations Support (2010)- The US Naval

Facilities Command retained Parsons to conduct debris removal and other support operations at various sites around Haiti following the 12 January 2010 magnitude 7.3 earthquake. My responsibilities involved:

- Developing and implementing a medical monitoring/inoculation program for Parsons and subcontract employees working in Haiti
- Developing and enacting a malaria prevent program for Parson and subcontract employee
- Establishing a security program for Parsons and subcontract employees
- Developing a H&S plan and APP that complied with OSHA and USACE requirements
- Providing safety training to personnel being deployed to Haiti
- Participating in daily conference calls with field team
- Investigating incidents (accidents and near misses)

Project Health and Safety Manager-Gwinnett County Reuse Pipeline and Diffuser Project (2008-2010)-Work under this project entailed the construction of a 72" diameter, subaqueous outfall pipeline and diffuser in Lake Lanier, Georgia. My responsibilities included:

- Developing a Project Health and Safety Program
- Reviewing contractor and lower tier subcontractor safety submittals
- Providing safety training to Parsons inspectors (10-hr OSHA construction outreach, confined space training, commercial diver safety overview training)
- Conducting monthly safety audits to verify contractor compliance with contract specifications, OSHA requirements and project plans
- Periodically meeting with client and General Contractor to discuss safety issues
- Submitting monthly safety reports to client

Program Health and Safety Manager-AFCEE Heavy Engineering Repair and Construction Program (2006-2009). Program involved a full range of methods and technologies supporting activities necessary to design and construct new facilities and infrastructure. Requirements were carried out under task orders in various locations worldwide with typical low-end TOs of $2-5Million. My responsibilities involved : developing the program H&S manual and AHAs, reviewing and approving project specific H&S plans, providing assistance to PMs and Site Safety Officers, conducting project audits, developing SOPs and training programs, and writing and submitting corporate risk reviews.

Program Health and Safety Manager, U.S. Army Defense Environmental Restoration Program OE/CWM and HTW Assessments (1996-2009). Provided health and safety program management of multidisciplinary workforce that included 200 Parsons employees from 20 offices and over 30 subcontractors. Specific responsibilities entailed: reviewing and approving project safety and health plans for over 30 OE/HTW sites and 6 CWM sites, developing and implementing site-specific training programs for OE/CWM workers; performing audits of OE/CWM/HTW operations and developing corrective action programs when findings were discovered, assisting field teams prepare for DA

safety audits (CWM sites); reviewing near miss and accident reports (3394 form) and developing measures to prevent recurrences, periodically meeting with Parsons OE safety personnel to review the OE/CWM program and assess where improvements can be made, and interfacing with USAESCH safety personnel (involved providing monthly safety reports, periodically developing safety guidance manuals and "White Papers," and meetings with COE safety and health personnel.)

Construction Safety Manager, Hurlburt Field, Florida (2006-2008). The scope of work under this contract was to perform repairs and upgrades to eight buildings at Hurlburt Field, Florida. A major component of the work involved the fabrication and installation of sixteen 20 x 63 foot hanger doors at Eason Hanger before start of hurricane season (June 1st). My responsibilities involve:

- Developing a Project Health and Safety Program
- Reviewing subcontractor safety submittals
- Providing workforce safety training (project orientation and task specific safety trainings [ie crane safety, fall protection, lockout/tagout, mobile scaffold safety, etc)
- Conducting inspections to verify compliance with safety requirements
- Developing and updating AHAs
- Reviewing incident reports and developing corrective actions

Program Health and Safety Manager, Fulton County, Georgia (2001-2006). Program Health and Safety Manager of a joint venture that provided Program and Construction Management (PCM) services for Fulton County's Water Services Division. Responsibilities included:

- Developing contract safety specifications for Fulton County
- Reviewing contractor and subcontractor safety submittals for compliance with bid specifications and OSHA requirements
- Interacting with Fulton County Loss Control Division
- Managing contractor and subcontractor OCIP enrollment
- Interfacing with OCIP insurance carrier and broker
- Developing Health and Safety program for joint venture team
- Performing inspections to verify that contractors and subcontractors are following contract specifications and applicable federal, state, and local safety requirements
- Developing & Implementing training programs for Joint Venture personnel (project orientation, 10-hr OSHA constructions safety, Permit-Required confined Space entry training, electrical safety, CPR/First aid, OCIP enrollment and reporting, etc)

The Parsons PM Team received safety awards and commendations from:

1) Georgia Department of Labor- Award of Safety excellence; "in recognition for outstanding workplace safety" (2004)

2) Fulton County Board of Commissioners- August 18, 2004 was proclaimed Parsons PM Team day. The Fulton County Commissioners praised Parsons safety record in the performance of difficult and high risk tasks (714 days without an injury)

3) Parsons Water & Infrastructure Group- Project safety award (2005)

4) National Safety Council- Perfect Record Award (2006)

Project Manager (2001) Hired by Delta Airlines to investigate a potential hydrocarbon leak from its fuel farm located at Atlanta Hartsfield Airport. Field tasks involved the:

- Collection of 6 soil borings to evaluate subsurface contamination;
- Installation of 6 ground water monitoring wells and collection of ground water samples; and
- Entry into the Flint River culvert to collect surface water samples to evaluate petroleum infiltration.

The Flint River sampling event was a permit confined space operation that involved entry into the 18-foot wide, 2-mile long culvert that runs under the airport. Eight surface water samples were collected and analyzed for petroleum hydrocarbons. Elevated petroleum hydrocarbon levels were not detected in down-stream samples.

Project Manager (1999-2001). Contracted by Public Works Department of Atlanta, Georgia to provide operations and maintenance employees at five wastewater treatment plants with hazard communication training. The course was designed to provide plant employees with information on the hazards associated with the chemicals in their workplace and the protective measures they can implement when handling these chemicals. Training involved both "hands-on" exercises and multi-media lectures (involving slides, VHS tapes and overheads) to enhance the retention of information. The training received excellent reviews from Public Works personnel.

Construction Safety Manager (1999-2005). Retained to provide construction safety services on a 10 mile $137 million dollar sewer interceptor tunnel project in Cobb County, Georgia. The workforce consisted of 100 workers from 3 different contractors operating 3 shifts per day. Responsibilities involved:

- Reviewing subcontractor safety plans and procedures
- Performing audits to verify contractor compliance with contract specifications and procedures
- Conducting crystalline silica worker exposure monitoring to verify compliance with OSHA/MSHA requirements
- Developing and implementing safety training programs (respiratory protection, explosives use and handing, controls to reduce silica exposure, emergency response and rescue, etc)

Technical Manager (1997-2000). Retained by BellSouth to: 1) Identify and classify confined spaces located on BellSouth properties and 2) develop a confine space database that provides safety information for each space. To date, over 1,400 confined spaces at 500 BellSouth facilities have been identified. Approximately, a third of these spaces have been classified as a permit-required confined space indicating that the space contains a safety or health hazard.

The confined space database provides hazard and logistic information on each space (space classification, atmospheric measurements, types of safety hazards inside space, location of space on property, space ID number, interior dimensions of the space, and proper entry procedures). When employees or contractors anticipate entry into a permit-required confined space they are required to call BellSouth's Facilities Management Department prior to entry. The Facilities Management Department accesses the database and informs the entrants of the specific hazards associated with the space and the

proper procedures to use for entry. This process ensures that workers are informed of the hazards so entry is performed safely.

Project Manager (1998). Retained by the Paulding Country Public Works Department to provide construction safety training. Training topics included:

- Excavation and trenching safety
- Electrical safety
- Personal protective equipment
- Heavy equipment safety
- Fall protection
- OSHA overview

The Director of Public Works praised the training program and recommended it to the County Department of Transportation.

Project Manager (1997) Contracted by insurance company to perform indoor air investigations at 3 homes where there were homeowner complaints. These investigations entailed:

- Interviewing homeowners
- Reviewing architectural drawings
- Performing visual survey of homes
- Conducting moisture testing of walls, floors, and ceiling
- Performing fungal sampling
- Performing volatile organic sampling

At two homes, visible mold was present on basement walls. (The insurance company later remediated the mold and constructed french drains along the perimeter of these homes.) At the third home petroleum hydrocarbons were detected in the basement (a gas station was located adjacent to the home).

Project Manager (1996 - 1997). Retained by the Metropolitan Atlanta Rapid Transit Authority (MARTA) to oversee lead paint abatement operations inside 23 box girders on the MARTA rail-lines. Responsibilities included:

- Review abatement contractor's submittals for compliance with project specifications.
- Oversee field operations. Document deviations from specifications.
- Perform OSHA compliance sampling to evaluate workers' exposure to lead dust.
- Conduct ambient air monitoring to evaluate lead dust emissions during abatement operations.
- Perform wipe sampling to ascertain the presence of residual lead on the surfaces of the box girders after abatement.
- Verify proper disposal of lead waste.

Task Manager (1996). Provided air monitoring services for a petroleum pipeline company. The purpose of the monitoring was to identify and quantify the concentrations of petroleum hydrocarbons vapors inside a cave system located adjacent to a diesel fuel spill site. Quarterly air samples were collected from 31 caves and vents in an effort to determine the exposure potential of recreational spelunkers. Sample results were compared to occupational exposure limits (OSHA PELs and ACGIH TLVs)-- the levels considered safe by the Tennessee Environmental Protection Division.

Technical Manager (1994-1995). Designed exposure monitoring study for Johnson Controls. The national contract with Johnson Controls involved the assessment of employee exposure to the refrigerant 2,2-dichloro-1,1,1-trifluoroethane during scheduled and emergency repair of chiller units. Additionally, the study evaluated mechanical room ventilation systems for adherence to American Society of Heating

Refrigeration and Air Conditioning Engineers (ASHRAE) Standards.

Task Manager (1994). Conducted indoor air quality (IAQ) assessment of a Metropolitan Atlanta Rapid Transit Authority office building. The assessment involved:

- Development and distribution of employee questionnaire and the evaluation of data for clusters;
- Visual walkthrough of areas identified as having a high incidence of occupant complaints;
- Inspection of HVAC system and review of maintenance procedures; and
- Collection and evaluation of mold and volatile organic samples.

From collected data, recommendations were made to eliminate employee IAQ complaints.

Task Manager (1994). Conducted 40-hour hazardous waste operations safety training for Mobil Oil employees.

Project Manager (1993). Responsible for the design and implementation of an industrial hygiene air survey for a petroleum pipeline company in Georgia. The study investigated employee exposure to lead and zinc oxide fumes associated with arc welding and oxyacetylene cutting during the construction of a drum storage facility.

Project Manager (1993). Managed several asbestos abatement projects for Metropolitan Atlanta Rapid Transit Authority (MARTA). Responsibilities included:

- Bulk sampling to confirm asbestos containing materials.
- Review abatement contractors qualifications and develop removal specifications.
- Perform oversight of abatement activities
- Conduct background, work area, clearance and OSHA compliance air sampling.

Project Manager (1992). Developed and performed occupational health and training for construction service and engineering personnel employed by MARTA.

Project Manager (1991 - 1992). Responsible for evaluating health and safety risk and recommending measures to control employee exposure at an automotive manufacturing facility located in Georgia.

Task Manager (1991). Developed and provided construction safety training for design and construction service personnel contracted by the Chinese Petroleum Company to manage the building of the Kaohsiung refinery's wastewater treatment system.

Project Quality Assurance Manager (1985-1990). Two industrial site investigations and contamination assessment projects and two remedial investigation and feasibility study (RI/FS) IRP projects for the U.S. Air Force. Responsibilities included the development of quality assurance project plans, the auditing of field and laboratory procedures, issuance of audit findings, and validation of laboratory and field data.

Toxicologist (1985 - 1990). Authored public health risk evaluations for several multi-site RI/FS projects.

1983 - 1985. NUS Corporation, Atlanta, Georgia.
Regional Safety Manager (1983 - 1985). Worked as a member of multidisciplinary field investigation team (FIT) under contract with the U.S. Environmental Protection Agency (USEPA). Duties as a safety officer included the instruction of USEPA, FIT, and State Emergency Response Personnel in hazardous waste operations. Topics of the training included the following areas:

protective clothing, respiratory protection, air monitoring instrumentation/OSHA regulations, site control, and site characterization. Developed the Health and Safety Standard Operating Procedures for the USEPA Region IV FIT.

As a **Quality Assurance Manager** (1983 - 1985) for the Region IV FIT, developed quality assurance/control standard operating procedures. Performed audits on several RI/FS projects to insure compliance with USEPAs, NEICs, and FITs quality assurance procedures. Coauthored the Quality Assurance Manual for Remedial Response Activities at Uncontrolled Hazardous Substance Facilities, Zone 1. Selected topics from this manual include: the development and control of work plans, document control, remedial design control, data acquisition, field data collection, subcontractor quality assurance requirements, identification and control of laboratory samples, auditing, etc. These procedures were adopted by USEPA and Zone 1 FIT.

Project Manager (1983 - 1985). Site investigations at eight Superfund sites, under contract with USEPA Region IV. The activities performed at these CERCLA sites included the installation of monitoring wells and the sampling of soils, sediments, groundwater, and surface waters. One site involved the excavation, sampling, and removal of drums containing corrosive materials (mineral acids). The level of protection utilized by personnel for this included the use of fully encapsulating suits and self-contained breathing apparatuses. Ranked all sites utilizing the Hazardous Ranking System (HRS).

Professional Affiliations

Certified Industrial Hygienist, Comprehensive Practice No. 5133

American Board of Industrial Hygienists

American Academy of Industrial Hygienists (Diplomat)

American Industrial Hygiene Association

Georgia Local Section- American Industrial Hygiene Association (former Officer)

AIHA Environmental SIG (Member)

Georgia AIHA Government Affairs Committee

Papers and Publications

“Safety and Health Issues Associated with the Cleanup of Formerly Use Defense (FUD) Sites”, presented at Joint ASSE/AIHA meeting, November 10, 2008.

"Exploding Trailer Incident Investigation," presented at American Industrial Hygiene Conference and Exposition, May 1995.

"Safety Considerations of Underground Storage Tank Investigations," presentation to the Arizona Society of Safety Engineers, 1985.

"Health and Safety Considerations for Hazardous Waste Operations," presented at the USEPA Region IV sponsored Symposium on the Progress of Regional and State Superfund Programs, July 1984.

"Protection by Ascorbate Against Acetylphenylhydrazine Induced Heinz Body Formation in Normal Human and Sheep Erythrocytes," *The Journal of Environmental Science and Health*, Volume 6, pp. 897-902, 1982.

"Ozone-Induced Decrease of Erythrocyte Survival in Adult Rabbits," *Advances in Modern Environmental Toxicology*, Volume 5, 1982.

""The Salmonella/Mammilian-Microsome Mutagenicity Test," presented before the Honor Society of Ohio Wesleyan University, June 1978.

THOMAS BOURQUE **PROJECT MANAGER**
USACE UXO # 2425

Date Completed Basic EOD School: March 1982

OTHER PERTINENT TRAINING: HAZWOPER 40 HOUR CRS: MAY 10, 2002, CURRENT HAZWOPER SUPERVISOR/REFRESHER, MASTER EOD TECHNICIAN (NEC 5337)

MILITARY EOD ASSIGNMENTS:

March 82 – July 89	Various Explosive Ordnance Disposal Operational Tours.
Aug 89 - May 93	Explosive Ordnance Disposal Technician/Field Operator, Naval Special Warfare Development Group, Damn Neck, VA Primary duties classified. Collateral responsibilities included Intelligence Officer and EOD Training Officer. Developed requirements, concepts and testing on special equipment and procedures for command and Army Special Forces EOD Technicians.
Jun 93 - Jun 95	Leading Chief Petty Officer, EOD Mobile Unit 5 Detachment, Guam Supervised 8 personnel. Managed detachment's training schedule and instructed on all EOD missions to Naval Base First Responders. Responsible for all mission planning and coordination of emergency EOD response to the Marianas Island Chain. Detachment Guam's area of operations included supporting local and federal law enforcement for Improvised Explosive Devices.
Jul 95-Sep 98	Air Operations and Surface Ordnance Department Head, EOD Training and Evaluation Unit ONE, HI Developed the Criteria, curriculum and evaluation process for teaching EOD Detachments on the subjects of: WMD, IED, Nuclear Weapons, Chemical and Biological Weapons and all ordnance items designed for a surface warfare application.
Oct 98-Nov 00	Command Master Chief (CMC) and Assistant Operational Inspection Officer, EOD Mobile Unit 5, Guam Supervised 110 enlisted personnel. Managed all advancement programs and command personnel initiatives. Managed the training and inspection cycles for all EOD, Shore, MCM, and Sea Detachments. Established the Training Curriculum and Inspection guides. Performed all inspections/evaluations of detachments during normal training cycles and fleet exercises.
Dec 00-Feb 03	Assistant Officer In Charge, Explosive Ordnance Disposal (EOD) Mobile Unit 3 Detachment Middle Pacific, Pearl Harbor Technical manager, supervising 8 personnel in all operational missions and administrative functions. Manage, procure funding and coordinate all aspects of 120 EOD missions. All missions required extensive logistical and operational planning.
Feb 03-May 03	Instructor, USIS Professional Services, Dos/Ata Program, Kabul Afghanistan Improvised Explosives Devices and Military Ordnance Instructor. Training Afghanistan Presidential Military Security Force Personnel in protection services. Training included planning and execution of motorcade routes, searching and inspecting for Improvised Explosive Devices or booby traps, Presidential Security, and the rendering safe of terrorist or military weapon systems
Jun 03-Sep 05	CNRH Assistant Kahoolawe Project Manager, Commander Navy Region Hawaii (CNRH) and Assistant Operations Officer

Supervised the close out of the Kahoolawe Bombing and Gunnery Range; a 460 million dollar project. Provided Navy over site and management to Parsons/UXB Joint Venture, two Navy Commands and three levels of State and Federal government. Balanced a myriad of sensitive Native Hawaiian issues, State of Hawaii restoration efforts and the Navy's ordnance removal work on the largest cleanup ever attempted to date by the Department of Defense. Lead Navy representative at State Commission meetings. Provided valuable insight on unexploded ordnance process /perspectives on site management to both Commander Navy Region Hawaii (CNRH) and the contractor.

CIVILIAN UXO ASSIGNMENTS:

OCT 05 - APR 13 NATIVE HAWAIIAN VETERANS, LLC PROGRAM MANAGER AND VICE PRESIDENT OF OPERATIONS

Oct 08-Aug 09 Project Manager, Removal Action & Supporting Functions, Former Waikoloa Maneuver Area, Waikoloa and Waimea, Hawaii Island, Hawaii
Native Hawaiian Veterans, LLC PM for the sweep team subcontract to the Dawson/Environet JV

Oct 09-Dec 09 Project Manager, UXO Institutional Controls And Awareness Training For The Big Island (Hawaii) (USACE W9128a-09-P-0049)
Native Hawaiian Veterans, LLC PM Established UXO institutional controls to targeted schools on the island of Hawaii. Performed the UXO Safety Awareness instruction for target audience of children 12 years and under.

Oct 09-Dec 12 Project Manager, Unexploded Ordnance (UXO) Safety Awareness Training and Institutional Controls for the Leeward Coast of Oahu, Hawaii (USACE W9128A-09-T-0027)
Native Hawaiian Veterans, LLC PM Supervised the establishment of UXO institutional controls to targeted schools on the Leeward Coast of the island of Oahu. Designed and implemented UXO Safety Awareness software to accompany the purchase and delivery of Computer Labs to Leeward Coast Schools.

Oct 08-Dec 12 Project Manager, Discarded Military Munitions (DMM) Disposal Alternatives Study and Community Outreach Program for Ordnance Reef Operations And Supporting Functions (USACE W9128A-08-T-0025)
Native Hawaiian Veterans, LLC PM Supervised the Developed a Community Outreach Program as well as a Feasibility Study for the screening of disposal alternatives to address the DMM at the Ordnance Reef site, Waianae, Hawaii.

Nov 10 – Aug 12 Project Manager for Kanahena Point RI/FS
Native Hawaiian Veterans, LLC PM for conducting an underwater RI/FS operations over an 800 Acre underwater Ahihi-Kinau NARS site. Work includes all RI/FS activities to include developing the Dive Plan, QC, Safety, TPP process, site operations and reports. NHV is a subcontractor to Huikala, LLC.

Feb 11 - Nov 12 Project Manager for Hawaii Army National Guard (HIARNG) Site Inspection (SI)
Native Hawaiian Veterans, LLC PM for conducting an SI for 4 HIARNG MRS sites on three different islands, SI requires through soil and site analysis a decision factor for continuance within the CERCLA process or a recommendation for no further action.

Sep 11 – Apr 13 Project Manager for USACE RI/FS

	Oahu Target Island, Oahu and Makanalua Bombing Range, Molokai Malama Aina JV, LLC (NHV/USA E Joint Venture) PM for the overall award and PM for Oahu Target Islands, an Underwater RI on Oahu North Eastern shore.
Sep 12 – Apr 13	Project Manager for USACE RI/FS Former Waikoloa Maneuver Area, Areas D and M Remedial Investigation/Feasibility Study (RI/FS). Area D is 8512 acres and Area M is 5074 acres to be investigated on the Island of Hawaii.
Sep 12 – Apr 13	Project Manager for USACE MRSPP Review Munitions Response Site Prioritization Protocol (MRSPP) for FUDS sites Opana Point Bombing Range, Opana Point Maui and Papohaku Target Range, Kaluakoi, Molokai. Establish a MRSPP grade following the investigation of the assigned sites, this is a three year effort.
MAY 13 - PRESENT	**USA ENVIRONMENTAL INC., SENIOR PROJECT MANAGER**
June 13 - Present	Project Manager to CH2M Hill for Navy Clean contract support
June 13 - Present	Project Manager for USACE RI/FS at the Culebra Island Site, Puerto Rico Project Manager for RI/FS activities including underwater investigation portions of the sites: MRS 06, 08, 09, 10, 11, 13
June 13 - Present	Project Manager for Parsons Prime Contract to USACE for an RI/FS at the Culebra Island Site, Puerto Rico for underwater portions of MRSs 02 and 07
Oct 13 - Present	Project Manager for USACE RI/FS at the Culebra Island Site, Puerto Rico Project Manager for RI/FS for MRS's 02, 04, 05, 07

ROBERT D. CROWNOVER CORPORATE QUALITY CONTROL MANAGER

Date Completed Basic EOD School: AUGUST 1978
Pertinent Training: HAZWOPER 40 Hour, August 1995; Current 8 Hour Supervisor/ Refresher

MILITARY EOD ASSIGNMENTS:

Aug 78 - Apr 80	EOD Technician, 45th EOD, Ft. Polk, LA. Team member who assisted in locating, identifying, removal & destruction of munitions. Member of range clearance team. Assisted in classroom & practical instruction.
Apr 80 - Jun 83	EOD Technician, 72nd EOD, Bremerhaven, Germany. Team member who assisted in determining and implementing render safe & disposal procedures. Range safety NCO. Assisted in training EOD and non-EOD personnel.
Jun 83 - Sep 87	EOD Supervisor, 60th EOD, Ft. Dix, NJ. Assumed command of an EOD Team. Determined render safe and disposal procedures. Performed administrative functions. Supervised other EOD personnel. Conducted range operations.
Sep 87 - May 90	EOD Instructor, EOD Tng. Det #1, Eglin AFB, Florida. Taught courses in ordnance recovery, protection of personnel and property safety, ORD. ID, and access and recovery. Testing of applied instructions. Drafting, finalizing and implementing testing criteria.
May 90 - Sep 90	EOD Supervisor, 52nd EOD, Pine Bluff, AR. Team leader during EOD operations. Range Safety NCO. Conducted training in EOD related matters. Conducted range operations. Performed administrative functions.
Sep 90 - May 91	EOD Supervisor, 16th EOD, Camp Darby, IT. Team leader during EOD operations. Assisted in determining and implementing policy. Range NCO. Safety NCO. Training of other EOD & non-EOD personnel. Regulated administrative functions.
May 91 - Dec 91	EOD Supervisor, 137th EOD, Ft. Sam, Houston, TX. Assumed command of an EOD team. Conducted range safety classes. Conducted training in EOD related matters. Determined render safe and disposal procedures security functions.

CIVILIAN UXO EXPERIENCE:

Mar 93 - Sep 94	UXO Supervisor, CMSI, Kuwait. Team member on minefield team. Conducted sweep, demolition and bunker operations. Field supervisor for 213 Third Country Nationals (TCN) and four EOD technicians. Conducted training for TCN. Supervised disposal operations.
Aug 95 – Jun 96	UXO Specialist, CMS Environmental, Inc., Fort Ord, CA. UXO Team member of a BRAC clearance and removal action.
Jun 96 – Sep 96	UXO Supervisor, CMS Environmental, Inc., Ft. Ord, CA. Sampling and removal of OE.
Sep 96 – Jul 98	UXO Safety Officer, CMS Environmental, Inc., Ft. Ord, CA. Responsible for the overall safety of the project personnel and compliance with the Site Safety and Health Plan.
Jul 98 – Nov 99	UXO Safety Officer, USA Environmental, Inc., Ft. Ord, CA. Responsible for the overall safety of the project personnel and compliance with the Site Safety and Health Plan.
Nov 99 – Mar 12	Corporate Safety & Health Manager/Quality Control Manager, USA Environmental, Inc., Tampa, FL. Responsible for the development and

implementation of USA's Safety and QC programs and plans. Performs project site inspections and audits to ensure compliance with requirements and standards. Reviews draft and final work plans, reports, and associated documents for accuracy, completeness, and content. Interfaces with agencies on safety, health, and/or quality issues at the corporate or job site levels.

Mar 01 – Present Director of Safety/Quality & Field Productivity Oversight, USA Environmental, Inc., Tampa, FL. Responsible for the development and oversight of safety and quality programs, policies and directives. Accomplishes this by coordinating, administering and ensuring implementation of comprehensive training programs in occupational, industrial and environmental safety, and quality control methods and procedures. Ensures reported accidents are evaluated in accordance with current best practices and recommends changes where necessary. Responsible for ensuring a comprehensive and effective Quality Management/Quality Control Program. Point of contact for regulatory agencies on matters of safety, health, and the environment, and the quality of all aspects of contracts' performance.

KEY PERSONNEL RESUME ***ALAN CRANDALL***
CURRENT JOB TITLE ***Senior Geophysicist***

Years of Service with USA: **13 Years**

Dates and Company Name for Experience with Other Firms: 14.25 Years: Geo-Centers, Inc., Sep 1986 – Jun 2001; 13 Years: Naval Explosive Ordnance Technology Division, Jul 1973 – Aug 1986

Education: Bachelor of Science – Electrical Engineering, Lowell Technological Institute, 1973

Active Registrations: N/A

Health and Safety Training – 29 CFR 1910.120: 40-Hour HAZWOPER – 06/1991; Current 8-Hour HAZWOPER Refresher, 06/2012; 8-Hour Supervisor's Course on Health and Safety for Hazardous Waste Site Workers, 1992; ROV Operation, Maintenance and Training for Hydro Product's RCV 225 and ADROV, 1984; Data Fusion and Multisensor Correlation Seminar, 1988

Senior Geophysicist, USA Environmental, Inc., Oldsmar, FL (Jul 2001 – Present). Manages USA's geophysical capabilities including in-house resources and geophysical subcontractors, including processing and interpreting UXO DGM data, ensuring DGM data quality, and DGM data delivery. Managed the development of USA's DGM towed array. A member of the NAOC Technology Committee, and a participant in several ESTCP Advanced Classification workshops.

Project Geophysicist for : Four Engineering Evaluation/Cost Analysis (EE/CA) Task Orders: Former Frankford Arsenal, Philadelphia, PA; Williams Field Target Range #6, Pinal County, AZ, FUDS Portion of Camp Chaffee, Fort Smith, AR, Former Waikoloa Maneuver Area, Phase III, Island of Hawaii, HI. A non time critical removal action on Flamenco Beach, Culebra, PR and 5 beaches around Culebrita, PR, A DGM survey of Test Site, Rock Island, IL, A removal Action of 2 sites on Adak, AK and completion of the RI/FS on Adak, AK, A removal action of 10 ranges on the former Camp Maxey, TX, A Removal Action in Area 12, Raritan, NJ, The RI/FS on two sites, Fort Riley, KS, The pre-construction removal action at the North Tipalao Housing Area, North Ramp Parking Area, and P100, P101, and P204 utility corridors, Guam, The RI/FS on 5 Munitions Response Sites, Culebra, PR, an SI of the Northwest peninsula, Culebra, PR, an RI/FS at Brooksville, FL and Withlacoochee, FL, UXO DGM Technology Demonstration, S. Korea, UXO removal action for Randal Park Housing area, Orlando, FL, RI/FS UXO DGM of Crab Orchard, Marion, IL.

Project Manager for Digital Geophysical Surveys to detect, map, and locate UXO and landfill extent at two sites at the Naval Surface Warfare Center, Dahlgren, VA.; OE Construction Support at Wagner Range, Fort Benning, GA; the Geophysical Meandering Path Technology Demonstration at former Fort Ord, California; UXO Detection Survey at the Picatinny Arsenal Proposed Outdoor Range Facility, Picatinny, NJ; the Expanded OE Time-Critical Removal Action at the Fort Sam Houston Junior High School Site, Fort Sam Houston, San Antonio, TX; the Non-Time Critical OE Removal Action at the Former Armstrong Air-to-Air Gunnery Range, SD; a towed magnetometer array survey of a 100-acre housing development area and the

former EOD Range in North Myrtle Beach, SC; digital geophysical mapping to support the site investigations at the Jackson Park Elementary School, Earlands Apartment Complex, the Kitsap County Health District, NAD Marine Park, and the NAD Soroptimist Park in Bremerton, WA; Geophysical Survey and UXO Removal at Camp Blanding, Clay County, FL and Odyssey Middle School Project, Orlando, FL; Established the geophysical test strip for the Remedial Investigation/Feasibility Study (RI/FS) for the Former Popoki Target Area, Island of Hawaii, HI. Project Manager on three technology development Task Orders: The Development of Automated Tools on Handheld PC for OE Field Operations and Quality Control, Option 2; The Development of a Quality Assurance Instrument for OE Safety Specialists, The Development of a Remote Excavator for Heavily Contaminated UXO Sites (Range Master).

Provide Technical Engineering and Field Support to Geo-Centers, Inc./SAIC for an ESTCP/USAESCH contract to develop and demonstrate a Combined EM and Magnetometer Data Acquisition and Processing System. Demonstrated the developed system at the Standardized UXO Test Site, Aberdeen, MD and Yuma, AZ, and at two surveys at the Former Lowery Bombing Range, CO, and the Portland International Air Port, Portland, OR. Part of this SAIC support, included participation in the ESTCP-funded Wide Area Assessment demonstration at Kirtland Precision Bombing Target. This support included assessment of airborne LiDAR and Orthophotography, the subsequent design of ground-based geophysical transects and grids using VSP, and the collection of the ground digital geophysical mapping data using SAIC's VSEMS.

Geophysical Project Manager, Geo-Centers, Inc., Newton Center, MA (Sep 1986 – Jun 2001). Designed, developed and tested integrated geophysical systems. Managed team of electronic design engineers and developed design specifications with other team leaders. Collaborated with mechanical and software engineering groups to ensure successful system integration. Reviewed designs throughout project cycle against design specifications. Implemented and tested vehicular and portable designs. Patented system providing commercial UXO detection and mapping services. Commercially deployed Geo-Centers' geophysical systems to detect, map and identify UXO at over 30 sites.

Naval Explosive Ordnance Disposal Technology Division, Indianhead, MD (Jul 1973 – Aug 1986. Project Manager. Set up and performed underwater technical evaluations for the Point Search System (PSS) that provides EOD divers with a hand held underwater ordnance locator. Trained military operators for operational evaluation conducted by the military. Provided system maintenance. Result: PSS was approved for service use and successfully transitioned to production.

Technical Support. Operated and maintained equipment for Area Point Search System development. Trained military personnel in use of towed ordnance locator system using side scan sonar and integrated microwave positioning. Deployed the developed system on more than 10 different surveys and port breakout exercises.

Technical Director. Designed, developed and operationally tested Remotely Operated Vehicles for explosive ordnance disposal. Deployed an ROV on a successful downed F-16 recovery project.

Project Manager. Designed, developed and tested a towed, Underwater Magnetometer Search system to detect and survey underwater unexploded ordnance.

JEFFERY A. LEWIS **GIS MANAGER**

B.S. Degree In Environmental Science/ Geographic Information Systems, Samford University, Birmingham, Al
Other Pertinent Training: HAZWOPER 40 Hour, November 2001; Current 8 Hour Refresher

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WORK EXPERIENCE:

Sep 98 – May 00 GIS Assistant, Jefferson County Alabama Information Services, GIS Department, Birmingham, AL. Worked with ArcView and Arc/Info producing maps and coverages. Updated street maps and county tax maps for the Birmingham and Jefferson County area. Developed custom ArcView software for the Jefferson County Emergency Management Association using Avenue Programming.

Mar 01 – Oct 01 GIS Analyst, Dynamic Drafting and Design (Consulting for IMC Phosphates), Ft. Lonesome, FL. Created and maintained GIS coverages using ArcView and Arc/Info. Used GIS to support the management of over 150,000 acres of company owned land. Produced maps used in permit applications and the permitting process. Supported engineers and biologists with graphics and maps used in reports. Analyzed GIS data for use in decision-making. Generated tables using ArcView and Excel.

Nov 01 - Present GIS Manager, USA Environmental, Inc., Oldsmar, FL. Oversees project GIS and data management functions for USA MEC characterization and remediation projects using ESRI ArcMap and various database software applications. Mr. Lewis supports the project teams from development of CSM graphics through management of collected field data and the development of maps and graphics for work plans and reports. Mr. Lewis was directly involved in data management and GIS applications for performance of AF MRP CSE Phase 1 project and numerous projects under the Navy MRC contract. Produced final maps for the following USA projects: Adak, AK RI/FS; Dahlgren, VA; Camp Pendleton, CA; Ft. Wingate, NM and others. Produced maps and coverages used in the planning process for work at the Former Camp Chaffee, AR; Removal Construction Support, Ft. Hood, TX; TCRA Armstrong, SD; and TCRA Pinecastle, FL, etc. Generated maps for USA field personnel and managed all intrusive data for the Removal Action at the Badlands Bombing Range, SD. Supported EE/CA planning (conceptual site model) and work being performed at the Former Frankford Arsenal, Philadelphia, PA. Supported the project manager during the TPP process at Williams Field, Florence, AZ. Was in charge of GPS data collection and integration at the Williams Field Site visit. In charge of acquiring and integrating relevant base map data and production of shapefiles, coverages and metadata for use in project GIS. Uses Microstation and AutoCAD data for inclusion into GIS. Creates, organizes and manages associated database files. Manages GPS survey data either sent to, or collected at project sites. Supports project managers with analysis, field maps and final maps. Supports geophysical operations with maps and fieldwork. In charge of creating and managing project web site including Internet GIS applications.

BRIAN SKUBIN **CORPORATE DIVE OFFICER**

Date Completed Basic EOD School: March 2003
Other Pertinent Training: B.S. Engineering/Math/Science, U.S. Naval Academy; Basic Diving Officer Certification, U.S. Navy, October 1998
HAZWOPER 40 Hour, Apr 2008; Current 8 Hour Supervisor/Refresher

MILITARY EOD ASSIGNMENTS:

Aug 01 – Dec 05 EOD Mobile Unit FIVE, Guam: Assistant Operations Officer/Officer in Charge EOD Detachment 7. Responsible for planning and executing operations and training for 9 EOD detachments. Led 7-person team providing EOD support for combat forces worldwide. Led 121 combat missions to render safe hazardous explosive devices and unexploded ordnance during Operation IRAQI FREEDOM, awarded Bronze Star Medal for "Heroism." Developed split-team strategy to support concurrent combat operations in 3 theaters during IRAQI FREEDOM. Designed initial plans, EOD procedures, and lead first command mission to counter an underwater ordnance item on remote Island of Wake. Managed equipment worth $1 million.

Jan 06 – Nov 07 EOD Mobile Unit THREE Detachment MID Pacific, Oahu, Hawaii: EOD Shore Detachment Officer in Charge. Led 10-person team providing explosive ordnance support for Hawaiian Islands. Advised regional naval commander during 10 major ordnance response/remediation projects regarding former military training sites situated on culturally sensitive Hawaiian islands. Led EOD team in execution of over 100 response missions to contend with unexploded ordnance items and potential explosive devices. Managed $126,000 budget, $2.5 million in equipment, and 3-acre facility.

CIVILIAN UXO ASSIGNMENTS:

Apr 08 - Present **Project Manager, USA Environmental, Inc., Oldsmar, FL (Mar 2008 – Present).** Responsible for the planning, scheduling, oversight and cost estimating of munitions response operations for multiple projects; provides CERCLA, RCRA, and other regulatory guidance.

Project Manager, USA Environmental, Inc., Farallon de Medinilla (FDM) Range, Northern Mariana Islands. Planned and executed multiple-year Operational Range Clearance (ORC) activities conducted for NAVFAC Pacific at this remote bombing range, to include development of work plans, field work planning/management, project documentation, and reports. Field operations included development of vegetation management program, clearance of MEC items from multiple Impact Areas, explosive disposal/venting of 656 MEC and MPPEH items, aerial herbicide application, prescribed burn initiation, extensive helicopter and tug/barge operations, insertion and construction of new range targets materials, and complex logistics planning and oversight.

Project Manager, USA Environmental, Inc., Aberdeen Proving Ground, MD. Managed long-term UXO team supporting environmental remediation projects for multiple clients at over 30 sites with potential for

encountering chemical military munitions.

Project Manager, USA Environmental, Inc. Columbus AFB, MS. Responsible for management of all field operations and development of associated reports for MEC services within a 25 acre former open detonation area. Tasks included UXO avoidance for civil survey and ground sampling/well installation, and detector assisted visual MEC surface clearance.

Project Manager, USA Environmental, Inc., Vieques, PR Task Orders CTO JN02 and CTO JN03. Lead manager for all field operations relating to vegetation and surface/subsurface MEC removal within 950 acres, and completion of multiple underwater survey tasks, at this large and complex NAVFAC Atlantic MMRP project site. Responsible for work plan development and maintaining high production/safety standards during two individual task orders that spanned a 3-year period and achieved removal of over 1.5 million MEC and range related debris items. MEC removal included addressing over 3,000 ICM/submunitions within the former Live Impact Area.

Project Manager, USA Environmental, Inc., Miami River Dredging, FL. Managed expedited mobilization and critical field effort for UXO teams supporting underwater dredging and material screening project to identify and remove MEC and related hazardous items. UXO teams supported 24-hour operating schedule to overall project was completed on-time and met all objectives.

Project Manager, USA Environmental, Inc., Louisiana Army Ammunition Plant, LA. Managed all elements relating to surface MEC removal actions within 17 acres of a former burning ground, which involved removal of 3,000 pounds of munitions and cultural debris and explosive disposal of 25 UXO items.

Project Manager, USA Environmental, Inc., Picatinny Arsenal, NJ. Planned and managed the execution of a comprehensive Time Critical Removal Action, along with a concurrent installation restoration project, to address a variety of MEC items at a former DRMO facility. Field operations included high-visibility remote removal, management, and utilization of an innovative detonation enclosure to complete explosive disposal of 282 suspected ICM/submunition items in accordance with a U.S. Army Corps of Engineers ICM Waiver directive. Restoration activities involved subsurface removal of 54,350 pounds of munitions and cultural debris, along with explosive disposal of 208 MEC items.

Project Manager, USA Environmental, Inc., Site Inspection (SI), Underwater Munitions, NDSA Pearl Harbor, Hawaii. Planned and managed a comprehensive underwater SI of a 2,741 acre former range complex, utilizing a combination of underwater sensors, ROV, and snorkelers to survey/inspect water depths ranging from 2-120 feet. SI activities included collection/assessment of Side Scan Sonar data, ROV reacquisition and investigation of underwater anomalies, visual survey of shallow water and surf zone areas, along with extensive data management and reporting requirements. All field operations were completed in a dynamic and challenging marine environment.

Rolando Soler Feliciano
Culebra PR
787 220 1185

QUALIFICATIONS AS MARINE WILDLIFE OBSERVER

EDUCATION:

1984: Professional Career Development Institute, School of Conservation,
Technical Degree in Wildlife Conservation

1986: NY Institute of Photography
Course in Commercial Photography

1993: Interamerican University of Puerto Rico
Bachelor of Science

WORKING EXPERIENCE:

2013:
Caribbean Marine Services
Worked as a observer in identifying sea turtles & manatees.
2012:
Tinglar Environmental Consulting, Arecibo Harbor Dredging Project
Perform as a USACOE Certified Marine Wildlife Observer

2008-PRESENT:

USA Environmental, Contractor
Perform Terrestrial and Marine Wildlife surveys on Identified Formerly Used Defense Sites (FUDS) assigned cleanup Areas, Culebra Island

- Open water Wildlife monitory
- Rescue and rehabilitation of stranded species
- Identification of sea turtle nesting activities in coastal zone areas.

2004-2008
Puerto Rico DENR, Biological Technician
Reserve Manager Assistant of the Canal Luis Peña Marine Reserve.

- Regular marine patrols to enforce the no take zone designation
- Monitor an maintain records of Marine mammals and sea turtle sightings around Culebra Island archipelago
- Maintain a volunteer qualification program for students and general community.

1995-1998
US Fish and Wildlife Service, Contractor Leatherback Sea Turtle Project

- Conduct beach surveys for the purpose of collecting data of nesting activities and hatchling activities of Leatherback sea turtle.

- Gathering and analyzing biological data and preparing progress and final reports of project.

Special Trainings:

1996- III Course of Sea turtle Biology and Conservation
ACG, Gaunacaste Costa Rica

2000- Short Course in conducting surveys for manatees, marine mammals and sea turtles.
Departamento de Recursos Naturales y Ambientales de PR
US National Marine and Fisheries Service

2006- Sea Turtle and Marine Mammals Monitoring Rescue and Rehabilitation Field Training Workshop
Departamento de Recursos Naturales y Ambientales de PR
US National Marine and Fisheries Service
(Training Staff)

Mark Padover

Lead Field Scientist

Profile

Mr. Padover has had academic and professional experience in designing, implementing, and directing biological, geological, and submerged cultural resource field research and sampling programs and investigations since 1987. As a licensed captain, he has managed and operated private, commercial, and state owned vessels. He has directed scientific crews and designed, operated, maintained, and repaired remote sensing and sampling equipment. His areas of expertise include biological surveys, sidescan sonar surveys, bathymetric surveys, magnetometer surveys, gradiometer surveys, vibracore sampling, dredged sediment sampling, and submerged cultural resources data acquisition, interpretation, and integration into various Geographic Information Systems (GIS) and Computer Aided Design (CAD) software packages. He has a broad background in the use and integration of Global Positioning System (GPS) including DGPS and RTK systems and real-time mapping and data logging software.

Mr. Padover has been fundamental in developing Aqua Survey's electromagnetometer (EM) capabilities for underwater metal detection. He helped take an existing technology and refined and improved it to become a high powered tool for metal detecting objects ranging from underwater MEC/UXO to treasure hunting for the *Nuestra Señora de Atocha* treasure. He has developed, performed troubleshooting, improved and field tested our EM equipment under varying conditions.

Mark has been a professional SCUBA diver since 1989. He has over 2,500 dives to depths of over 200 feet. He has worked as a professional diver in France, Bermuda, the Caribbean, and over most of the Eastern United States. He has assisted with the documentation of marine habitats for the creation of a marine park as well as volunteered with marine mammal and turtle rescue groups in the Florida Keys. At the University of Michigan he conducted a full year of independent study courses on the identification and classification of Caribbean marine fish and invertebrates.

He has experience designing and developing GIS applications and integrating information from a wide range of sources into a comprehensive and cohesive project. He has created GIS projects for federal, state, and private agencies. He has authored and contributed too many scientific reports and publications.

Languages

- French

Credentials

- 2002, Masters Candidate, Program in Maritime Studies, East Carolina University
- 1991, B.S. Natural Resources with Honors – Biophysical Concentration, University of Michigan
- USCG 100-ton Ships Master license with Auxiliary Tow & sailing endorsements (1995)
- Phi Alpha Theta National History Honors Society
- Golden Key National Honors Society

Diving Certifications

- PADI Open water (1984)
- PADI Advanced Open water (1988)
- PADI Medic / First Aid (2002)
- PADI Rescue Diver (1989)
- PADI Instructor (1992)
- PADI Medic / First Aid Instructor (1992)
- PADI Specialty Instructor (7 Specialties) (1997)
- PADI Master Scuba Diver Trainer (1998)
- NAUI Rescue Diver (1989)
- NAUI Dive master (1989)
- NAUI Instructor (1989)
- NAUI Specialty Instructor (10 Specialties) (1992)
- NAUI Nitrox Instructor (1994)
- NAUI Instructor Trainer (1996)
- NAUI Course Director (1997)
- IANTD Nitrox Diver (1993)
- IANTD Nitrox Instructor (1993)
- IANTD Mixed Gas Blender (1993)
- SSI Instructor (1992)
- SSI Advanced Instructor (11 Specialties) (1992)
- Lifeguard Systems Dive Accident Response Technician (1993)
- DAN Oxygen Provider (1997)
- DAN Oxygen Provider Instructor (1997)
- DAN Oxygen Provider Instructor Trainer (1997)
- University of Michigan Scientific Diver (1990)
- AAUS Scientific Diver (1999)

Affiliations

- NAUI Lifetime Member
- Society of Exploration Geophysicists
- Society for Historical Archaeology

Selected presentations and publications

Presentations

"Underwater Video in Scientific Research," East Carolina University, March 1999

"Dive Computers and Decompression Theory," East Carolina University, April 1999

Publications

Author / Co – Author

Archival Research and Remote Sensing Survey, Medway River, Sunbury, Georgia. A report prepared for Mr. Bernard Maley by Tidewater Atlantic Research, November 2002.

Fort Morgan Point Submerged Cultural Resource Target Identification and Remote Sensing Survey, Mobile Bay, Alabama 2001. A report prepared for the Baldwin County Archaeological Preservation Committee by The Institute for International Maritime Research, May 2002.

Diver Hands-on Evaluation of Anomalies, Proposed Brunswick Bird Island, Glynn County, Georgia. A report prepared for the US Army Corps of Engineers Savannah District by Tidewater Atlantic Research, March 2002.

A Hazard and Phase I Submerged Cultural Resource Remote Sensing Survey for Range Light Cable Alignments in Charleston Harbor, Charleston, South Carolina. A report prepared for Barnett & Casbarian, Inc. by Tidewater Atlantic Research, February 2002.

Assessment of MV Wellwood Grounding Site Restoration Anchoring Area. A report prepared for Coastal Planning and Engineering by Tidewater Atlantic Research, December 2001.

Investigation of the Confederate Commerce Raider CSS Alabama *20001*. A report prepared for the CSS Alabama Association, the Association CSS Alabama, and the Naval Historical Center by The Institute for International Maritime Research, November 2001.

Archival Research and Remote Sensing Survey, Medway River, Sunbury, Georgia. A report prepared for Mr. Terry A. Lyle by Tidewater Atlantic Research, November 2001.

Proton Precession Magnetometer Survey Berth 8, Chatham County, Georgia. A report prepared for Lockwood Greene Engineering & Construction by Tidewater Atlantic Research, November 2001.

Offshore Borrow Areas Submerged Historic Properties Survey, Captiva Island Lee County, Florida. A report prepared for Coastal Planning and Engineering by Tidewater Atlantic Research, September 2001.

Phase I Archaeological Investigations, Maybank Dredging Project Cooper River, Berkeley County, South Carolina. A report prepared for the General Engineering Laboratories, Inc. by Tidewater Atlantic Research, August 2001.

Fort Morgan Point Submerged Cultural Resource Remote Sensing Survey, Mobile Bay, Alabama. A report prepared for the Baldwin County Archaeological Preservation Committee by The Institute for International Maritime Research, August 2001.

Investigation of the CSS Alabama *2000.* A report prepared for the CSS Alabama Association, the Association CSS Alabama, and the Naval Historical Center by The Institute for International Maritime Research, November 2000.

"Voyage of the R/V *Perkins"* in *Stem to Stern 2000.* East Carolina University Program in Maritime Studies Volume 15, Greenville, North Carolina, 2000.

"A Tale of Shipwrecks and Dolphins: The Fall 1999 Bermuda Research Semester*"* in *Stem to Stern 2000.* East Carolina University Program in Maritime Studies Volume 15, Greenville, North Carolina, 2000.

Huber, Joyce and John Huber, Best Dives of the Caribbean. Hunter Publishing, New Jersey, 1994.

Contributor

The St. Johns County Submerged Cultural Resources Inventory and Management Plan: 2001-2002, Phase I. A report prepared for the US Army Corps of Engineers Savannah District by The Lighthouse Archaeological Maritime Program, July 2002.

Archaeological Diver Identification and Evaluation of Eight Potentially Significant Submerged Targets in the Tampa Bay Area for the Manatee Harbor Entrance Channel,Hillsborough County, Florida. A report prepared for the US Army Corps of Engineers Jacksonville District by Tidewater Atlantic Research, December 2001.

Diver Hands-on Evaluation of Anomalies St. Marys Entrance Channel, Camden County, Georgia. A report prepared for the US Army Corps of Engineers Savannah District by Tidewater Atlantic Research, December 2001.

Archival Research and Remote Sensing Survey Submarine Cable Corridor, Ossabaw Sound Chatham County, Georgia. A report prepared for Durocher Dock and Dredge by Tidewater Atlantic Research, September 2001.

Remote Sensing Archaeological Survey of Borrow Areas 2A, 2B, 2C, 3A, 4A, 4B, 5A, 5B, 6A, 7A and 8A Atlantic Coast of Long Island, Fire Island Inlet to Moriches Inlet Suffolk County, New York Reformulation Study. A report prepared for URS Consultants, Inc. and Moffatt Nichol Engineers JV. by Tidewater Atlantic Research, September 2001.

An Investigation and Assessment of Civil War Shipwrecks off Fort Fisher, North Carolina. **A report prepared for the Underwater Archaeology Unit, NC Division of Archives and History by Tidewater Atlantic Research, July 2001.**

Archaeological Survey of Bird/Long Island Wetland Mitigation Site, Chatham County, Georgia. A report prepared for the Georgia Department of Transportation by Tidewater Atlantic Research, June 2001.

An Archaeological Diver Identification and Evaluation of Target ICW/FM-5, in the Intra Coastal Waterway West of Rattlesnake Island, St. Johns County, Florida. A report prepared for the US Army Corps of Engineers Jacksonville District by Tidewater Atlantic Research, March 2001.

Remote Sensing Survey and Archaeological Diver Identification and Evaluation of Artificial Reef Site "A" and Diver Evaluation of Two Targets in Mill Cove Duval County, Florida. A report prepared for the US Army Corps of Engineers Jacksonville District by Tidewater Atlantic Research, January 2001.

Archaeological Diver Identification and Evaluation of Fourteen Potentially Significant Submerged Targets for the Brevard County Shore Protection Project, Brevard County, Florida. A report prepared for the US Army Corps of Engineers Jacksonville District by Tidewater Atlantic Research, December 2000.

Summary of Professional Experience and Key Projects

Aqua Survey, Inc.

Sr. Field Operations Specialist, April, 2003 - Present

Sediment Sampling and Hydrosurveys, Mannington Mills, Salem, NJ

- As a team member with Langan Engineering over the last several years, Mr. Padover has conducted many week long surveys in the tidal creeks surrounding the facility including hydrosurveys, terrestrial surveys, sediment vibracoring and percussive coring as part of a larger scope of work conducted by Langan. At the completion of each field effort, Mr. Padover was responsible for post processing of the hydro and elevation data and the sediment coring data and provided final xyz, ASCII data, maps and core logs for final reporting.

Richmond Creek Survey, CDM Federal, Staten Island, NY

- ASI provided several field services to CDM on this project including sediment sampling on both land and water and a hydrographic survey of this estuarine system. Mr. Padover was responsible for conducting the sediment sampling component of this work, which included vibracoring from an all-terrain vehicle/tetrapod setup for wetland locations and a small pontoon vessel for shallow water. Positioning was done with an RTK system, survey management was performed using Hypack, and an Innerspace 455 single beam fathometer was used for water depth measurements. Mr. Padover provided core logs and maps for the final report.

EM Development Team Member

- Member of team researching, developing, troubleshooting, repairing, improving and using EM equipment for various projects which led to the development of new Aqua Survey products for underwater metal detection: EM-Tipped Jet-ProbeTM, Diver Single-Coil EM System, 3-meter wide EM Detector Benthic Sled, The Smart CoreTM EM Vibracoring System, and high powered EM detection system
- Perform design, procurement and fabrication work for new equipment and repair/development of existing sampling and geophysical surveying equipment

Lower Passaic River Remediation Project, Newark, NJ

- Mr. Padover was responsible for the hydrographic survey, sub-bottom profiling, side scan sonar survey, magnetometer/gradiometer survey, sediment ground truthing and assisting with the sediment profile imaging portion of work on the lower 17 mile study area. Mr. Padover captained many of ASI's survey and sampling barges for this project. Mr. Padover was responsible for the overall coordination of ASI's reporting efforts. He put together a written and fully interactive GIS report presenting the results and final analysis of all phases of the survey and sampling.

Dredged Material Sampling, Global Marine Terminal, Newark Bay, NJ, Project Scientist

- Project responsibilities included use of Vibracore for 4 deep sediment cores as part of a site investigation (SI) to characterize sediment quality and evaluate potential environmental impacts associated with dredging and disposal activities. Successfully supervised the collection of sediment to a depth of 42 feet below mean sea level. Supervised the completion of sample characterizations.

Coal Tar Contamination Assessment, Newport Harbor, Jersey City, NJ, TRC Raviv Assoc., Project Scientist

- Assisted in the task planning and implementation of vibracoring in and around Newport Harbor Marina to determine the extent and concentrations of coal tar contamination through the proposed project area. Helped supervise the processing of 30 foot vibracores pulled from more than 15 locations.

Investigation of Potential Habitat Restoration for Winter Flounder Breeding Habitats, New York Harbor, NY, U.S. Army Corps of Engineers, New York District, Project Scientist

- Assisted in the task planning and implementation of on-water drilling in New York Harbor near Ellis Island and the Military Ocean Terminal at Bayonne. Successfully supervised the collection of sediment to a depth of 50 feet below mean sea level. Supervised the completion of sample characterizations.

Sediment Contamination Assessment, 59th St. Facility, New York, NY, Consolidated Edison, Project Scientist

- Performed field activities to support sediment contamination assessment near pump stations at the 59th St. facility of Consolidated Edison. Activities included designing, fabricating, and implementing manual sediment collection devices. Collected sediment from 3 discreet locations

and composited sediment in pilot test program to evaluate future needs for physical water filtration.

Hydrographic Survey, Hudson River, NY, Miller Marine, Project Scientist

- Designed and conducted hydrographic surveys at 7 marine transfer stations along a 20-mile stretch of the lower Hudson River near Newburgh, NY. Installed and surveyed in vertical controls at each terminal. Processed data and created geo-referenced bathymetric maps of each facility using Hypack, AutoCAD, and Quicksurf software packages.

Tidewater Atlantic Research/ Institute for International Maritime Research

Underwater Archaeologist, Computer Specialist, Vessel Captain, Dive Safety Officer, 7/99-3/2003

- Project preparation, survey layout, and equipment assembly.
- In the field, director, vessel captain, magnetometer / side scan sonar operator, and dive safety officer.
- Post-processing work included data analysis, report preparation and production; GIS design, creation, and development; and historical research.
- Vessel and equipment repair and maintenance, equipment fabrication, carpentry and wiring, and computer repair and upgrades. Delivered liquid propane to residential and commercial sites. Inspected equipment, prepared invoices, collected payments.

East Carolina University

Vessel Captain, 1/99-12/2000

- Prepared and motored the 65' R/V *Perkins* from Bay City, MI to Washington, NC.
- Responsible for all aspects of vessel operations, including crew assignments, navigation, emergency drills, repairs and maintenance.

Fantasea Divers

General Manager, Director of Training, Vessel Captain, 5/94-9/98

- Directed operations of two store locations.
- Handled accounts payable, accounts receivable, payroll, advertising, purchasing, merchandising, regulations compliance, facilities and asset maintenance.
- Annual profits increased $250,000, under my direction.
- Captaining 31' M/V *Fantasea* carrying dive charters, and teaching scuba at all levels from resort courses to Instructor Trainer.

M/V One Inc.

Vessel Captain, 2/94-5/94

- Captained trips from Marathon, FL to St. Petersburg, FL; including trips to Key West and the Dry Tortugas.
- All aspects of vessel operations for private 87' Hatteras and 30' Luhrs, including repairs and maintenance, crew assignments, and navigation.

Instructor Trainer, 2/93-2/94

- Taught scuba instructor career development courses.
- Taught all levels of scuba diving from resort courses to instructor.
- Dive mastered on 34 foot *Lady Key Diver.*
- Developed new training materials. Maintained compressors and diving equipment.
- Assisted with marine mammal rescue program primarily for stranded pilot whales
- Identified and documented turtle sightings and injuries/tumor frequencies in the back country around Big Pine Key for the Turtle Hospital of Marathon, Florida.

Dive Statia

Store Manager, Instructor, 11/91-12/92

- Taught scuba diving from resort courses to dive master
- General maintenance, which included vessel, compressor, and scuba equipment repairs
- Handled accounts payable, accounts receivable, and payroll.
- Assisted the Dutch Government with the initial biological assessment of the marine habitats on the leeward side of St. Eustatius towards the creation of a marine sanctuary.

University of Michigan

Instructor, Scientific Diver, 9/89-8/91

- University of Michigan scientific diver. Project locations ranged from Michigan to Bonaire.
- Taught basic scuba diving, scientific diving, and underwater research methods.
- Assisted professor during independent study project organizing and sorting collection of more than 2,000 Caribbean fish and invertebrate slides by species.

Other Qualifications

Professional Experience

Project Coordinator, Underwater Archaeologist, and Report Writer (January 2000- March 2003)

CSS *Alabama* Association / Institute for International Maritime Research (IIMR)

- Duties involved assisting with planning and preparation for research activities on the CSS *Alabama*, Cherbourg, France. On site responsibilities involved conducting research on site including video documentation and mapping; working with US Navy ROV unit in documenting the wreck site; document translation and interpretation for project personnel; assembling site photo mosaics in AutoCAD and Photoshop. Post project work involved the creation of educational presentations and films, and assisting in report preparation and artifact analysis.

GIS Specialist (January 2001- March 2003)

US Naval Historical Center / IIMR

- Developed and assembled a GIS project for all known US Navy vessels lost in Virginia state waters using ARC View, AutoCAD, Photoshop, Acrobat, Office, XMap and other software packages.

US Naval Historical Center / IIMR

- Partially developed and assembled a GIS project for all known US Navy vessels lost in Georgia state waters using ARC View, AutoCAD, Photoshop, Acrobat, Office, XMap, and other software packages. Operated Marine Sonics 1200kHz digital side scan sonar on CSS *Nashville*.

GIS Specialist (July 2001- March 2003)

Georgia Department of Transportation / IIMR

- Currently developing and assembling a GIS project for all known vessels lost in Georgia state waters utilizing ARC View, AutoCAD, Photoshop, Acrobat, Office, XMap, and other software packages.

Underwater Archaeologist, Remote Sensing Technician, Data Analyzer, and Report Writer (January 2003)

US Army Corps of Engineers (USACOE), Jacksonville District / TAR

- Prepared and performed survey in Pass-A-Grille Inlet, FL. Operated Marine Sonics 600kHz digital side scan sonar. Relocated, identified, and documented previously detected magnetic anomalies near Pass-A-Grille Inlet and Egmont Channel near the mouth of Tampa Bay, Florida using boat towed and hand held magnetometers, hydro probes and water-induction dredges. Analyzed data and helped produce a report describing findings.

Remote Sensing Technician, Data Analyzer, and Report Writer (January 2003)

Coastal Planning and Engineering, FL / TAR

- Prepared and performed survey on proposed sand borrow areas off of Anna Maria Island and Longboat Key, FL. Operated Marine Sonics 600kHz digital side scan sonar and EGG magnetometer. Analyzed data and helped produce a report describing findings.

Remote Sensing Technician, Data Analyzer, and Report Writer (January 2003)

Consul-Tech Engineering, FL / TAR

- Prepared and performed survey on proposed channel improvement areas in the Arlington River, FL. Operated Marine Sonics 600kHz digital side scan sonar and EGG magnetometer. Analyzed data and helped produce a report describing findings.

Remote Sensing Technician, Historian, and Report Writer (November 2002)

Mr. Bernard Maley, GA / TAR

- Prepared and performed survey on the Medway River near Sunbury, Georgia. Operated Marine Sonics 600 kHz digital side scan sonar and EGG magnetometer. Performed historical research, analyzed data and produced a report describing findings.

Remote Sensing Technician (October 2001 & July 2002)

Lighthouse Archaeological Maritime Program, St. Augustine, FL / IIMR

- Prepared and performed survey on the Saint Johns River and offshore of St. Augustine, Florida. Operated Marine Sonics 1200 kHz digital side scan sonar and EGG magnetometer. Assisted with report preparation after field work.

Remote Sensing Technician and Vessel Captain (May 2002)

Georgia Department of Transportation / Tidewater Atlantic Research (TAR)

- Prepared and performed survey on the South Channel, Savannah River, near Fort Pulaski, Georgia. Operated Marine Sonics 600 kHz digital side scan sonar and EGG magnetometer.

Underwater Archaeologist and Report Writer (April 2002)

US Army Corps of Engineers (USACOE), Jacksonville District / TAR

- Relocated and identified previously detected magnetic anomalies in Stevenson Creek near Tampa, Florida using WAAS corrected GPS, a hand held magnetometer, and manual probes. Assisted with report preparation and target analysis.

Underwater Archaeologist (March 2002)

USACOE Savannah District / TAR

- Relocated and identified previously detected magnetic anomalies in Brunswick Harbor, Georgia using WAAS corrected GPS, a hand held magnetometer, manual and hydro probes. Assisted with report preparation.

Geologic Sample and Report Writer (January 2002)

Zapata Engineering, SC / TAR

- Prepared sediment samples from offshore borrow areas near Hunting Island, South Carolina for analysis. Assisted with report preparation.

Data Analyzer and Report Writer (December 2001 - February 2002)

Barnett & Caesarian, Inc, SC / TAR

- Analyzed remote sensing data from Charleston Harbor, South Carolina, and assisted with report preparation.

Data Analyzer and Report Writer (December 2001)

USACOE Jacksonville District / TAR

- Duties included historical research, analyzed remote sensing data from Tampa Bay, Florida, and assisted with report preparation.

Historian and Report Writer (December 2001)

USACOE Savannah District / TAR

- Analyzed coastal migration through digitization and comparison of coastal changes at St. Mary's Inlet, Georgia (1856 – present), using AutoCAD and Photoshop.

Remote Sensing Technician, Historian, and Report Writer (November 2001)

Mr. Terry A. Lyle, GA / TAR

- Prepared and performed survey on the Medway River near Sunbury, Georgia. Operated Marine Sonics 600 kHz digital side scan sonar and EGG magnetometer. Performed historical research, analyzed data and produced a report describing findings.

Remote Sensing Technician, Historian, and Report Writer (November 2001)

Lockwood Greene Engineering & Construction, GA / TAR

- Prepared and performed survey on the Cooper River near Savannah, Georgia. Operated EGG magnetometer. Performed historical research, analyzed data and produced a report describing findings.

Field Director, Underwater Archaeologist, and Report Writer (October 2001)

Baldwin County Archaeological Preservation Committee, AL / IIMR

- Planned, prepared, and conducted magnetic remote sensing survey off Mobile Bay, Alabama a Littlemore magnetometer. Duties included directing the field crew; relocating targets, identifying, and documenting previously detected magnetic anomalies using boat towed and hand held

magnetometers, hydro probes and water induction dredges. Analyzed data and produced a report describing findings.

Data Analyzer and Report Writer (September 2001)

Coastal Planning and Engineering, FL / TAR

- Analyzed remote sensing data from the Captiva, Florida area, and assisted in report preparation.

Remote Sensing Technician, Historian, and Report Writer (August 2001)

General Engineering Laboratories, Inc., GA / TAR

- Prepared and performed survey on the Cooper River, Georgia. Operated Marine Sonics 600 kHz digital side scan sonar and EGG cesium magnetometer. Responsibilities included analyzing data and producing a report describing findings.

Remote Sensing Technician, Data Analyzer, and Report Writer (August 2001)

URS Consultants, Inc., Moffatt Nichol Engineers JV., NY / TAR

- Prepared and performed survey off Long Island, New York. Operated Klein 500kHz side scan sonar and EGG magnetometer. Duties included analyzing data and producing a report describing findings.

Underwater Archaeologist, Biologist, Remote Sensing Technician, Data Analyzer, and Report Writer (August 2001)

Coastal Planning and Engineering, FL / TAR

- Prepared and performed archaeological and environmental impact survey on the grounding site of the MV *Wellwood* on Molasses Reef near Key Largo, Florida. Operated Marine Sonics 600kHz digital side scan sonar. On site responsibilities required performing visual inspection of the grounding site and surrounding area. Documented findings using underwater video and WAAS corrected GPS. Analyzed data and produced a report describing findings.

Report Writer (July 2001)

Underwater Archaeology Unit, NC Division of Archives and History, NC / TAR

- Prepared illustrations and edited report on wrecks off Fort Fisher, North Carolina.

Remote Sensing Technician, Data Analyzer, and Report Writer (July 2001)

Baldwin County Archaeological Preservation Committee, AL / IIMR

- Planned, prepared, and conducted magnetic remote sensing survey off Mobile Bay, Alabama. Analyzed data and produced a report describing findings.

AutoCAD Technician and Report Writer (June 2001)

Georgia Department of Transportation / TAR

- Analyzed island formation and channel development on the Savannah River near Fort Pulaski, Georgia. Digitized and compared the changes in the shoreline from 1780 to present using AutoCAD and Photoshop. Prepared illustrations and helped produce the report.

Remote Sensing Technician, Data Analyzer, and Report Writer (May 2001)

Durocher Dock and Dredge, NC / TAR

- Prepared and performed survey off Baldhead Island near Southport, North Carolina. Duties required operating an EGG magnetometer, analyzing data and producing a report describing findings.

Archaeologist (April 2001)

Georgia Department of Transportation, GA / TAR

- Performed terrestrial survey of marshlands near Savannah, Georgia.

Underwater Archaeologist, Data Analyzer, and Report Writer (March 2001)

USACOE Jacksonville District / TAR

- Relocated and identified previously detected magnetic anomalies near Matanzas Inlet, Florida using boat towed magnetometer, manual and hydro probes. Analyzed data and helped produce a report describing findings.

Underwater Archaeologist and Report Writer (January 2001)

USACOE Jacksonville District / TAR

- Relocated, identified, and documented previously detected magnetic anomalies in Mill Cove on the St Johns River near Jacksonville, Florida using boat towed and hand held magnetometers, manual and hydro probes. Helped produce a report describing findings.

Remote Sensing Technician and Vessel Captain (September 2000)

Stroud Engineering, NC / TAR

- Prepared and performed survey in Snug Harbor near Morehead City, North Carolina. Operated Marine Sonics 600 kHz digital side scan sonar and EGG magnetometer.

Remote Sensing Technician (June 2000)

Global Link Inc. / TAR

- Prepared and performed survey off Cap Hatteras, North Carolina. Operated EGG magnetometer and Odom Echotrac survey grade fathometer.

Historian and Carpenter (July 1999 to May 2000)

Institute for International Maritime Research

- Assisted with designing and restoring the historic skipjack *Ada Mae*. Duties included developing marketing materials and illustrations to raise money for restoration.

Underwater Archaeologist, Data Analyzer, and Report Writer (March 2000)

USACOE Jacksonville District / TAR

- Relocated and identified previously detected magnetic anomalies off Cape Canaveral, Florida using boat towed and hand held magnetometers, manual and hydro probes. Analyzed data and helped produce a report describing findings.

Remote Sensing Technician (March 2000)

USACOE Jacksonville District / TAR

- Prepared and performed survey on the St. Johns River near Jacksonville, Florida. Operated Marine Sonics 600 kHz digital side scan sonar and EGG magnetometer.

Remote Sensing Technician (December 1999)

Stroud Engineering, P.A. and CSE Baird LLC / TAR

- Prepared and performed survey on Bogue Banks off Beaufort, North Carolina. Operated EGG magnetometer.

Remote Sensing Technician (November 1999)

USACOE Norfolk and Wilmington Districts / TAR

- Prepared and performed survey off Cape Henry, Virginia. Operated Klein 500kHz side scan sonar and EGG magnetometer.

Remote Sensing Technician (October 1999)

Gray & Paper, Inc., VA / TAR

- Prepared and performed survey on the Pamunkey and Mattaponi Rivers near West Point, Virginia. Operated Marine Sonics 600kHz digital side scan sonar and EGG magnetometer.

Underwater Archaeologist and Vessel Captain (October 1999)

East Carolina University Field School, NC

- Located, excavated, and mapped remains of 18th century vessel off Bermuda. Examined wrecks dating from 16th century to 20th century. Captained boat and maintained diving equipment.

AutoCAD Technician and Remote Sensing Technician (July 1999 – Oct 1999)

USACOE Wilmington District / TAR

- Prepared site plans and pre-sinking representations of several steamships using AutoCAD and Photoshop. Operated Marine Sonics 1200kHz digital side scan sonar.

Data Analyzer and Report Writer (September 1999)

USACOE Jacksonville District / TAR

- Analyzed remote sensing data from near Egmont Channel in Tampa Bay, Florida, and assisted in report preparation.

Underwater Archaeologist (August 1999)

City of Norfolk, Virginia / TAR

- Relocated, identified, and documented previously detected acoustic and magnetic anomalies in the Elizabeth River near Norfolk, Virginia using a boat towed magnetometer, manual and hydro probes.

Underwater Archaeologist (August 1999)

Baldwin County Archaeological Preservation Committee, AL / IIMR

- Relocated, identified, and documented previously detected magnetic anomalies off Mobile Bay, Alabama using Hypack survey software, boat towed and hand held magnetometers, hydro probes and water induction dredges.

Underwater Archaeologist (July 1999)

City of Portsmouth, VA / TAR

- Relocated, identified, and documented previously detected acoustic and magnetic anomalies in the Elizabeth River and Scotts Creek near Portsmouth, Virginia using a boat towed magnetometer, manual and hydro probes.

Underwater Archaeologist (July 1999)

City of Chesapeake, VA / TAR

- Relocated, identified, and documented previously detected acoustic and magnetic anomalies in the southern branch of the Elizabeth River near Chesapeake, Virginia using a boat towed magnetometer, manual and hydro probes.

APPENDIX I. TPP MEMORANDUM

This appendix contains a copy of the Final TPP Memorandum from TPP Meeting #3 held October 22, 2014.

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DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
701 SAN MARCO BOULEVARD
JACKSONVILLE, FLORIDA 32207-8175

REPLY TO
ATTENTION OF

APR 23 2015

CESAJ-PM-M

MEMORANDUM FOR SEE DISTRIBUTION LIST

SUBJECT: Final Technical Project Planning (TPP) Memorandum, Meeting No. 3 Munitions Response Sites (MRS) 07 (Culebrita Artillery Impact Area) and 02 (All Cayos of MRS 02) Underwater Remedial Investigation/Feasibility Study (RI/FS), Defense Environmental Restoration Program for Formerly Used Defense Sites (DERP-FUDS) Property No. I02PR0068, Culebra, Puerto Rico

The Jacksonville District, U.S. Army Corps of Engineers is enclosing for your records the final TPP Memorandum for Meeting No. 3 MRSs 07 and 02 Underwater RI/FS associated with the DERP-FUDS Property No. I02PR0068, Culebra, Puerto Rico.

Should you need additional information, please contact me at (904) 232-1758 or by e-mail at John.E.Keiser@usace.army.mil or Mr. Wilberto Cubero at 904-232-1426 or by email at Wilberto.Cubero-delToro@usace.army.mil.

Sincerely,

John E. Keiser, P.E.
Program Manager, Formerly Used
Defense Sites
Military/Interagency and International
Services Branch

Enclosure

Final TPP Memorandum, Meeting No. 3 MRS 07 and 02 Underwater RI/FS, DERP-FUDS Property No. I02PR0068, Culebra, Puerto Rico	
Ms. Wilmarie Rivera PR Environmental Quality Board 1375 Ponce de Leon Avenue San Juan, PR 00926-2604	Ms. Marelisa Rivera US Fish and Wildlife Service Road 301, Km 5.1 Boquerón, PR 00622
Dr. Lisamarie Carrubba NOAA Fisheries Caribbean Field Office Road 301, Km 5.1 Boquerón, PR 00622	Dr. Craig Lilyestrom Department of Natural and Environmental Resources PO Box 366147 San Juan PR 00936-6147
Mr. Julio Vazquez US EPA Region 2 Special Project Branch/Federal Facilities Section 290 Broadway – 18th Floor New York, NY 10007-1866	Ms. Diane Wehner NOAA Office of Response and Restoration 290 Broadway Room 2059 New York, NY 10007
Ms. Ana Roman US Fish and Wildlife Service Culebra National Wildlife Refuge Manager Road 301, Km 5.1 Boquerón, PR 00622	Mr. Richard Henry US Fish and Wildlife Service 2890 Woodbridge Ave. Edison, NJ 08837
Mr. Jose Rivera NOAA Fisheries c/o USACE Antilles Office 400 Fernandez Juncos, Parada 7.5 Puerta de Tierra, PR 00901-3299	Mr. Jose Mendez USACE Antilles Office 400 Fernandez Juncos, Parada 7.5 Puerta de Tierra, PR 00901-3299

U.S. Army Corps of Engineers

Final Technical Project Planning Memorandum Addendum #3

MRS 07 Culebrita Artillery Impact Area Water Acreage and All Cayos of MRS 02 Culebra, Puerto Rico

Project No. I02PR0068

In Support of

Remedial Investigation/Feasibility Study

prepared for:

U.S. Army Corps of Engineers, Jacksonville District
701 San Marco Boulevard
Jacksonville, FL 32207
and
U.S. Army Engineering and Support Center, Huntsville
4820 University Square
Huntsville, AL 35816-1822

prepared by:

PARSONS
3577 Parkway Lane, Suite 100
Norcross, GA 30092

Contract: W912DY-09-D-0062
Delivery Order: 0010

US Army Corps of Engineers ®
Jacksonville District

US Army Corps of Engineers ®
Huntsville, US Army Engineering and Support Center

Technical Project Planning Memo:

Subject: Documentation of Technical Project Planning (TPP) Meeting No. 3 for the Remedial Investigation/Feasibility Study (RI/FS), MRS 07 Culebrita Artillery Impact Area Water Acreage and All Cayos of MRS 02, Culebra, Puerto Rico

Contract: Contract Number W912DY-09-D-0062, Delivery Order 0010

This document is intended to provide a record of the TPP Meeting #3 for the ***RI/FS, MRS 07 Culebrita Artillery Impact Area Water Acreage and All Cayos of MRS 02, Culebra, PR,*** held on October 22, 2014 at the U.S. Army Corps of Engineers, Antilles Office, San Juan, PR. The purpose of the TPP Meeting was to discuss Phase II of the RI – Underwater (U/W) Electromagnetic (EM) Survey and the Draft Final Work Plan comments received from the Project Delivery Team (PDT). The TPP team members listed on the attached Attendance Sign-In Sheet (Attachment 1) were provided an opportunity to comment on the Draft Final Phase II – U/W EM Survey Work Plan prior to the TPP Meeting.

Attendees: The meeting was attended by representatives from the USACE – Huntsville Center (USAESCH) and Jacksonville District (CESAJ); PR Environmental Quality Board (PREQB); PR Department of Natural and Environmental Resources (PR DNER); National Oceanic and Atmospheric Administration National Marine Fisheries Service (NOAA NMFS); U.S. Fish and Wildlife Service (USFWS); U.S. Environmental Protection Agency (USEPA); Parsons; USA Environmental (USAE); AquaSurvey, Inc. (ASI); and TetraTech.

General:

Parsons' presentation of the Phase II – U/W EM Survey Work Plan began at approximately 9:00 a.m. Prior to Parsons' presentation, Mr. Tom Freeman (CESAJ) provided a briefing on the history of the Department of Defense's (DoD's) use of Culebrita and Cayos of MRS 02 as training and target areas, discussing range fans, Marine and Navy air patterns, and torpedo training.

Presentation:

Ms. Patti Berry (Parsons) presented an overview of the RI process to include a brief summary of the results of the Phase I - Environmental Baseline Survey (EBS) of MRS 07 and All Cayos of MRS 02 as documented in the Final EBS Report. Ms. Berry then discussed the proposed technical approach that will be implemented during Phase II –

U/W EM Survey and was presented in the Draft Final EM Survey Work Plan submitted for review and comment. The presentation is included as Attachment 2.

Concerns:

Discussions were held regarding concerns with the field operations presented in the Phase II Draft Final Work Plan. The concerns raised and the proposed resolutions were as follows:

- Data gap between land and water – A concern was raised that there appears to be a data gap between the water survey and land survey in the intertidal zone area, especially on Culebrita (MRS 07). Tom Bourque (USAE) stated that if MEC is identified during the Phase III - U/W Intrusive Investigation near the beach, step-outs will be conducted that may go onto the beach. In resolution, Parsons/USAE will optimize the tides for the water survey and will review the data from the previous RI and Non-Time Critical Removal Action (NTCRA) conducted on Culebrita to determine if a data gap exists. If so, documentation will be added to the WP that a sweep of the beach at low tide using analog methods will be conducted during Phase III – U/W Intrusive Investigation.

- Insufficient MRS boundary on the Cayos and Culebrita – The PDT members expressed concern that the current MRS boundaries limited the area of U/W investigation around the cayos and particularly, Culebrita. On Culebrita, the southeast coastlines are not proposed for investigation and areas to the northeast not included within the boundary are used for fishing and diving. Based on the earlier discussion led by Mr. Tom Freeman regarding DoD's use of MRS 07, the southeast portion of Culebrita was not part of the target area used by the military. The northeast MRS boundary was collectively decided and established by PREQB, USACE, and other members of the TPP team and was determined based on specific areas where pathways exist for public exposure, DoD's use, and current/future use. Mr. Wilberto Cubero (CESAJ) agreed to provide documentation to the TPP Team (Attachment 3).

- Parameters used on Visual Sample Plan (VSP) for the proposed transects – USEPA expressed concern that VSP inputs were inadequately addressed in the WP and default values required better justification. Kelly Enriquez (CEHNC) stated that she checked the impact to the transect spacing by changing several of the default parameter values and minimal change occurred. Ms. Enriquez stated that the target and anomaly input parameters are the only inputs that result in significant changes to transect spacing. Parsons will provide more detail in the WP on the VSP inputs and justification for using the default values.

- Concern of finding 20mm projectiles around Culebrita – Mr. Pastorick (PREQB Consultant) expressed concern about the use of the 20mm projectiles on Culebrita and the ability of the EM61 sensors to adequately detect the 20mm projectiles. Historically, 20mm have been very difficult to detect and would require the sensor height at a close proximity to the seafloor. Because the altitude over the seafloor will vary during the survey, detection might be problematic. The resolution was to document the altitude of the coil above the seafloor and identify as gaps, areas where 20mm were known to be used but were not detected. Applicable text will be added to the work plan regarding this scenario.

Specific Comment Discussion:

After the presentation, a discussion was held regarding the resolution of specific PDT comments as follows:

- NOAA NMFS – Dr. Lisamarie Carrubba Comment 5: Dr. Carrubba's comment that the Nassau and Goliath Groupers are not endangered species appeared to be in conflict with PR EQB's comment that the species' are endangered and critically endangered, respectively. In resolution, the text will be revised to specify which species are endangered at the Commonwealth level versus the Federal level. The revised text will also reflect that Nassau grouper are currently proposed for listing as threatened under the Endangered Species Act, that Goliath grouper are not being considered for listing, and that there are fishing prohibitions for both species in federal waters (and also in Commonwealth waters).

- PR DNER – Comment 3 regarding intertidal zone: The comment requested clarification on how the intertidal zone will be investigated. Similar to earlier discussions under "Concerns" above, Parsons/USAE will review previous RI and NTCRA data to determine if data gaps exist. If necessary, a sweep of the beach areas at low tide will be conducted during Phase III operations. The information regarding data gaps will be added to the Work Plan and Data Quality Objectives (DQOs), if necessary.

- US EPA –

    - Comment 1 regarding end of day instrument verification strip (IVS) equipment check: USEPA was concerned about the quality of the digital geophysical mapping (DGM) data without conducting an end of day IVS test. The response was that adding an end of day IVS check would reduce the amount of time available during the day to collect the DGM data. It was agreed that an afternoon static test would be added as a quality control (QC) measure to make sure the sensors were still working properly at the end of the day. Since the IVS is performed every morning prior to collecting data, if the equipment fails the IVS check during the morning evaluation, the previous

day's data would be reviewed and possibly recollected. The PDT agreed to this approach.

- o Comment 2 regarding insufficient QC/QA procedures and repeat of DGM transects: USEPA commented that the QC/QA procedures are inadequate to ensure that DGM survey is accurate and references Table 4-1, Definable Features of Work. It was pointed out that Table 3-3, Performance Metrics of Marine DGM Survey, contains the specific QC tests, performance standards, frequencies of tests, and failure criteria. In addition, an end-of-day static test has been added to ensure that the equipment remained operable throughout the day. Regarding the comment to repeat DGM transects to ensure that the data is consistent, the response was that exactly repeating transect line is not feasible due to the dynamic nature of the underwater environment. The PDT agreed that this response was acceptable.

- o Comment 5 regarding VSP inputs: VSP inputs will be added to the work plan as discussed above.

- o Comment 6 regarding post-hoc evaluation of data using VSP: It was agreed that VSP will be used after data collection to create anomaly density maps and to determine if data gaps exist. It was also agreed that if any data gaps are identified, they can be investigated during the Phase III Intrusive Investigation field effort.

- o Comments 13 and 14 regarding CSMs: The CSMs will be revised in accordance with the comments, i.e., use and accessibility of the sites.

- o Comment 18 regarding coil height and anomaly selection criteria: It was explained that the anomaly selection criteria will be based on the results of the initial findings at the IVS with the coil positioned at various altitudes. The anomaly selection criteria will be presented in the Geophysical System Verification Report. Coil heights will be recorded during transect surveys and will be analyzed on a continual basis. Discussion will be added to the work plan to address this comment.

- PR EQB –

  - o Comment 1 regarding investigation boundaries: Discussion will be added to the work plan to explain why portions of the water surrounding Culebrita are not included in the investigation, consistent with the discussion above regarding MRS boundaries.

  - o Comment 5 regarding torpedoes: Extensive discussion took place regarding use of torpedoes, particularly in the area of Cayo Genequi and the northeast

side of Culebrita. The work plan will be revised to include the possible use of the Culebrita Torpedo Range. Parsons requested that any known torpedo locations be provided so that the areas can be investigated by divers using analog methods during the Phase III Intrusive Investigation field effort.

- Comment 12 regarding approach for small cayos: It was explained during the discussion that the proposed EM survey approach was the same for all of the cayos of MRS 02. A question was asked regarding the land portions of the cayos and whether the shorelines would be investigated. Several PDT members indicated that some of the cayos were not accessible due to the rugged shoreline and sea state conditions. USAE stated that the land portions of some of the MRS 02 cayos are proposed for analog survey during the follow on RI. The PDT requested that 2 conceptual site models (CSMs) be prepared for MRS 02 – one depicting accessible cayos (trespassers as receptors) and one depicting non-accessible cayos (no human receptors). The revised CSMs will be included in the work plan.

- Comment 15 regarding IVS and coil height: The work plan will be revised to include additional discussion on the IVS process, locations, and establishment and documentation of anomaly selection criteria.

- Comment 28 regarding gaps in transect coverage: Additional text will be added to the work plan to explain why there might be gaps in the transect coverage and to state that the gaps will remain unsurveyed.

After discussion of specific comments, Ms. Berry stated that responses to comments will be provided to USACE for review prior to being submitted to the PDT members. Once the USACE accepts the responses to comments, the responses will be submitted with the work plan that will be provided in "track changes" format. The comments will be incorporated into a final document and submitted for acceptance prior to mobilizing to the field.

ATTACHMENT 1

ATTENDANCE SIGN-IN SHEET

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US Army Corps of Engineers

Technical Project Planning (TTP) Meetings

22-Oct-14

NAME	SIGNATURE	ORGANIZATION	TELEPHONE	E-MAIL
Lisamarie Carrubba		NMFS PRD	787-851-3720	lisamarie.carrubba@noaa.gov
Marelisa Rivera		USFWS-CESTO	787-851-7297	marelisa_rivera@fws.gov
Ana Roman		USFWS-Refuges	787-851-7258	ana_roman@fws.gov
Tim Reilly		USCG/DNCR	978-290-1242	treilly@lighthousetechnical.com
Craig Lilyestrom		DNER	757-772-2022	craig.lilyestrom@dnr.virginia.gov
Daniel Rodriquez		EPA	787-741-5201	rodriguez.daniel@epa.gov
Julio F. Vazquez		US EPA	212-637-4323	vazquez.julio@epa.gov
Angela Carpenter		US EPA	212-637-4135	carpenter.angela@epa.gov
Diane Wehner		NOAA	240-338-3411	diane.wehner@noaa.gov
Katarina Rutkowski		TRC/PREQB	860 3054339	krutkowski@trcsolutions.com
Wilmarie Rivera		PREQB	787-767-8056	wilmarie.rivera@jca.gobierno.pr
Jim Pastorick		UXO PRO	2035485300	JIM@UXOPRO.COM
Mark Padover		ASI	908 347 9776	padover@aquasurvey.com
Brad McCowan		USACE	256-217-2570	bmccowan@usatampa.com
Ron Marnicio		Tetra Tech	617-443-7551	ronald.marnicio@tetratech.com
Richard Funk		Tetra Tech	425-482-7629	richard.funk@tetratech.com
SCOT WILSON		TETRA TECH	360 598-8111	SCOT.WILSON@TETRATECH.COM
Steve Rembish		PARSONS	512-567-6090	steve.j.rembish@parsons.com
Jae Yun		PARSONS	678-209-7620	Jae.Yun@parsons.com
Margaret Zaice		USA Environmental	256-665-5702	mzaice@usatampa.com
Matt Tucker		USH Environmental	813-426-2426	mtucker@usatampa.com
Sarah Dyer		USACE-Huntsville	256-509-3495	sarah.e.dyer@usace.army.mil

US Army Corps of Engineers

TTP Continuation List

22-Oct-14

NAME	SIGNATURE	ORGANIZATION	TELEPHONE	E-MAIL	
Kelly Enriquez		USACE - Huntsville	256-679-3544	Kelly.d.enriquez@usace.army.mil	Kelly Enriquez
Tom Bourque		USA	808 255 2320	T.Bourque@us.army.com	Tom Bourque
TOM FREEMAN		USACE-Jacksonville	314.374.0220	tom.freeman@usace.army.mil	Tom Freeman
Jose M Mendez		Corps of Eng Jax	787-578-8996	Jose.M.Mendez2@USACE.ARMY.mil	Jose Mendez
Amanda Parker		USACE	904-232-1676	Amanda.D.Parker@usace.army.mil	Amanda Parker
Donna West-Barnhill		USACE Contractor	803.713.7171	Donna.L.West2@usace.army.mil	Donna West-Barnhill
Paul DeMarco		USACE-PD-EC	904-232-1897	Paul.M.DeMarco@usace.army.mil	Paul DeMarco
Cindy Martin		TRC-TECHSOP SOB	978 656 3588	cmartin@trchsolutions.com	Cindy Martin
John Keiser		USACE	904-232-1758	john.e.keiser@usace.army.mil	John Keiser
Wilberto Cubero		USACE	904-232-1426	wilberto.cubero@usace.army.mil	Wilberto Cubero
Patti Berry		Parsons	01896924110	patricia.berry@parsons.com	Patti Berry
FERNANDO PAGES		TETRATECH, INC.	626.608.1017	FERNANDO.PAGES@TETRATECH.COM	Fernando Pages
On Phone:					
Tom Hall	Tech Law Inc.				Tom Hall
Roland Belew	USACE HNC				Roland Belew
Jose Rivera	NMFS				Jose Rivera

ATTACHMENT 2

TPP MEETING # 3 PRESENTATION

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Culebra Remedial Investigation /Feasibility Study
Underwater Investigation MRS 07 Culebrita and All Cayos of MRS 02

22-23 October 2014

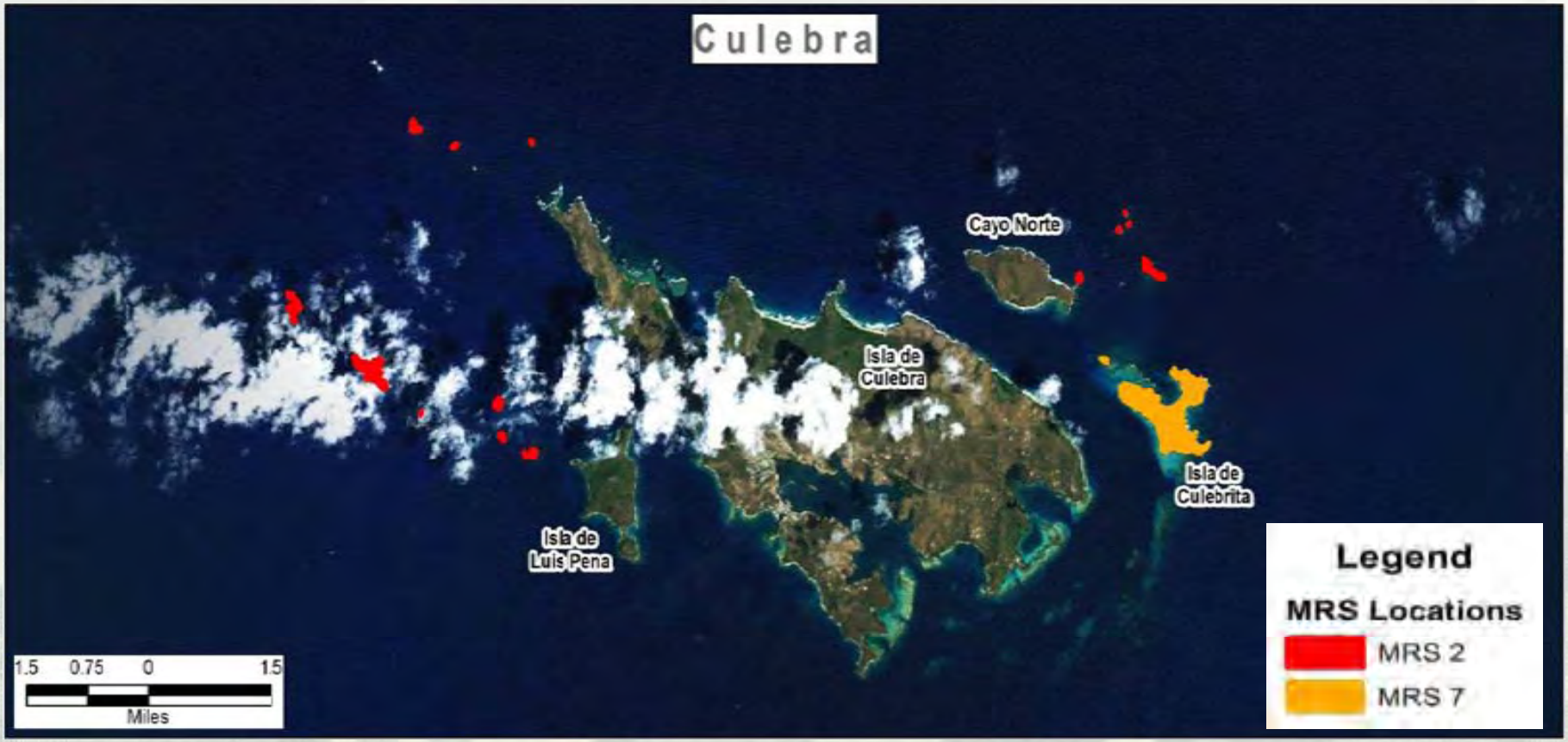
Technical Project Planning Meeting,

San Juan, Puerto Rico

TPP No. 3 Meeting Agenda

- Introductions
- Munitions Response Site Remedial Investigation Scope
- Objectives of the Remedial Investigation
- Summary of Phase I - Environmental Baseline Survey
- Phase II – Underwater EM Survey
  - Data Quality Objectives
  - Conceptual Site Models
  - Work Plan Review
  - Field Activities
  - Data Documentation
- Phase III – Intrusive Investigation Summary
- Schedule

MRS 07 and All Cayos of MRS 02 Remedial Investigation Scope



MRS 07 and All Cayos of MRS 02 Remedial Investigation Scope

- **Objectives of the Remedial Investigation (RI):**
  - Determine nature and extent of possible contamination of Munitions and Explosives of Concern (MEC) and Munitions Constituents (MC) resulting from former Department of Defense use of the site
  - Focus of this RI is the underwater areas surrounding Munitions Response Site (MRS) 07 Culebrita and all Cayos of MRS 02
  - The underwater operations at each site will commence at the shoreline, and extend seaward to the MRS boundary.

MRS 07 and All Cayos of MRS 02 Remedial Investigation Scope

- **Objectives of the RI (cont'd):**
  - Data gathered from the RI will be incorporated into a RI Report including a risk assessment for human health and the environment that will be used to determine if further remedial action is warranted at the MRSs.
  - If risk to human health or the environment is identified, a Feasibility Study will be prepared to present the development, screening, and detailed evaluation of alternative remedial actions.

MRS 07 and All Cayos of MRS 02 Remedial Investigation Scope

- **Three phased approach:**
  - Phase I: Environmental Baseline Survey (EBS)
    - Final EBS Report approved in April 2014
  - Phase II: Underwater EM Survey
    - Transect design based on results of Phase I – EBS
    - Draft Final EM Survey Work Plan submitted July 1, 2014
    - Comments received through October 3, 2014
    - Final EM Survey Work Plan - November 2014
    - Field work anticipated November – December timeframe
  - Phase III: Underwater Intrusive Investigation/ MC Sampling

Summary of Phase I - Environmental Baseline Survey

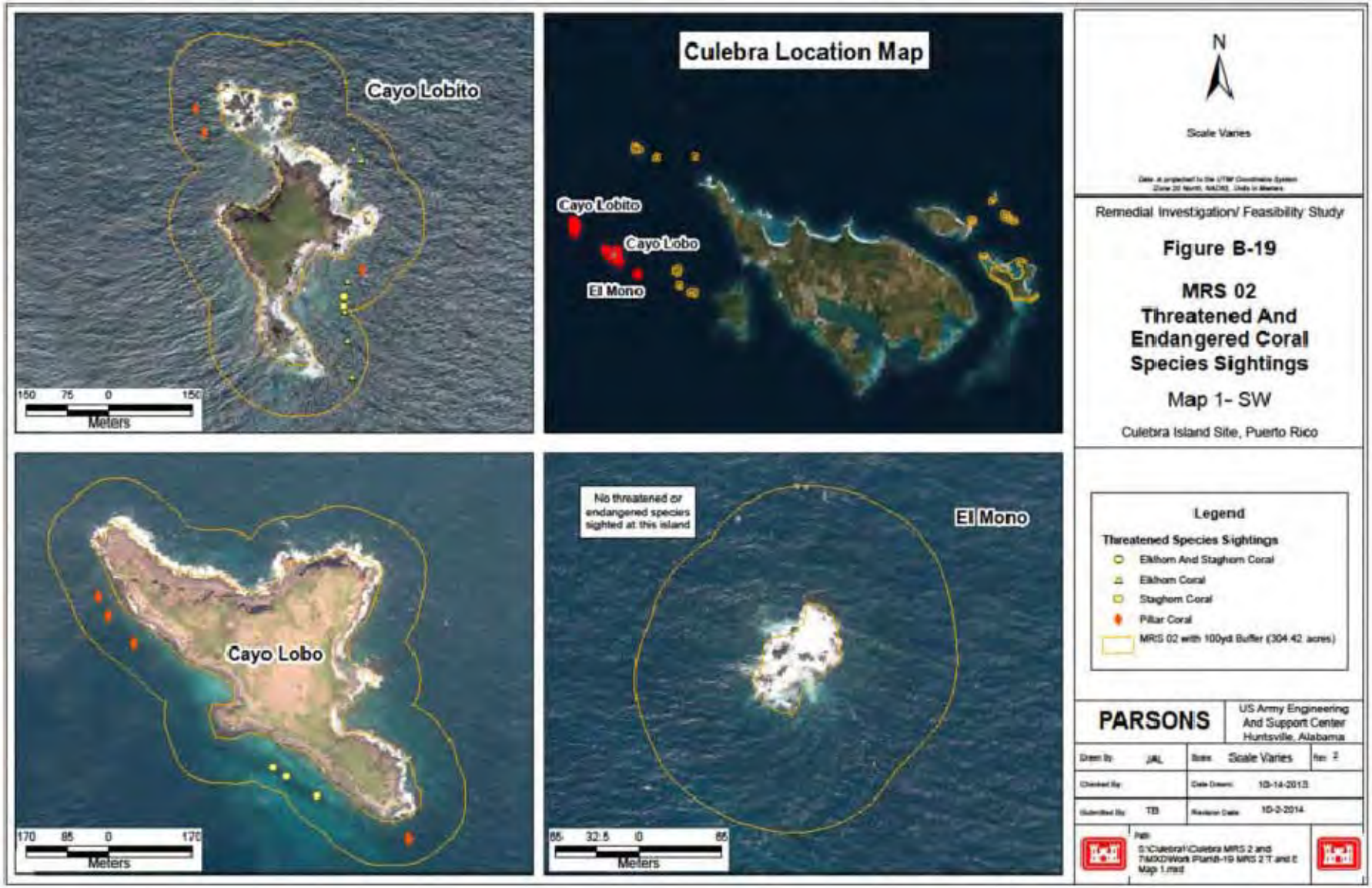
- Phase 1A - Multibeam Bathymetry Surveys (MBS) and Side Scan Sonar (SSS) Surveys:
  - Conducted in all of the accessible areas of each MRS, as defined by the Data Quality Objectives (DQOs).
  - Based on the results of the MBS and SSS surveys and analysis of NOAA's benthic Geographic Information System (GIS) files, transects were revised to minimize the potential environmental impact and still maintain sufficient coverage to obtain the desired results.

Summary of Phase I - Environmental Baseline Survey

- Phase 1B - Remotely Operated Vehicle (ROV) Investigations included:
  - Biological Spot Investigations to collect representative video of habitat types present. 11 locations were selected at MRS 02 and 3 at MRS 07.
  - Location of 11 suspected MPPEH items at Cayos Geniqui and Cayo Alcarraza that were investigated using video footage to document the item and the surrounding underwater habitat.

Summary of Phase I - Environmental Baseline Survey

- **EBS Results**:
  - Total Coverage:
    - MRS 02: 17.04 Miles (114% of miles proposed in Work Plan)
    - MRS 07: 7.01 Miles (98%)
  - Resulting data was used to determine Phase II EM Survey platform configurations and transect locations
  - Figures in EM Survey Work Plan have been revised to incorporate current listing of threatened species from NOAA's 27 August 2014 Press Release and Fact Sheet


Cayo Lobito
150 75 0 150
Meters
Culebra Location Map
Cayo Lobito
Cayo Lobo
El Mono
Cayo Lobo
170 85 0 170
Meters
No threatened or endangered species sighted at this island
El Mono
65 32.5 0 65
Meters
N
Scale Varies
Remedial Investigation/ Feasibility Study
Figure B-19
MRS 02
Threatened And Endangered Coral Species Sightings
Map 1- SW
Culebra Island Site, Puerto Rico
Legend
Threatened Species Sightings
Elkhorn And Staghorn Coral
Elkhorn Coral
Staghorn Coral
Pillar Coral
MRS 02 with 100yd Buffer (304.42 acres)
PARSONS
US Army Engineering And Support Center Huntsville, Alabama
Drawn By: JAL
Scale: Scale Varies
Rev: 2
Checked By:
Date Drawn: 10-14-2013
Submitted By: TB
Revision Date: 10-2-2014
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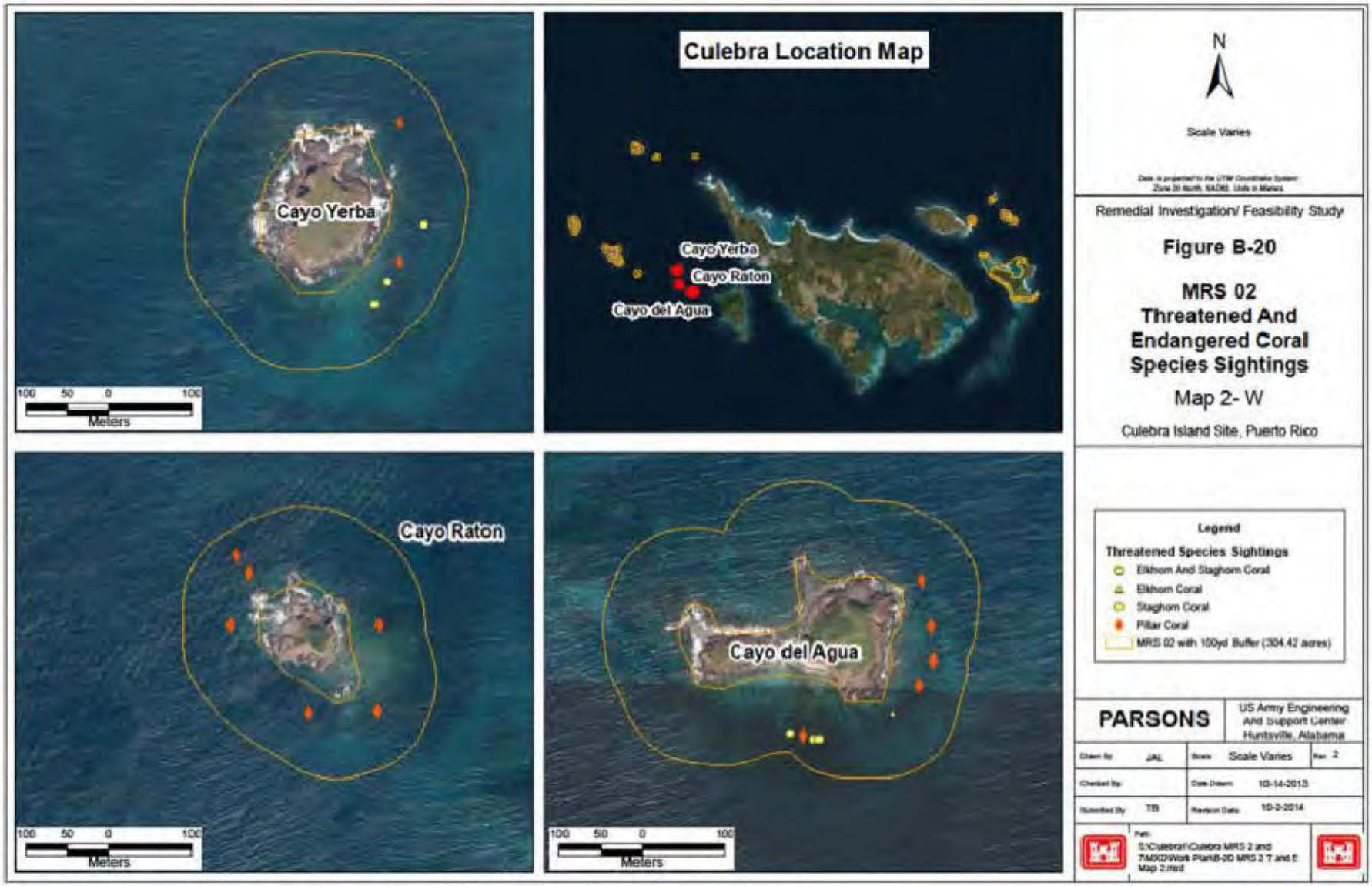
Cayo Yerba
100 50 0 100
Meters
Culebra Location Map
Cayo Yerba
Cayo Raton
Cayo del Agua
Cayo Raton
100 50 0 100
Meters
Cayo del Agua
100 50 0 100
Meters
N
Scale Varies
Remedial Investigation/ Feasibility Study
Figure B-20
MRS 02
Threatened And
Endangered Coral
Species Sightings
Map 2- W
Culebra Island Site, Puerto Rico
Legend
Threatened Species Sightings
Elkhorn And Staghorn Coral
Elkhorn Coral
Staghorn Coral
Pillar Coral
MRS 02 with 100yd Buffer (304.42 acres)
PARSONS
US Army Engineering
And Support Center
Huntsville, Alabama
Scale Varies
10-14-2013
10-2-2014
TB
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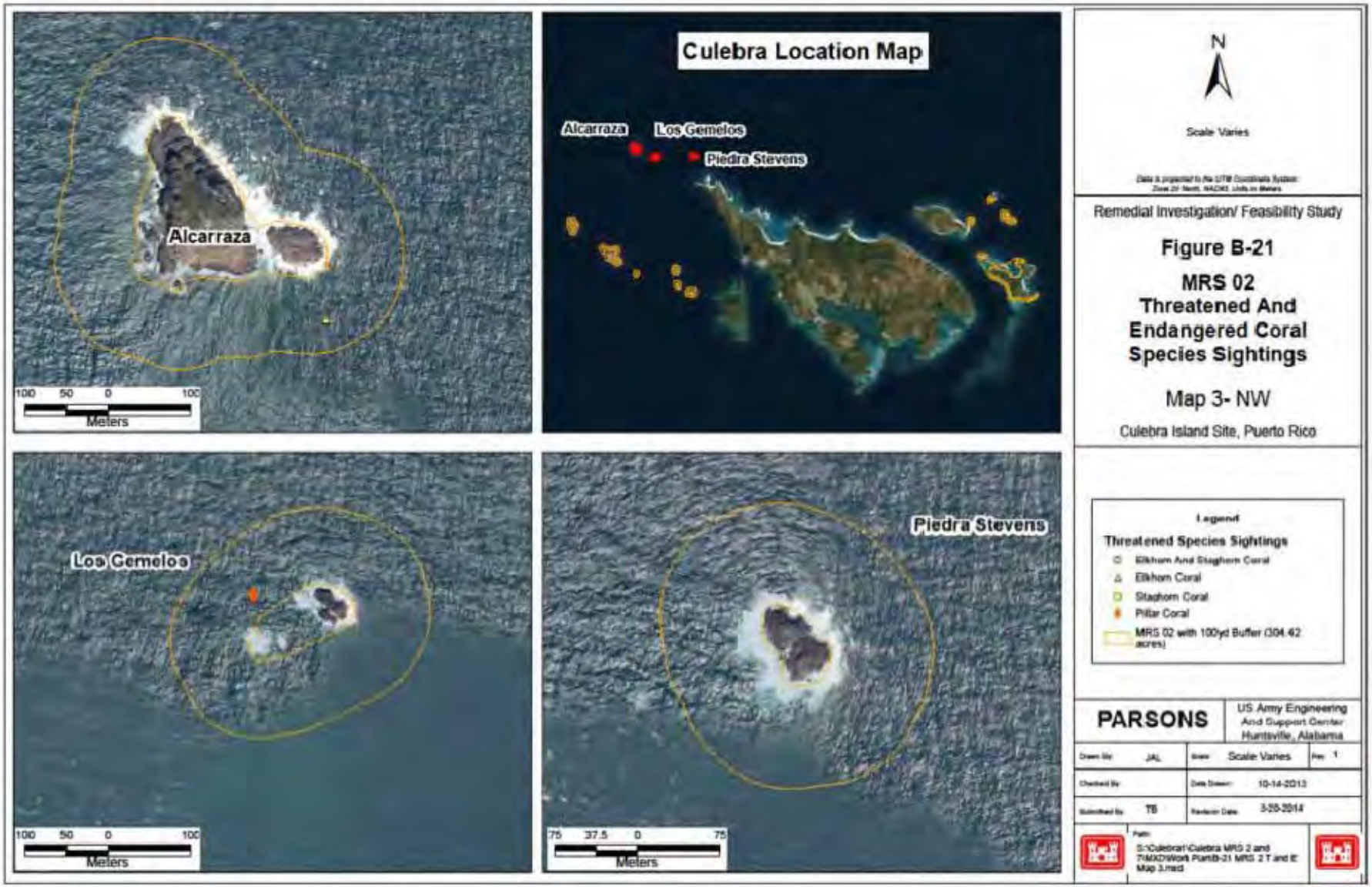
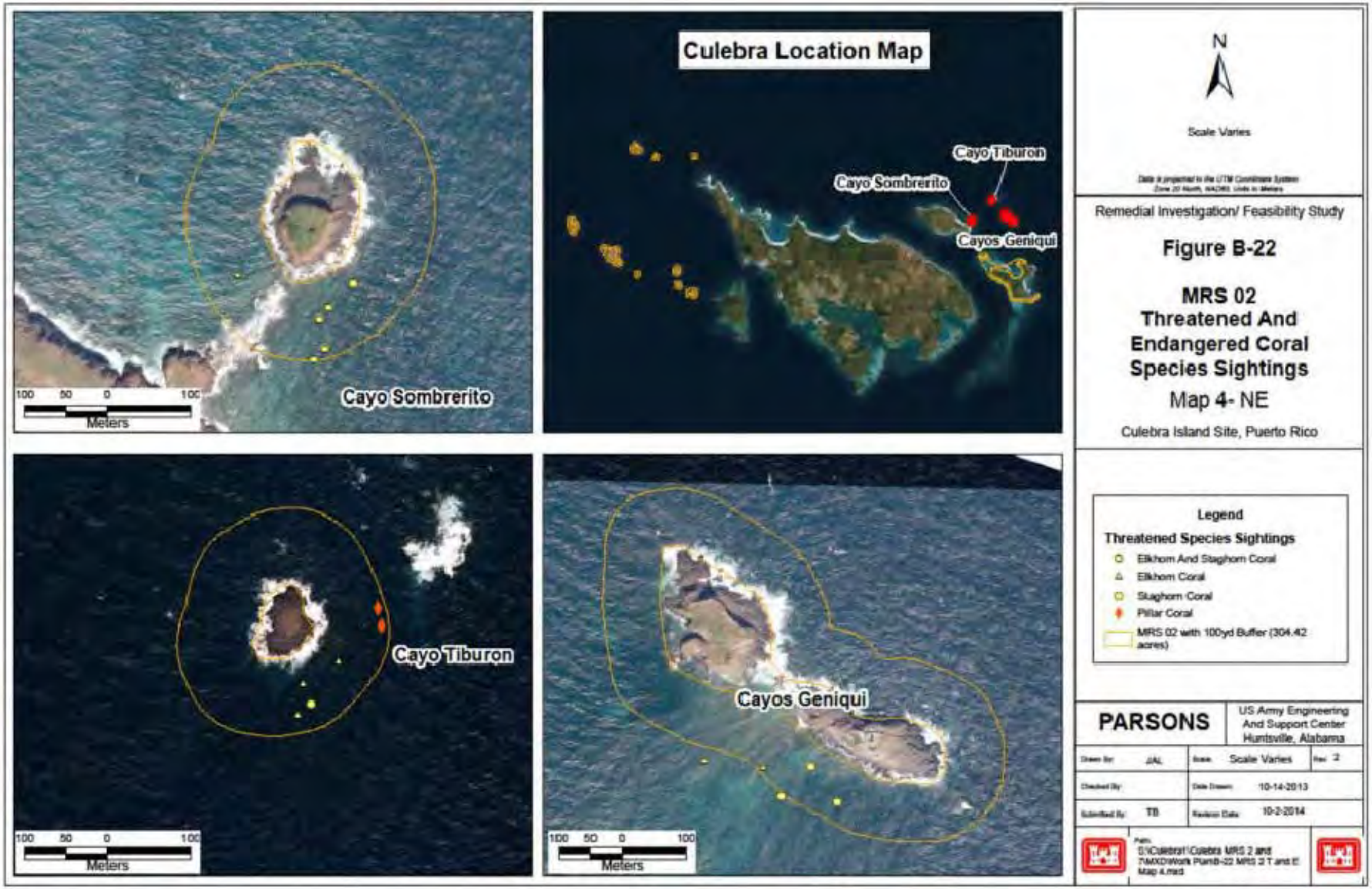
7\MXD\Work Plan\B-20 MRS 2 T and E
Map 2.mxd


Alcarraza
100 50 0 100
Meters
Culebra Location Map
Alcarraza
Los Gemelos
Piedra Stevens
Los Gemelos
100 50 0 100
Meters
Piedra Stevens
75 37.5 0 75
Meters
N
Scale Varies
Remedial Investigation/ Feasibility Study
Figure B-21
MRS 02
Threatened And
Endangered Coral
Species Sightings
Map 3- NW
Culebra Island Site, Puerto Rico
Legend
Threatened Species Sightings
Elkhorn And Staghorn Coral
Elkhorn Coral
Staghorn Coral
Pillar Coral
MRS 02 with 100yd Buffer (304.62 acres)
PARSONS
US Army Engineering
And Support Center
Huntsville, Alabama
JAL
Scale Varies
10-14-2013
TB
3-25-2014


Culebra Location Map
Cayo Tiburon
Cayo Sombrerito
Cayos Geniqui
Cayo Sombrerito
Cayo Tiburon
Cayos Geniqui
100 50 0 100
Meters
N
Scale Varies
Remedial Investigation/ Feasibility Study
Figure B-22
MRS 02
Threatened And
Endangered Coral
Species Sightings
Map 4- NE
Culebra Island Site, Puerto Rico
Legend
Threatened Species Sightings
Elkhorn And Staghorn Coral
Elkhorn Coral
Staghorn Coral
Pillar Coral
MRS 02 with 100yd Buffer (304.42 acres)
PARSONS
US Army Engineering And Support Center Huntsville, Alabama
Scale Varies
10-14-2013
10-2-2014


N
200 100 0 200
Meters
Remedial Investigation/ Feasibility Study
Figure B-23
MRS 07
Threatened And
Endangered Coral
Species Sightings
Culebra Island Site, Puerto Rico
Culebrita
Legend
Threatened Species Sightings
Elkhorn And Staghorn Coral
Elkhorn Coral
Staghorn Coral
Pillar Coral
MRS 07 with 100yd Buffer (213.48 acres)
PARSONS
US Army Engineering And Support Center Huntsville, Alabama
1 inch = 200 meters
10-11-2013
10-2-2014
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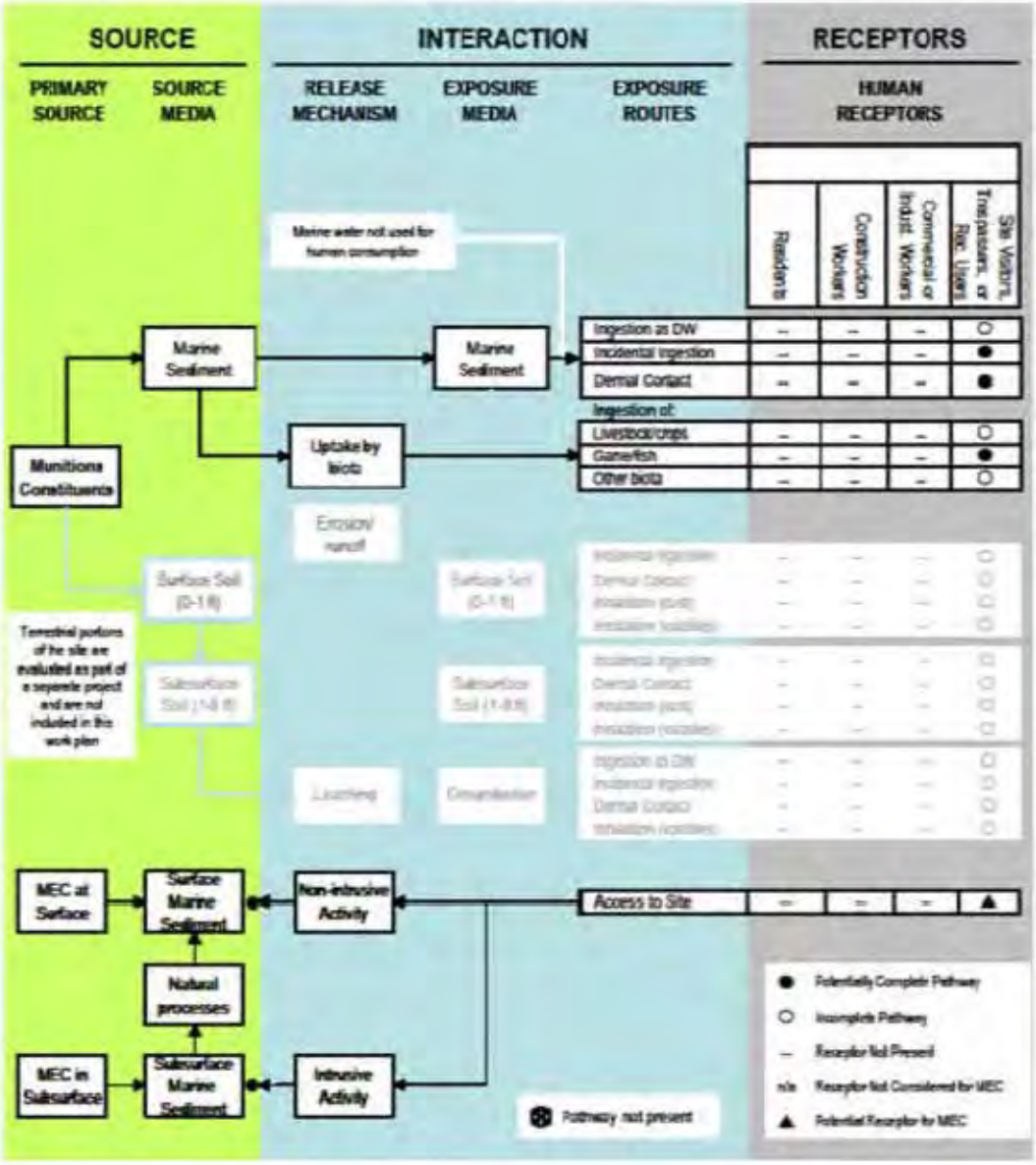
Phase II - Underwater EM Survey of MRS 07 and All Cayos of MRS 02

- **Data Quality Objectives (DQOs):**
  - Included for Project Delivery Team (PDT) review in Table 3-1 of Draft Final Work Plan
  - Comments regarding DQOs were received from PREQB and NOAA Fisheries and will be incorporated into the Final Work Plan
- **Conceptual Site Models** have been updated based on PDT EM Survey Work Plan comments

Conceptual Site Exposure Model Diagram

SiteMRS Name: Culebra Island, PR – MRS 2 Underwater Acres

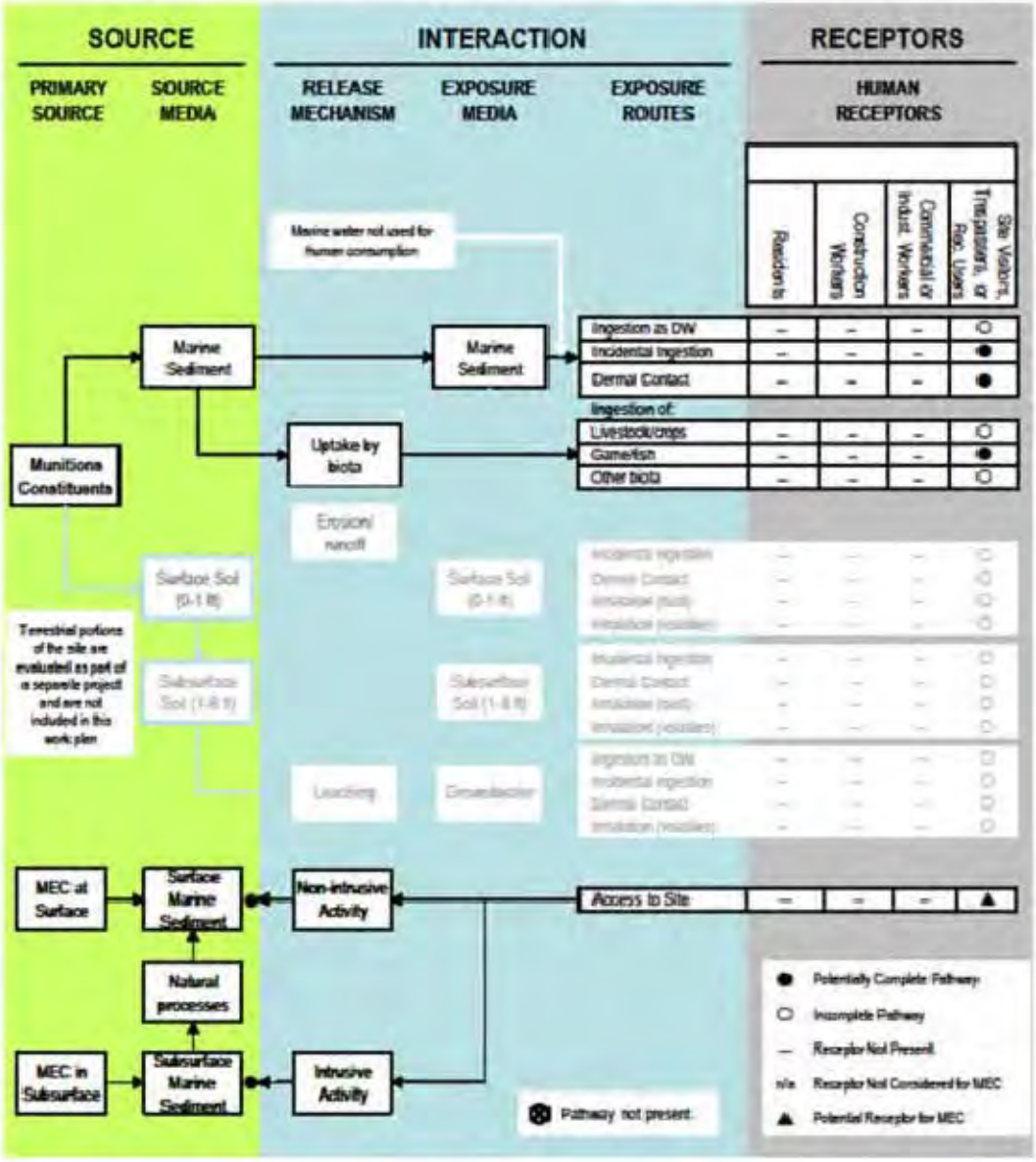
Completed By: Steve Rembish, Parsons / Tom Bourque, USA ***Date Completed:*** October 6, 2014



Conceptual Site Exposure Model Diagram

Site/MRS Name: Culebra Island, PR – MRS 7 Underwater Acres

Completed By: Steve Rembish, Parsons / Tom Bourque, USA ***Date Completed:*** October 6, 2014



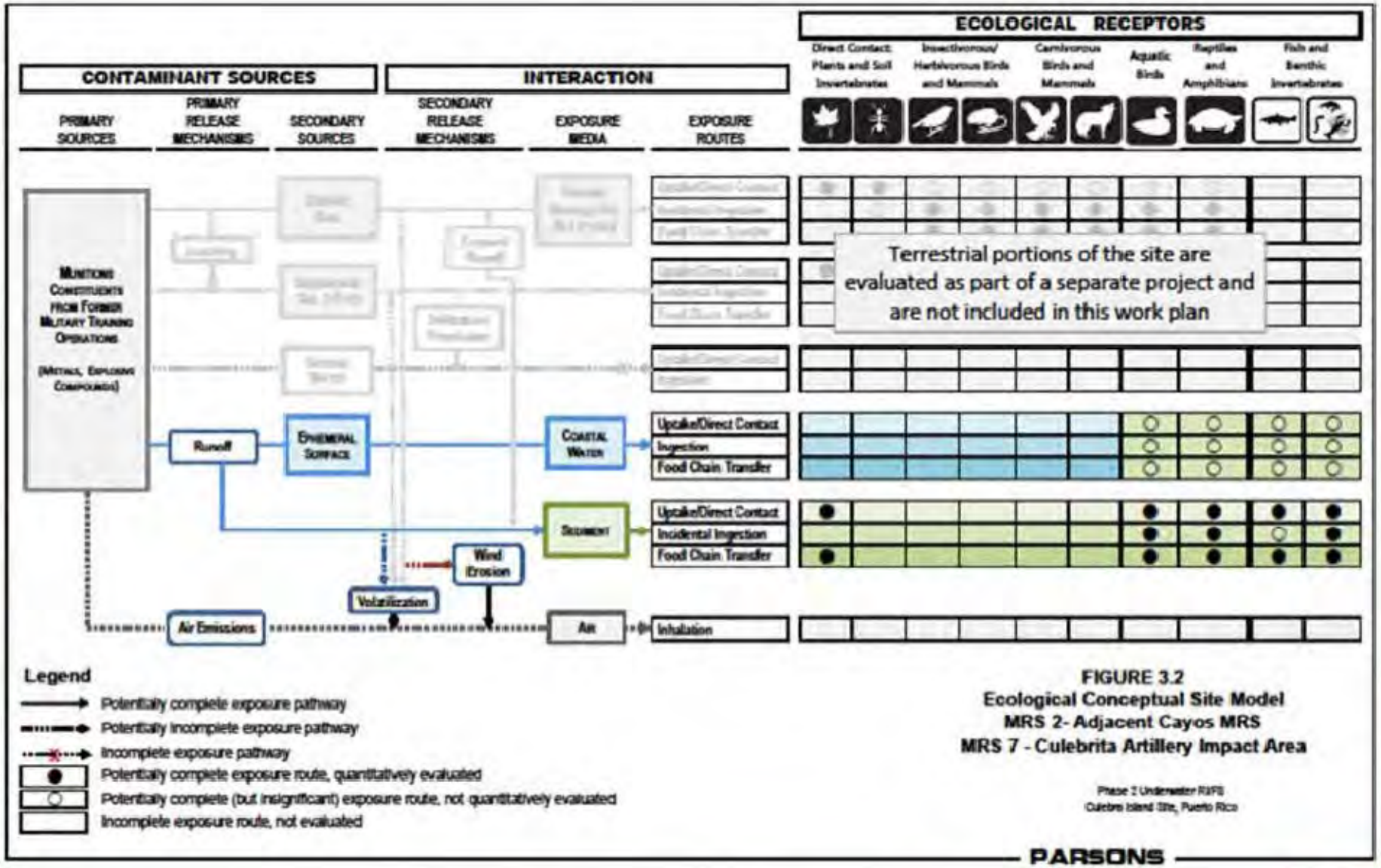


FIGURE 3.2
Ecological Conceptual Site Model
MRS 2- Adjacent Cayos MRS
MRS 7 - Culebrita Artillery Impact Area

Phase 2 Underwater RI/FS
Culebra Island Site, Puerto Rico

PARSONS

Phase II - Underwater EM Survey of MRS 07 and All Cayos of MRS 02

- **Work Plan Review:**
  - Phase II EM Survey Work Plan was submitted July 1, 2014 detailing field investigation approach
    - Incorporates findings from EBS Report into EM survey transect design and selection of DGM platforms
    - Incorporates SOP for Endangered Species Conservation and their Critical Habitat during Underwater Investigations (Feb 2014) to be followed during field operations
    - Incorporates current listing of Threatened and Endangered Species from 27 August 2014 Press Release and Fact Sheet (added as Appendix N)
    - Includes Quality Control measures required to meet DQOs

Phase II - Underwater EM Survey of MRS 07 and All Cayos of MRS 02

- **Work Plan Review:**
  - Comments requiring discussion:
    - Visual Sample Plan (VSP) for MRS 07
    - Instrument Verification Strip (IVS) at end of day
  - Remaining PDT comments will be incorporated into the Final Work Plan

Phase II - Underwater EM Survey of MRS 07 and All Cayos of MRS 02

- **Field Activities:**
  - Planned data collection:
    - MRS 02 – 15.03 transect miles
    - MRS 07 – 9.07 transect miles
  - Underwater IVSs will be set up prior to beginning transect surveys
    - 3 locations – 2 deep, 1 shallow
    - Items placed on surface
    - Will be removed at completion of field work
  - Standard Operating Procedures (SOPs) for Endangered Species will be followed
  - Full time Biologist to monitor operations and implement SOPs
  - Quality Control will be implemented per the Work Plan

Phase II - Underwater EM Survey of MRS 07 and All Cayos of MRS 02

Phase II - Underwater EM Survey of MRS 07 and All Cayos of MRS 02

- **Field Activities (cont'd):**
  - DGM platforms
    - All transect sections with scattered coral, reef, or colonized hard bottom will be surveyed with a method which results in no contact with the sea floor.
    - In shallow water areas (1 to 4 feet), the coil will be floated or will be suspended beneath a floating platform.
    - In areas that are too deep for the float system, or in areas containing coral heads with high relief, a ROV platform will be used to propel the EM coil along the RI transect.
    - If the EM platform is not suitable for selected transect segments these segments will be surveyed by Self Contained Underwater Breathing Apparatus (SCUBA) or snorkelers as an instrument aided visual transect during Phase III.

Phase II - Underwater EM Survey of MRS 07 and All Cayos of MRS 02

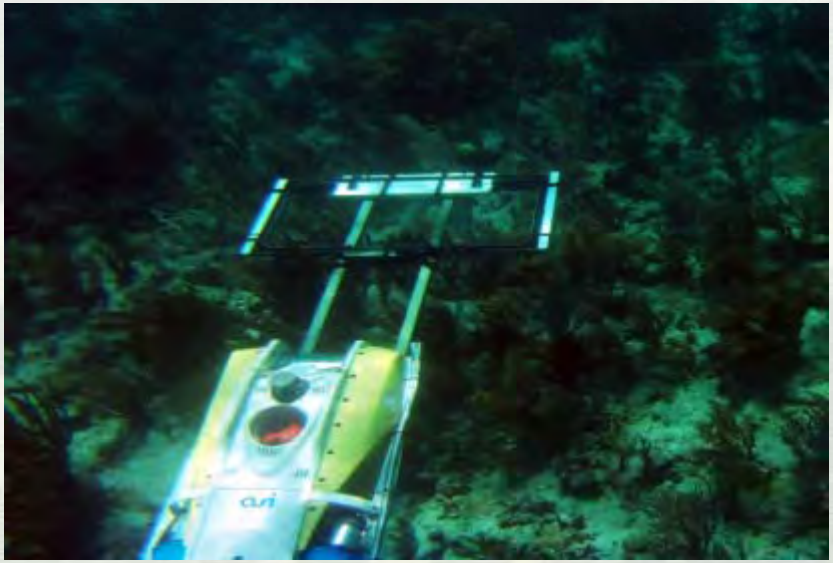
Configurations for deploying EM-61

EM61 Deep and Shallow Floating Platforms

EM61 Deep Floating Platform

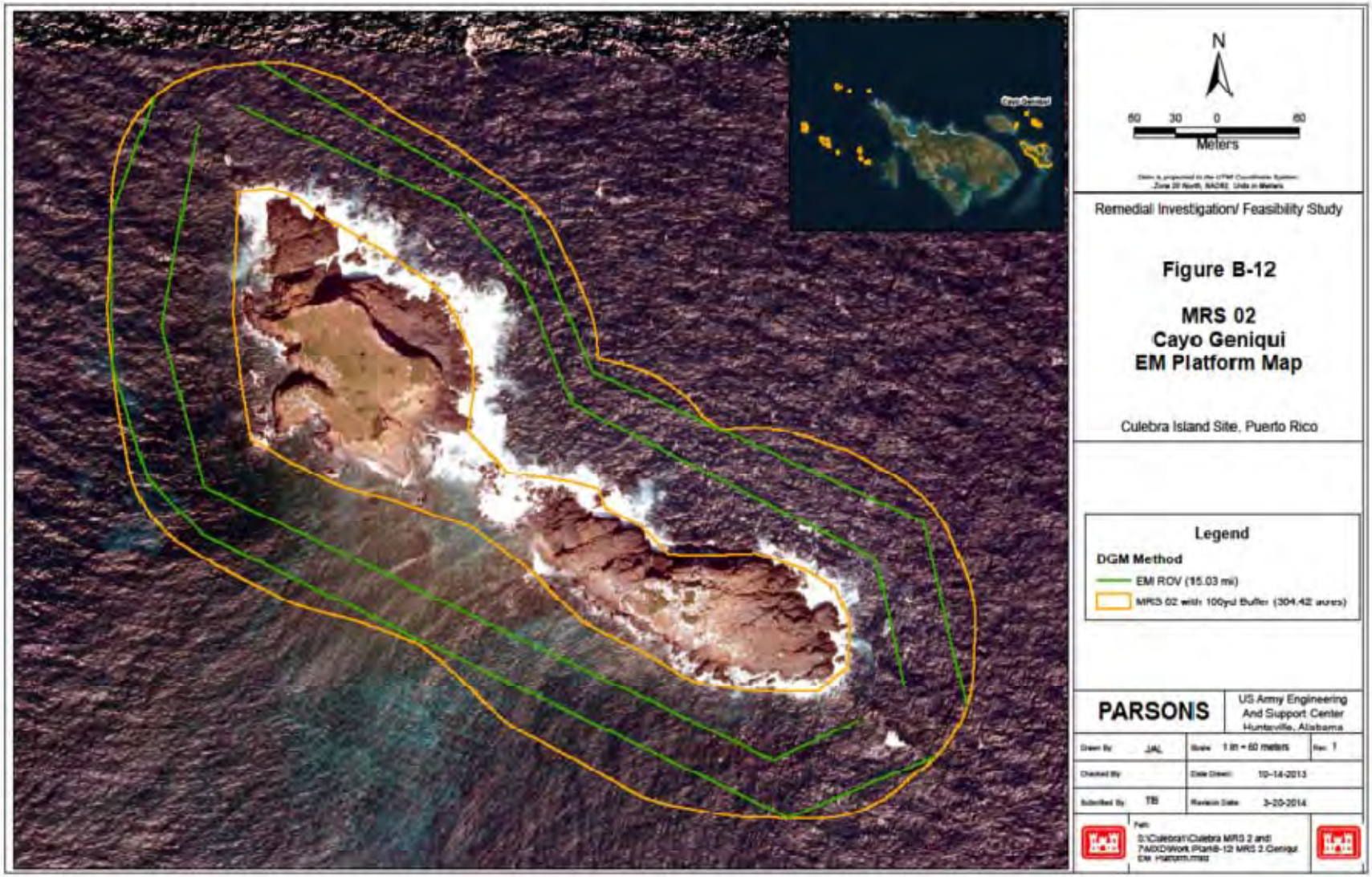
Phase II - Underwater EM Survey of MRS 07 and All Cayos of MRS 02

ROV EM Platform

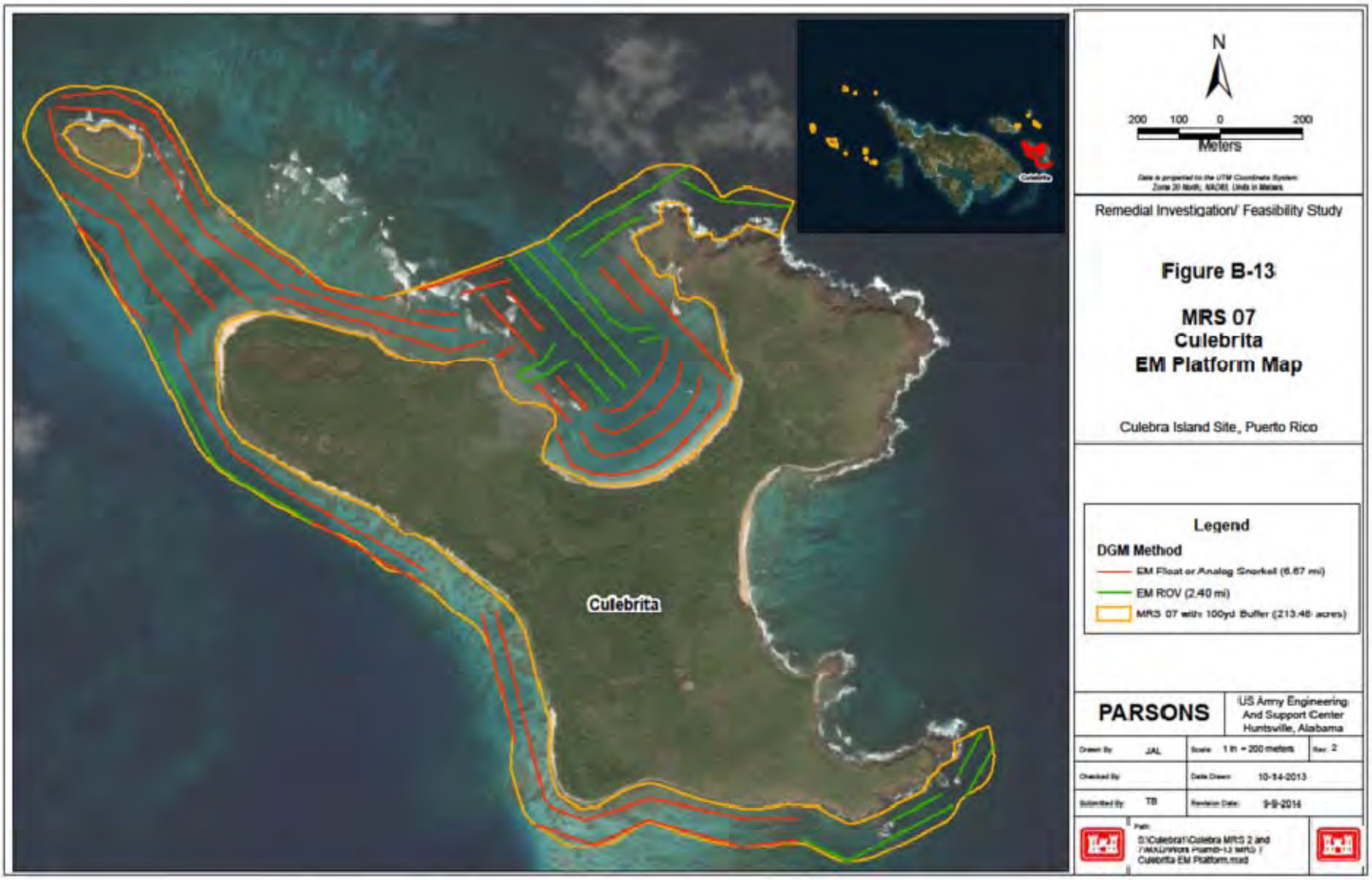


EM61 Attached to ROV

Typical MRS 02 EM Platform



MRS 07 EM Platform



Scope: Phase II - Underwater EM Survey of MRS 07 and All Cayos of MRS 02

- Data Documentation:
  - DGM data will be processed daily and undergo Parsons QC and USACE QA
  - Daily QC Reports (DGM [Phase 2] Prep Initial and Follow-up)
  - Daily Observer Logs (Biologist)
  - Incorporated into the GIS database per the Work Plan
- DGM targets will be identified for follow-on Phase III intrusive investigation and will be incorporated into the Phase III Work Plan

Phase III: Intrusive Investigation Summary

- Phase III work plan detailing intrusive investigation approach will be prepared for review and submittal prior to any field work being conducted.
- SOP for Endangered Species Conservation and their Critical Habitat during Underwater Investigations will be followed.
- Will follow processes and procedures approved for USA Environmental's U/W Intrusive Investigation at MRS 09 and MRS 13 and incorporate any lessons learned from USA's U/W field work conducted at MRS 09 and MRS 13.
- Munitions Constituents Sampling:
  - Discrete marine sediment samples at locations where Munitions Debris (MD) or suspected MPPEH items are observed.
  - Parsons/USA does not anticipate sampling soft or hard corals, sea grass, or other species for the purposes of the subsequent screening level risk assessment.

Phase III: Intrusive Investigation Summary

- Explosives Site Plan (ESP) will be developed and submitted based on the ESP prepared by USA Environmental for MRSs 09 and 13.
- Underwater Detonations will require extensive coordination with project team/local government agencies
- A Decision Matrix will be developed to provide timely decisions.
- Each MPPEH item will be evaluated as a separate scenario
- MPPEH Disposal will follow SOPs for Endangered Species

Schedule

Phase II - EM Survey Work Plan *	13-Mar-14	18-Nov-14
Phase II Field Work - Underwater EM Survey *	01-Dec-14	22-Dec-14
Phase III - Intrusive Investigation Work Plan/ESP	02-Jan-15	30-Jun-15
Phase III - U/W Intrusive Investigation/ MC Sampling/MEC Disposal	01-Jul-15	30-Sep-15
RI/FS Reports	01-Oct-15	16-Feb-16
Proposed Plans	17-Feb-16	20-May-16
Decision Documents	21-May-16	11-Jul-16

* Pending acceptance of responses to comments on Draft Final Work Plan and incorporation of comments into Final Work Plan.

Discussions

- Issues
- Comments
- Questions

Safety Is Our #1 Priority

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ATTACHMENT 3

MRS 07 BOUNDARY DOCUMENTATION

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Original
Bridgers
dp s fb

Environmental Quality Board
COMMONWEALTH OF PUERTO RICO
Office of the Governor

35 Years of Environmental Management

Office of the Chairman

August 1st, 2005

Colonel Robert M. Carpenter
U.S. Army Corps of Engineers
Jacksonville District
701 San Marco Blvd.
Jacksonville, FL 32207-8175

RE: CULEBRA ISLAND PROJECT

As mentioned in previous letters and as requested by personn[illegible] Puerto Rico Environmental Quality Board asks for the definition given in the Engineering Regulation 200-3-1 dated May 10, 2004 which categorizes "Offshore Ordnance Property" as ineligible properties. Certain areas that are farther than the one hundred yards from the shore should be investigated in the Culebra project in order to address the safety concerns of the Commonwealth of Puerto Rico.

The island of Culebra, Puerto Rico was used by the US Navy as a naval station and training area from 1902 until 1975. Military operations during this period included naval gunfire support and aerial bombardment of the Northwest (Flamenco) Peninsula, the island of Culebrita, Luis Peña Cayo, and other smaller cayos around Culebra. In the Vietnam War era, Culebra was used intensely for ordnance training. Additionally, it has been recently discovered that the US Marine Corps used various cayos or islands around Culebra as artillery impact areas during frequent training exercises before World War II. During these operations numerous unexploded munitions ended up in the waters around the islands.

The waters around Culebra and its adjacent cayos are heavily used for fishing and recreation. The area is well known for its crystal clear waters and beautiful coral formations. The public is being subjected to substantial and imminent exposure to the remaining unexploded ordnance, and the boaters can be at risk when they drop their anchors in the numerous harbors. Swimmers and scuba divers can also have

Physical Address: Ave. Ponce de León, Hato Rey, PR 00918 Tel. 787-767-8181 • Fax 787-767-4861
Postal Address: PO Box 11488, Santurce, PR 00910
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direct contact with the ordnance items in the coral beds and sea floor, and fishermen could accidentally snag munitions that might still be present. In these same waters, Note B of the NOAA Navigation Chart No. 25650, states that "Mariners are cautioned against anchoring, dredging, or trawling in this area due to the possible existence of unexploded ordnance.

We have outlined on the attached drawing the areas where a direct and easy pathway exists for the public to access these remaining items. Much of this area is in the Luis Peña Marine Reserve. Significantly, a large portion of the areas falls outside the 100-yard seaward limit that your previously mentioned Engineering Regulation 200-3-1 stipulates as the distance for eligibility to be included for remediation under the Formerly Used Defense Site (FUDS) program.

We request that you reconsider this limitation in light of the fact that these munitions originated from a FUDS eligible property and constitute a substantial danger to public health or welfare and to the environment. Remediation activities under the FUDS program could then be initiated to mitigate this exposure.

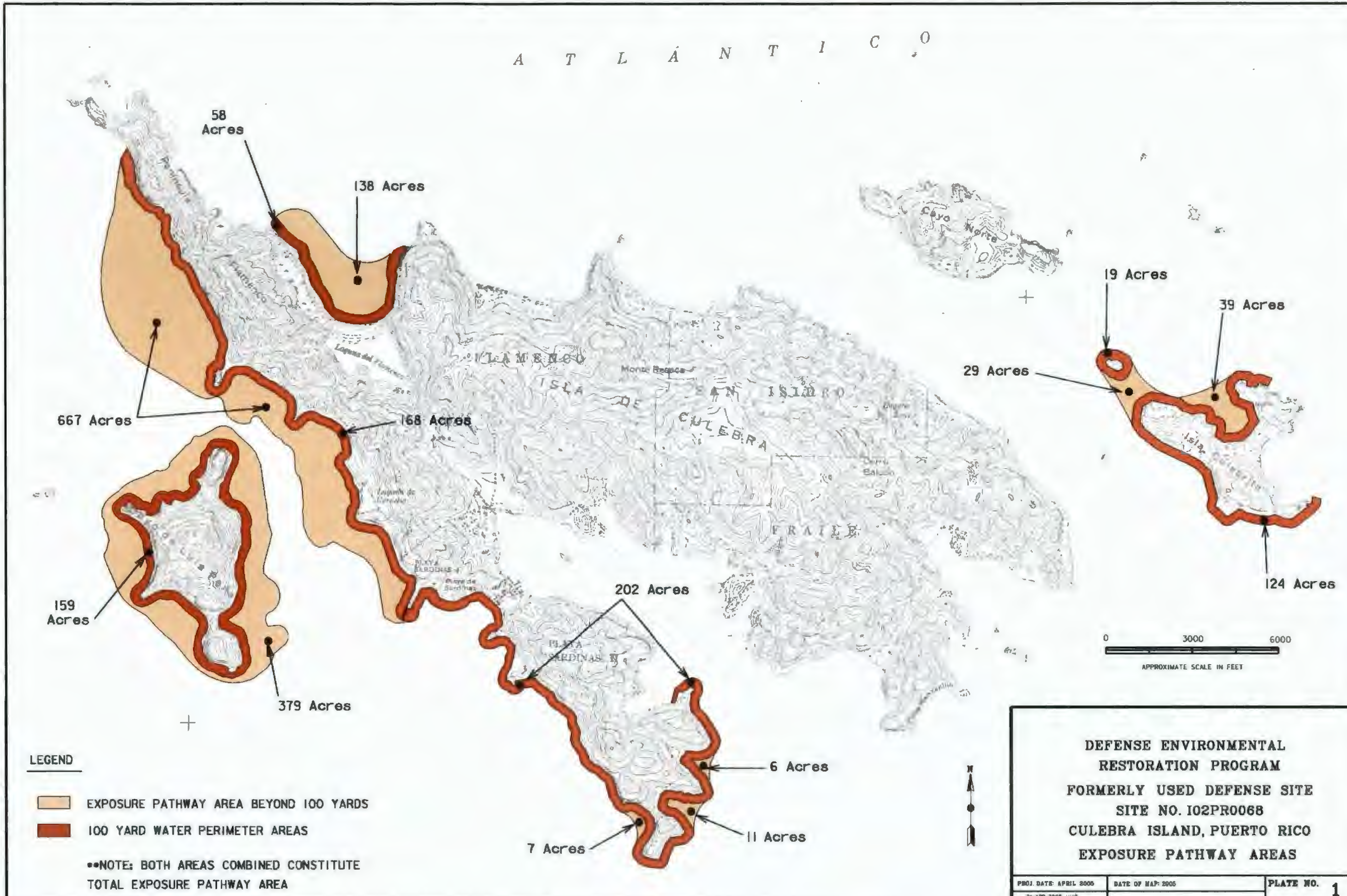
If you have any doubts or questions you may contact me at (787) 767-8056. Your prompt consideration of this matter would be greatly appreciated.

Cordially,

Carlos W. López Freytes
President

Enclosure

Cc: Javier Arocho, Secretary
Department of Natural and Environmental Resources



A T L Á N T I C O
58 Acres
138 Acres
667 Acres
168 Acres
159 Acres
379 Acres
202 Acres
6 Acres
7 Acres
11 Acres
19 Acres
39 Acres
29 Acres
124 Acres
Cayo Norte
FLAMENCO
ISLA DE CULEBRA
SAN ISIDRO
FRAILE
Monte Resaca
PLAYA SARDINAS II
0 3000 6000
APPROXIMATE SCALE IN FEET
N
LEGEND
EXPOSURE PATHWAY AREA BEYOND 100 YARDS
100 YARD WATER PERIMETER AREAS
**NOTE: BOTH AREAS COMBINED CONSTITUTE TOTAL EXPOSURE PATHWAY AREA
DEFENSE ENVIRONMENTAL RESTORATION PROGRAM
FORMERLY USED DEFENSE SITE
SITE NO. I02PR0068
CULEBRA ISLAND, PUERTO RICO
EXPOSURE PATHWAY AREAS
PROJ. DATE: APRIL 2005
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DATE OF MAP: 2005
PLATE NO. 1

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APPENDIX J. SCHEDULE

This appendix contains a copy of the Schedule for this project.

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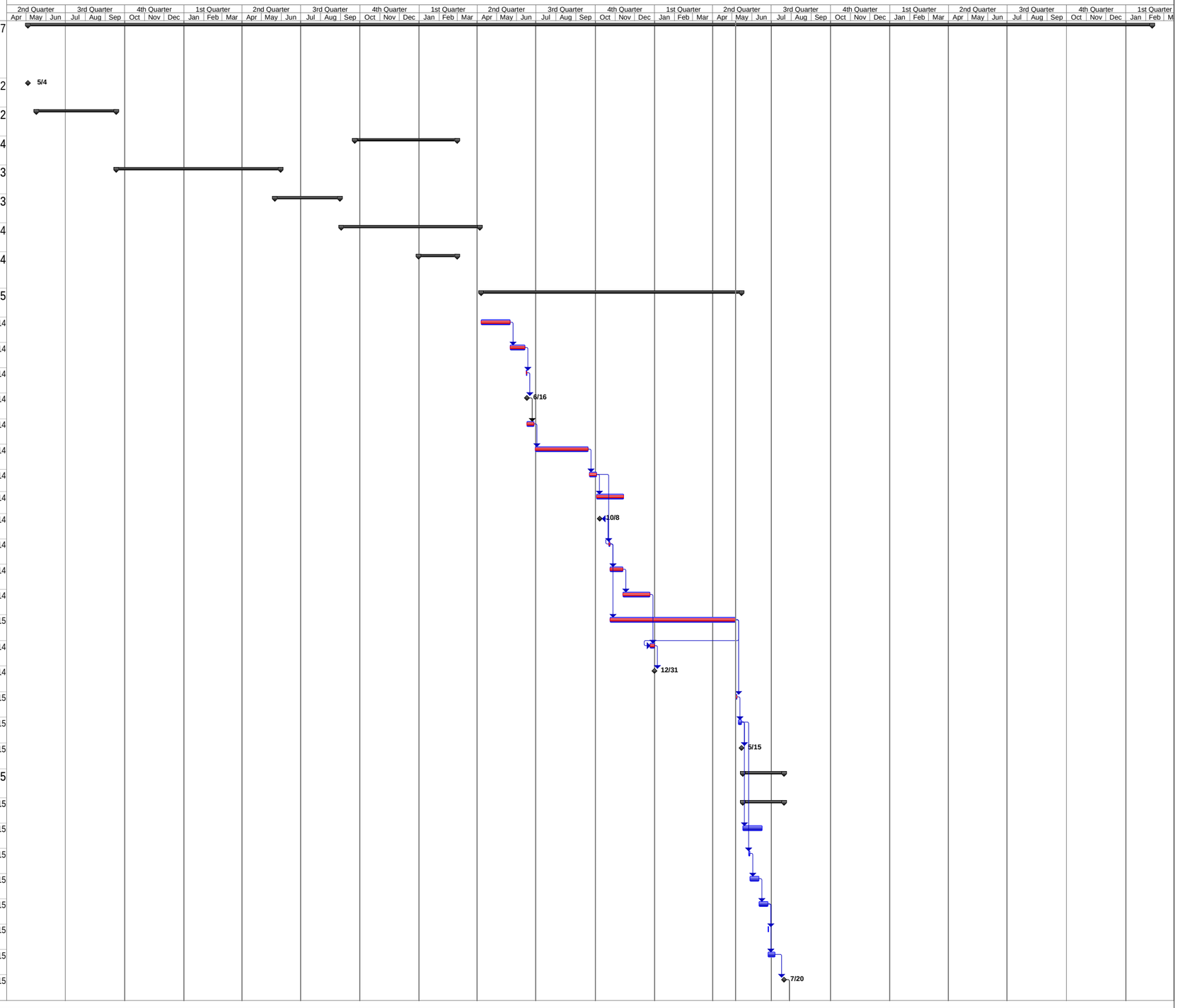
Remedial Investigation/Feasibility Study
MRS 07 Culebrita Artillery Impact Area Water Acreage and all Cayos of MRS 02

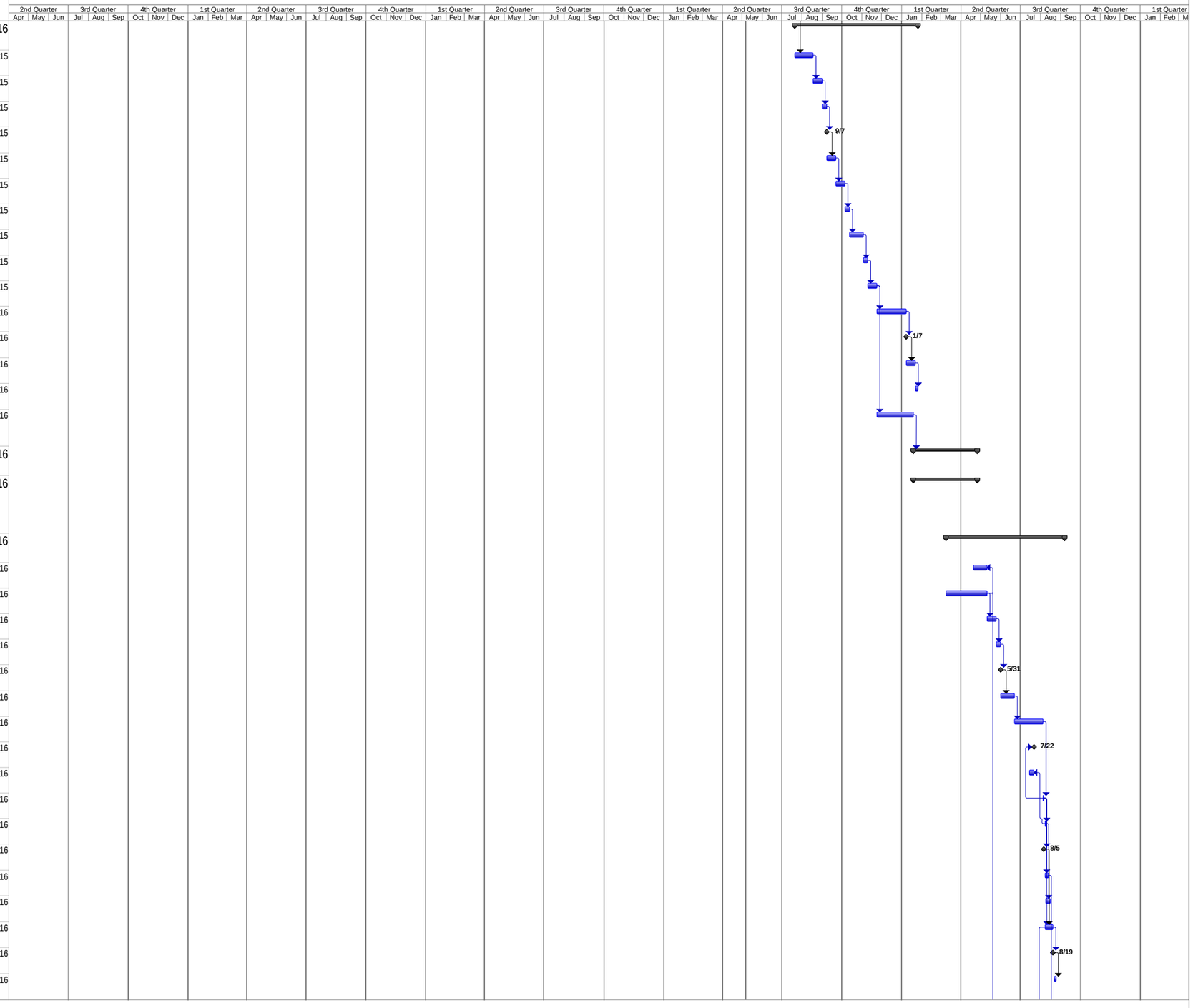
ID	Task Name	Duration	Start	Finish
1	MRS 07 Culebrita Artillery Impact Area Water Acreage and all Cayos of MRS 02	1246 days	Fri 5/4/12	Fri 2/10/17
2	Award	0 days	Fri 5/4/12	Fri 5/4/12
3	TPP (Task 1)	88 days	Thu 5/17/12	Mon 9/17/12
16	Community Relations Plan (CRP) (Task 10)	115 days	Mon 9/23/13	Fri 2/28/14
25	Baseline Survey Work Plan/QASP (Task 2c and 2b)	183 days	Tue 9/18/12	Thu 5/30/13
35	RI/FS Field Activities (Task 4a1-3, Task 4b1-3, and Task 14)	73 days	Wed 5/22/13	Fri 8/30/13
48	Baseline Survey Report (Task 13)	155 days	Mon 9/2/13	Fri 4/4/14
58	TPP Meeting No. 2 (Task 1)	44 days	Tue 12/31/13	Fri 2/28/14
65	EM Survey Work Plan (Task 2b, 2d)	290 days	Mon 4/7/14	Fri 5/15/15
66	Draft EM Survey Work Plan/Dive Plan	33 days	Mon 4/7/14	Wed 5/21/14
67	USACE PDT Review of EM Survey Work Plan/Dive Plan	17 days	Thu 5/22/14	Fri 6/13/14
68	Response to Comments	1 day	Mon 6/16/14	Mon 6/16/14
69	Milestone - Acceptance of EM Survey Work Plan/Dive Plan	0 days	Mon 6/16/14	Mon 6/16/14
70	Draft Final EM Survey Work Plan/ Dive Plan	9 days	Tue 6/17/14	Fri 6/27/14
71	Regulator Review of DF EM Survey Work Plan	60 days	Mon 6/30/14	Fri 9/19/14
72	EM CX Review of DF EM Survey Work Plan	9 days	Mon 9/22/14	Thu 10/2/14
73	Respond to EM-CX/Regulator comments	30 days	Fri 10/3/14	Thu 11/13/14
74	Pre-TPP Meeting No. 3 Materials (Task 1)	0 days	Wed 10/8/14	Wed 10/8/14
75	TPP Meeting No. 3 (Finalize Work Plans) (Task 1)	2 days	Wed 10/22/14	Thu 10/23/14
76	Draft TPP No. 3 Memorandum (Task 1)	14 days	Fri 10/24/14	Wed 11/12/14
77	Review of TPP No. 3 Memorandum (Task 1)	30 days	Thu 11/13/14	Wed 12/24/14
78	Milestone - Acceptance of DF EM Survey Work Plan/ Dive Plan	139 days	Fri 10/24/14	Wed 5/6/15
79	Final TPP No. 3 Memorandum (Task 1)	5 days	Thu 12/25/14	Wed 12/31/14
80	Milestone - Acceptance of TPP Memorandum Addendum	0 days	Wed 12/31/14	Wed 12/31/14
81	Final EM Survey Work Plan/ Dive Plan	2 days	Thu 5/7/15	Fri 5/8/15
82	Milestone - Acceptance of Final EM Survey Work Plan/ Dive Plan and NTP	5 days	Mon 5/11/15	Fri 5/15/15
83	Milestone - Pre-RI Analysis GIS Submittal (Task 3)	0 days	Fri 5/15/15	Fri 5/15/15
84	RI/FS Field Activities (Task 4a4, Task 4b4, and Task 14)	46 days	Mon 5/18/15	Mon 7/20/15
85	Underwater EM Survey	46 days	Mon 5/18/15	Mon 7/20/15
86	Concurrent Beach Monitoring (Task 14)	22 days	Mon 5/18/15	Tue 6/16/15
87	Mobilization- Underwater EM Team/IVS	2 days	Wed 5/27/15	Thu 5/28/15
88	MRS 7: Culebrita Artillery Impact Area Water Acreage (Task 4a4)	10 days	Fri 5/29/15	Thu 6/11/15
89	MRS 2: All Other Cayos (Task 4b4)	10 days	Fri 6/12/15	Thu 6/25/15
90	Demobilization- Underwater EM Team	1 day	Fri 6/26/15	Fri 6/26/15
91	Submit Data	7 days	Fri 6/26/15	Mon 7/6/15
92	Milestone - Government Review/Acceptance of Data	10 days	Tue 7/7/15	Mon 7/20/15



Task | Milestone | Project Summary | External Milestone | Inactive Milestone | Manual Task | Manual Summary Rollup | Start-only | Progress
Split | Summary | External Tasks | Inactive Task | Inactive Summary | Duration-only | Manual Summary | Finish-only | Deadline

Remedial Investigation/Feasibility Study
MRS 07 Culebrita Artillery Impact Area Water Acreage and all Cayos of MRS 02

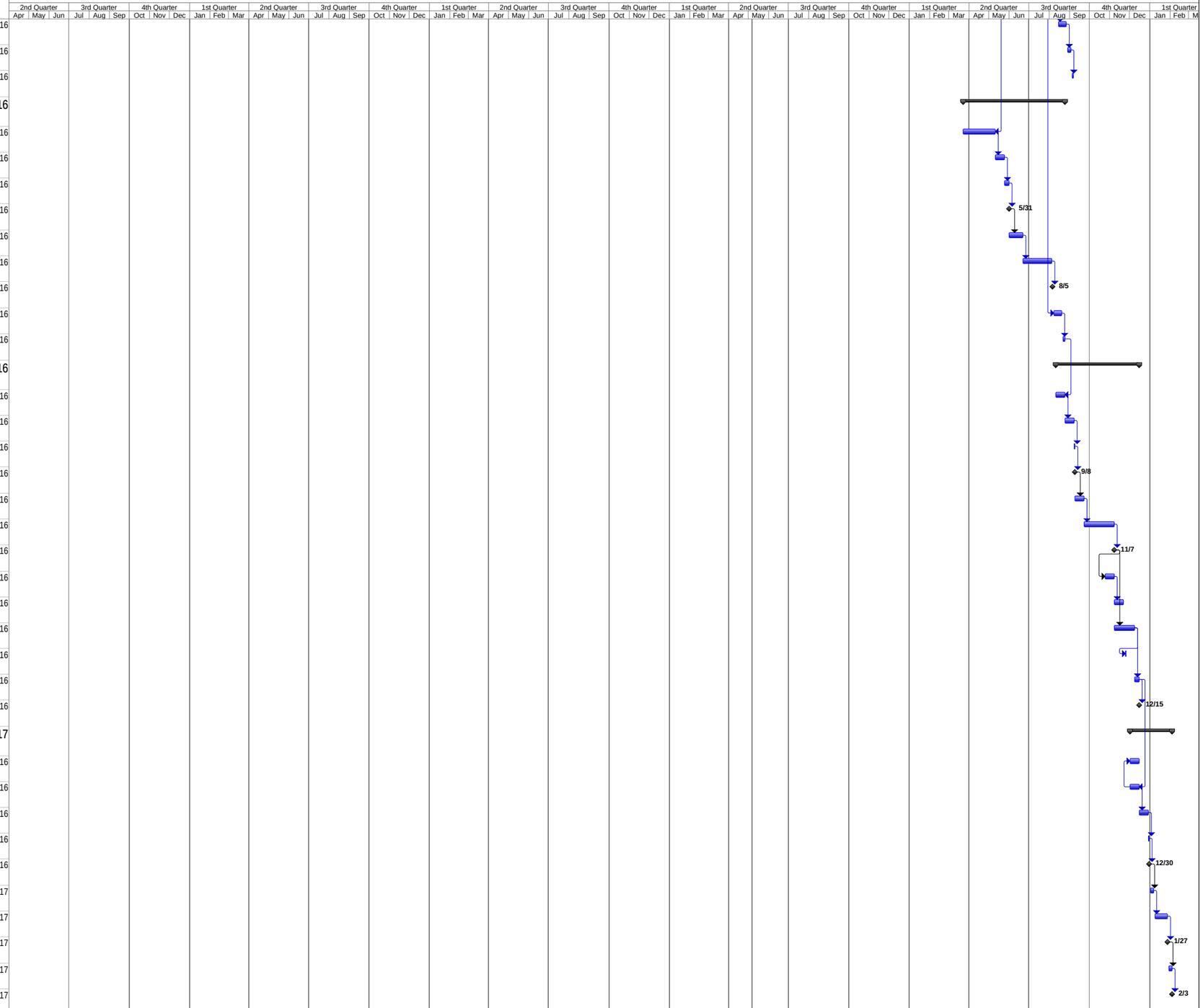
ID	Task Name	Duration	Start	Finish
93	**Intrusive Investigation Work Plan/ESP (Task 2a, 2e)**	135 days	Tue 7/21/15	Mon 1/25/16
94	Draft Intrusive Investigation Work Plan/ESP	20 days	Tue 7/21/15	Mon 8/17/15
95	USACE PDT Review of Intrusive Investigation Work Plan/ESP	10 days	Tue 8/18/15	Mon 8/31/15
96	Response to Comments	5 days	Tue 9/1/15	Mon 9/7/15
97	Milestone - Acceptance of Draft Intrusive Investigation Work Plan/ESP	0 days	Mon 9/7/15	Mon 9/7/15
98	Draft Final Intrusive Investigation Work Plan/ESP	10 days	Tue 9/8/15	Mon 9/21/15
99	USACE PDT Backcheck of Revisions	10 days	Tue 9/22/15	Mon 10/5/15
100	Incorporate Changes	5 days	Tue 10/6/15	Mon 10/12/15
101	MM CX Review of DF Intrusive Investigation Work Plan/ESP	15 days	Tue 10/13/15	Mon 11/2/15
102	Incorporate Changes	5 days	Tue 11/3/15	Mon 11/9/15
103	MM CX Backcheck of Revisions	10 days	Tue 11/10/15	Mon 11/23/15
104	Regulator Review of DF Intrusive Investigation Work Plan	33 days	Tue 11/24/15	Thu 1/7/16
105	Milestone - Acceptance of DF Intrusive Investigation Work Plan/ESP	0 days	Thu 1/7/16	Thu 1/7/16
106	Final Intrusive Investigation Work Plan/ESP	10 days	Fri 1/8/16	Thu 1/21/16
107	Milestone - Acceptance of Final Intrusive Investigation Work Plan/ESP	2 days	Fri 1/22/16	Mon 1/25/16
108	DDESB Review and Approval of ESP	40 days	Tue 11/24/15	Mon 1/18/16
109	**RI/FS Field Activities (Task 4a5, Task 4b5, and Task 14)**	70 days	Tue 1/19/16	Mon 4/25/16
110	**Underwater Intrusive Investigation/ MC Sampling/MEC Disposal**	70 days	Tue 1/19/16	Mon 4/25/16
125	**RI Reports (Task 5)**	130 days	Wed 3/9/16	Tue 9/6/16
126	MC Risk Assessment	15 days	Wed 4/20/16	Tue 5/10/16
127	Draft RI Report (Task 5a - MRS 7 and 5b - MRS 2)	45 days	Wed 3/9/16	Tue 5/10/16
128	USACE PDT Review of Draft RI Reports	10 days	Wed 5/11/16	Tue 5/24/16
129	Response to Comments	5 days	Wed 5/25/16	Tue 5/31/16
130	Milestone - Acceptance of Draft RI Reports	0 days	Tue 5/31/16	Tue 5/31/16
131	Draft Final RI Reports	15 days	Wed 6/1/16	Tue 6/21/16
132	EM-CX/Regulator Review of DF RI Reports	32 days	Wed 6/22/16	Thu 8/4/16
133	Pre-TPP Meeting No. 2 Materials (Task 1)	0 days	Fri 7/22/16	Fri 7/22/16
134	Pre-Public Meeting No. 2 Materials (Task 9)	5 days	Fri 7/15/16	Fri 7/22/16
135	TPP Meeting No. 3 (Data Review/ Finalize RI Report) (Task 1)	1 day	Fri 8/5/16	Fri 8/5/16
136	Public Meeting No. 2 - RI/FS Field Work Update (Task 9)	1 day	Mon 8/8/16	Mon 8/8/16
137	Milestone - Acceptance of DF RI Reports	0 days	Fri 8/5/16	Fri 8/5/16
138	Draft TPP No. 3 Memorandum (Task 1)	5 days	Mon 8/8/16	Fri 8/12/16
139	Milestone - Submittal of Public Meeting 2 minutes	5 days	Tue 8/9/16	Mon 8/15/16
140	Final RI Reports	10 days	Mon 8/8/16	Fri 8/19/16
141	Milestone - Post-RI GIS Analysis Submittal (Task 3)	0 days	Fri 8/19/16	Fri 8/19/16
142	Milestone - Acceptance of Final RI Reports	3 days	Mon 8/22/16	Wed 8/24/16



Task | Milestone | Project Summary | External Milestone | Inactive Milestone | Manual Task | Manual Summary Rollup | Start-only | Progress
Split | Summary | External Tasks | Inactive Task | Inactive Summary | Duration-only | Manual Summary | Finish-only | Deadline

Remedial Investigation/Feasibility Study
MRS 07 Culebrita Artillery Impact Area Water Acreage and all Cayos of MRS 02

ID	Task Name	Duration	Start	Finish
143	Review of TPP No. 3 Memorandum (Task 1)	10 days	Mon 8/15/16	Fri 8/26/16
144	Final TPP No. 3 Memorandum (Task 1)	5 days	Mon 8/29/16	Fri 9/2/16
145	Milestone - Acceptance of TPP No. 3 Memorandum	2 days	Mon 9/5/16	Tue 9/6/16
146	**FS and Reports (Task 6)**	**111 days**	**Wed 3/23/16**	**Wed 8/24/16**
147	Draft FS Reports (Task 6a - MRS 7 and Task 6b - MRS 2)	35 days	Wed 3/23/16	Tue 5/10/16
148	USACE PDT Review of Draft FS Report	10 days	Wed 5/11/16	Tue 5/24/16
149	Response to Comments	5 days	Wed 5/25/16	Tue 5/31/16
150	Milestone - Acceptance of Draft FS Report	0 days	Tue 5/31/16	Tue 5/31/16
151	Draft Final FS Reports	15 days	Wed 6/1/16	Tue 6/21/16
152	Regulator Review of DF FS Reports	32 days	Wed 6/22/16	Thu 8/4/16
153	Milestone - Acceptance of DF FS Reports	0 days	Fri 8/5/16	Fri 8/5/16
154	Final FS Report	10 days	Mon 8/8/16	Fri 8/19/16
155	Milestone - Acceptance of Final FS Reports	3 days	Mon 8/22/16	Wed 8/24/16
156	**Proposed Plans (Task 7)**	**91 days**	**Thu 8/11/16**	**Thu 12/15/16**
157	Draft PPs (Task 7a - MRS 7 and Task 7b - MRS 2	10 days	Thu 8/11/16	Wed 8/24/16
158	USACE PDT Review of Draft PPs	10 days	Thu 8/25/16	Wed 9/7/16
159	Responses to Comments	1 day	Thu 9/8/16	Thu 9/8/16
160	Milestone - Acceptance of Draft PPs	0 days	Thu 9/8/16	Thu 9/8/16
161	Draft Final PPs	10 days	Fri 9/9/16	Thu 9/22/16
162	EM-CX/Regulator Review of DF PPs	32 days	Fri 9/23/16	Mon 11/7/16
163	Milestone - Acceptance of Draft Final PP	0 days	Mon 11/7/16	Mon 11/7/16
164	Pre-Public Meeting No. 3 Materials	10 days	Tue 10/25/16	Mon 11/7/16
165	USACE PDT Review of Public Meeting Materials	10 days	Tue 11/8/16	Mon 11/21/16
166	Public Review of DF PPs	23 days	Tue 11/8/16	Thu 12/8/16
167	Public Meeting No.3- Proposed Plan (Task 9)	1 day	Fri 11/25/16	Fri 11/25/16
168	Final PP and PP Meeting Transcripts	5 days	Fri 12/9/16	Thu 12/15/16
169	Milestone - Acceptance of Final PPs	0 days	Thu 12/15/16	Thu 12/15/16
170	**Decision Documents (Task 8)**	**46 days**	**Fri 12/2/16**	**Fri 2/3/17**
171	Responsiveness Summary	10 days	Fri 12/2/16	Thu 12/15/16
172	Draft Decision Documents (Task 8a - MRS 7 and Task 8b - MRS 2)	10 days	Fri 12/2/16	Thu 12/15/16
173	USACE PDT Review of Draft DDs	10 days	Fri 12/16/16	Thu 12/29/16
174	Response to Comments	1 day	Fri 12/30/16	Fri 12/30/16
175	Milestone - Acceptance of Draft DDs	0 days	Fri 12/30/16	Fri 12/30/16
176	Draft Final Decision Documents	5 days	Mon 1/2/17	Fri 1/6/17
177	MM CX Review of DF PPs	15 days	Mon 1/9/17	Fri 1/27/17
178	Milestone - Acceptance of DF DDs	0 days	Fri 1/27/17	Fri 1/27/17
179	Final DDs	5 days	Mon 1/30/17	Fri 2/3/17
180	Milestone - Acceptance of Final DDs	0 days	Fri 2/3/17	Fri 2/3/17



Task — Milestone — Project Summary — External Milestone — Inactive Milestone — Manual Task — Manual Summary Rollup — Start-only — Progress
Split — Summary — External Tasks — Inactive Task — Inactive Summary — Duration-only — Manual Summary — Finish-only — Deadline

Remedial Investigation/Feasibility Study

MRS 07 Culebrita Artillery Impact Area Water Acreage and all Cayos of MRS 02

ID	Task Name	Duration	Start	Finish
181	Community Relations Support	850 days	Mon 6/10/13	Fri 9/9/16
182	Administrative Record (Task 11)	960 days	Mon 6/10/13	Fri 2/10/17

2nd Quarter | 3rd Quarter | 4th Quarter | 1st Quarter | 2nd Quarter | 3rd Quarter | 4th Quarter | 1st Quarter | 2nd Quarter | 3rd Quarter | 4th Quarter | 1st Quarter | 2nd Quarter | 3rd Quarter | 4th Quarter | 1st Quarter | 2nd Quarter | 3rd Quarter | 4th Quarter | 1st Quarter

Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb M

Task | Milestone | Project Summary | External Milestone | Inactive Milestone | Manual Task | Manual Summary Rollup | Start-only | Progress

Split | Summary | External Tasks | Inactive Task | Inactive Summary | Duration-only | Manual Summary | Finish-only | Deadline

APPENDIX K. STANDARD OPERATING PROCEDURES (SOPS)

This appendix contains the following SOPs related to this effort.

- DSOP 01 – SCUBA Pre Dive Brief
- DSOP 02 - Temporary Control Point Setup using NGS OPUS
- DSOP 03 – Dive Supervisor Check List
- DSOP 04 – SCUBA Dive Logs
- DSOP 05 – Dive Equipment Load out
- DSOP 06 – Dive System Equipment Inspection
- DSOP 07 – Dive Line Pull and Hand Signals
- DSOP 10 – Underwater Operations in Marine Habitats
- DSOP 12 – Aqua Survey EM UXO Surveys
- Final Supplemental Standard Operating Procedures for Endangered Species Conservation and their Critical Habitat, DERP-FUDS Property No. I02PR0068, Culebra, Puerto Rico, February 2014 (Addendum 1 February 2015)

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STANDARD OPERATING PROCEDURE
DSOP-01: SCUBA PRE DIVE BRIEF

****This pre dive brief will be conducted each work day diving operations are planned, and will be completed in concert with other required project Safety meetings and Tailgate Safety Briefs.**

****Underwater explosive disposal events will also require completion of a task specific safety and operations brief.**

DATE _____

DIVE SUMMARY

Purpose of the Dive: _____

Diving System in Use: _____

Location of Dive Site: _____

Boat Platform or Land Based Dive Site _____

Special Tools/Equipment _____

DIVE PROFILE

Planned Table/Schedule: _____ FSW /_____ (min)

Repet Group: _____

Non-Decompression Limits for Anticipated dive depth: _____ (min)

Non-Decompression Limits for next deeper dive profile: _____ FSW /_____ (min)

Divers will not exceed a depth of _____(FSW) during the dive

Diver will not exceed a bottom time of _____(min) during the dive

SITE CONDITIONS

1) Water Temp _____

2) Air Temp _____

3) Wind Speed _____ Direction _____

4) Sunrise _____ Sunset _____

5) Surface Conditions/Wave Height _____

6) Low Tide _____ High Tide _____

7) Anticipated Current _____ Direction _____

8) Bottom Type _____

9) In-Water Visibility _____

ANTICIPATED SITE HAZARDS

1) Boat Traffic
2) Weather Related Hazards
3) Unexploded Ordnance
4) Sea Life

ASSIGNMENTS

Diver #1 _____

Diver #2 _____

Standby _____

DIVER READINESS

1) Divers/personnel on medication:

Name _____ Medication_____

Name_____ Medication _____

2) All divers Clear: YES / NO

3) Any personnel completed a dive in the previous 12 hours:

Name _____ Profile _____

4) Does any diver intend to fly within 12-hours after making these dives

5) Any divers wearing contact lenses or false teeth:

Name _____ Type_____

Name_____ Type _____

6) Any diver have pre-existing medical or neurological conditions that the Dive Supervisor should be aware of:

Name _____ Condition _____

Name _____ Condition _____

**NOTE: All divers should note their physical condition both before and after each dive. Report any symptoms, developing conditions, or concerns to the Diving Supervisor.

COMMUNICATION

1) As required, verify communication equipment is operational, and ensure that local support agencies and facilities are availability to provide medical response support:

Cell Phone _____

Satellite Phone _____

VHF _____

Local Ambulance _____

USCG Air Operations _____

Local recompression chamber _____

SAFETY

If at anytime the USA personnel feel that unsafe situations are occurring, the diver will not enter the water until complete resolution of the procedures or conditions are resolved.

All divers and support personnel will function as safety observers during all activities, and will maintain the authorization to direct the cessation of site operations if a safety concern is identified.

CASUALTY RESPONSE ASSIGNMENTS

In the event of a casualty, the Dive Supervisor will take charge of the side, assess the situation, and direct required response actions.

Pre-assigned positions consist of the following:

1) Boat Coxswain
- Contact local medical response agencies as required
- Immediately prepare to get underway

2) Dive Tender
- Provide CPR and/or administering emergency oxygen

Remaining personnel will secure equipment for transit, provide additional First Aid, and provide additional support as directed by the Dive Supervisor.

EMERGENCY PROCEDURES

Review emergency procedures, as listed in the Dive Safe Practices Manual, for the following events:

1) Entrapped or fouled diver
2) Loss of vital support equipment
3) Loss of gas supply
4) Loss of communication
5) Lost diver plan
6) Injured diver
7) Discovery of fire
8) Diver blow up/over rapid ascent to surface
9) Diver loss of consciousness
10) Injury/illness of member of surface crew with diver in the water
11) Adverse Weather Conditions.

QUESTIONS

Following questions, complete all preparations for diving.

_____ _____

Dive Supervisor Name Dive Supervisor Signature

Standard Operating Procedure –DSOP 02
Temporary Control Point Setup using NGS OPUS

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide general procedures for the measurement of static GPS data and using the National Geodetic Survey's (NGS's) Online Positioning User Service (OPUS) to obtain high accuracy National Spatial Reference System coordinates.

2.0 SCOPE

This SOP applies to the static measurement and creation of site survey network control points. The GPS data positions are collected and uploaded to OPUS, returning a high accuracy position to be used for control points, Real-Time Kinematic GPS base station correction and position QC. These guidelines will be used to calculate survey control points.

3.0 EQUIPMENT

3.1 Equipment Components – DGPS gear including base, rover, tripod, tribrach, batteries, etc

3.2 Other Equipment – field logbook, radios, maps, flags, markers, flagging tape, spray paint, rebar, survey nails, etc.

4.0 PROCEDURES

4.1 DGPS Occupation and Data Collection

1. Pick a suitable area for DGPS base station with a full view of the sky. Other considerations are accessibility, proximity to possible multi-path sources such as chain link fences, trees, buildings, etc.
2. Install a permanent fixed object into the ground to use as the control point such as a section of rebar or large survey nail hammered into the ground. Mark with flagging tape, lath, etc. This will be measured as the control point.
3. Set up DGPS over installed control point. Make sure DGPS antenna is level, centered, and setup is secure over the control point. Record antenna height.
4. Using either a DGPS controller/datalogger, or laptop PC, set DGPS antenna to collect static occupation data over control point. Recording rate (epochs) of 30 seconds or lower is necessary for OPUS upload.
5. Collect static occupation data for several hours. Generally, the longer the occupation, the more accurate the solution. Use 2 hours as a minimum, 4 hours if possible. Multiple static occupations of the same control point can be averaged.

4.2 DGPS Data Conversion

1. Download raw occupation data from DGPS equipment to a PC.
2. Convert raw data format to RINEX 2.x format. OPUS also accepts other file formats.

4.3 OPUS Upload

1. Navigate to http://www.ngs.noaa.gov/OPUS/
2. Click on "Choose File" button. Select RINEX file for upload
3. Select antenna type. For help in identifying antenna type, navigate to http://www.ngs.noaa.gov/ANTCAL/. Common antennas are Trimble Zephyr (TRM41249.00) and Topcon HiPer II (TSHIPER_II)
4. Enter antenna height in meters
5. Enter email address to where solution will be delivered.
6. Click "Upload to Static" button. OPUS will generate a solution report containing UTM and State Plane coordinates for measured control point. In general, a high quality OPUS solution will have the following characteristics:
   a. 4+ hour GPS data file
   b. >= 70% observations used

c. >=70% ambiguities fixed
d. <= 3cm RMS
e. <= 4cm peak-to-peaks, lat. & lon.
f. <= 8cm peak-to-peak, el. Hgt

4.4 Field Quality Control Check

1. To check OPUS coordinate accuracy, the DGPS base station can be set on a known survey location and measured with an RTK GPS rover. Typically, OPUS coordinates are repeatable within 1-2 cm. The known survey location can be a previously surveyed control point, benchmark or monument, or a second OPUS derived position.

5.0 QUALITY CONTROL

Quality control checks are documented in the sections above. Important checks include ensuring that the positioning information is valid and repeatable. Daily QC check of base station coordinate used to be carried out.

OPUS Observer Field Log

Date:	Name:	Email:	Raw Data File Name:
Start Time:	End Time/Duration:	Antenna Type:	Antenna Serial Number:
Antenna Height:	Receiver Model:	Receiver Serial Number:	Firmware Version (Optional):
Description and Location, Markings, etc.:			
Notes:			
Photo File Names:			

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STANDARD OPERATING PROCEDURE
DSOP-003: DIVE SUPERVISOR CHECK LIST

DATE: _____

A. PRE DIVE EQUIPMENT INSPECTION COMPLETED	
B. DIVER COMMUNICATION SYSTEM CHECKED	
C. DIVE/CODE ALFA FLYING	

DIVERS	#1	#2	Standby
Fins			
Mask			
Knife (Not jettison able)			
Sufficient Weight			
Watch			
Tank Pressure	PSI	PSI	PSI
Bailout Bottle properly rigged and charged			
Verify quick release straps are accessible and properly rigged			
Verify divers have sufficient weight for the dive			
Harness and tending line properly rigged to not obstruct removal of dive gear			
Verify that the B/C it is not constricted			
Verify operation of B/C power inflator and dump valve			
Verify the cylinder valve is opened fully and backed off 1/4 turn			
Have diver(s) breath through both regulators (primary and bailout bottle)			
Reiterate the depth of the dive and the maximum bottom time			
Reiterate the purpose of the dive and diver tasks			
Direct divers to enter the water and conduct in-water checks			

_____ _____

Dive Supervisor Name Dive Supervisor Signature

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STANDARD OPERATING PROCEDURE
DSOP-04: SCUBA DIVE LOG

Date:	**Geographic Location:**											**Air Temp (F):**
Project:				**Dive System Type:**								**Wave Height (ft):**
Breathing Medium:				**Dive Platform:**								**Water Temp (F):**
Dive Supervisor:			**Purpose:**				**Tools Used:**					**Current (knots):**
Bottom Type:							**In-Water Visibility:**					
Diver (Last Name, First Name)	**Max Depth**	**LS**	**RB**	**LB**	**RS**	**RNT**	**TBT**	**Single Equivalent Dive Time**	**TDT**	**TTD**	**Table & Schedule Used /Repet Group**	**Surface Interval**
Standby												

_____ _____

Diving Supervisor Name Diving Supervisor Signature

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STANDARD OPERATING PROCEDURE
DSOP-05: DIVE EQUIPMENT LOADOUT

DATE: _____

Dive Equipment

Item	Quantity	Inspected for operation and Loaded
DIVE FLAG (CIVILIAN AND CODE ALPHA)		
LOST DIVER BUOY		
TENDING LINES AND HARNESSES		
GPS		
BUDDY LINES		
REGULATORS AND BC		
BOTTLES		
CELLULAR PHONE (ON AND CHARGED)		
VHF RADIO		
DRINKING WATER W/CUPS		
PERSONAL DIVE GEAR		
DIVE OPS WORK PLAN		
DIVE SAFE PRACTICES MANUAL		
U.S. NAVY DIVE MANUAL (Copy)		
EMERGENCY CONTACT LIST POSTED		
REQUIRED LINES, BUOYS, ANCHORS		

Medical Equipment

Item	Quantity	Inspected for operation and Loaded (Note PSI of Oxygen Systems)
FIRST AID KIT		
EMERGENCY OXYGEN SYSTEM		**PSI**
STRETCHER OR BACKBOARD		

Tools, UXO Related Equipment, Explosive Materials

Item	Quantity	Inspected for operation and Loaded

_____ _____

Name of Person Supervising Loadout Signature

STANDARD OPERATING PROCEDURE
DSOP-06: DIVE SYSTEM EQUIPMENT INSPECTION

DATE:_____

	Cylinders				Regulators/ Gages		Buoyancy Compensators	
	Singles		Doubles					
	Pre-Dive	Post Dive	Pre-Dive	Post Dive	Pre-Dive	Post Dive	Pre-Dive	Post Dive
#	Inspect	Clean and Charge (PSI)	Inspect	Clean and Charge (PSI)	Inspect/Test	Clean and Inspect	Inspect/Test	Clean/Inspect
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

Notes:
1) Divers complete and initial each block prior to and after each dive. Place PSI level in block as indicated.
2) Ensure all bottles have 2500 PSI minimum following charge

Cylinders
Rinse cylinders
Leak check cylinders during charging

BC
Rinse and clean BC
Inspect BC inflation and dump valves
Inflate and leave overnight for drying and leak check

Regulators/Gages
Rinse & sterilize regulator
Inspect regulator & hoses
Rinse & inspect gauges

_____ _____
Diving Supervisor Name Diving Supervisor Signature

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STANDARD OPERATING PROCEDURE
DSOP-07: LINE PULL AND HAND SIGNALS

LINE PULL SIGNALS

FROM TENDER TO DIVER	**SEARCHING SIGNALS** **(WITHOUT CIRCLING LINE)**

1 PULL	"ARE YOU ALL RIGHT? WHEN DIVER IS DESCENDING, ONE PULL MEANS STOP".	7 PULLS	"GO ON (OR OFF) SEARCHING SIGNALS".
2 PULLS	"GOING DOWN". DURING ASCENT 2 PULLS MEANS "YOU HAVE COME UP TO FAR, GO BACK DOWN UNTIL WE STOP YOU".	1 PULL	"STOP AND SEARCH WHERE YOU ARE".
3 PULLS	"STANDBY TO COME UP".	2 PULLS	"MOVE DIRECTLY AWAY FROM THE TENDER IF GIVEN SLACK: MOVE TOWARD THE TENDER IF A STRAIN IS TAKEN ON THE LINE".
4 PULLS	"COME UP".	3 PULLS	"FACE YOUR UMBILICAL, TAKE A STRAIN, MOVE RIGHT".
2-1 PULLS	"I UNDERSTAND" OR "TALK TO ME"	4 PULLS	"FACE YOUR UMBILICAL, TAKE A STRAIN, MOVE LEFT".
3-2 PULLS	"VENTILATE"		
4-3 PULLS	"CIRCULATE"		

FROM DIVER TO TENDER	**SEARCHING SIGNALS (WITH CIRCLING LINE)**

1 PULL	"I AM OK" WHEN DESCENDING ONE PULL MEANS STOP	7 PULLS	SAME
2 PULLS	"LOWER OR GIVE ME SLACK"	1 PULL	SAME
3 PULLS	"TAKE UP MY SLACK"	2 PULLS	"MOVE AWAY FROM THE WEIGHT"
4 PULLS	'HAUL ME UP"	3 PULLS	"FACE THE WEIGHT AND GO RIGHT"
2-1 PULLS	"I UNDERSTAND OR TALK TO ME"	4 PULLS	"FACE THE WEIGHT AND GO LEFT"
3-2 PULLS	"MORE AIR"		
4-3 PULLS	"LESS AIR"		

SPECIAL SIGNALS FROM THE DIVER		EMERGENCY SIGNALS FROM THE DIVER	
1-2-3 PULLS	"SEND ME A SQUARE MARK"	2-2-2 PULLS	"I AM FOULED AND NEED ASSISTANCE OF ANOTHER DIVER"
5 PULLS	"SEND ME A LINE"	3-3-3 PULLS	"I AM FOULED BUT CAN CLEAR MYSELF"
2-1-2 PULLS	"SEND ME A SLATE"	4-4-4 PULLS	"HAUL ME UP IMMEDIATELY"
		ALL EMERGENCY SIGNALS SHALL BE ANSWERED AS GIVEN EXCEPT 4-4-4	

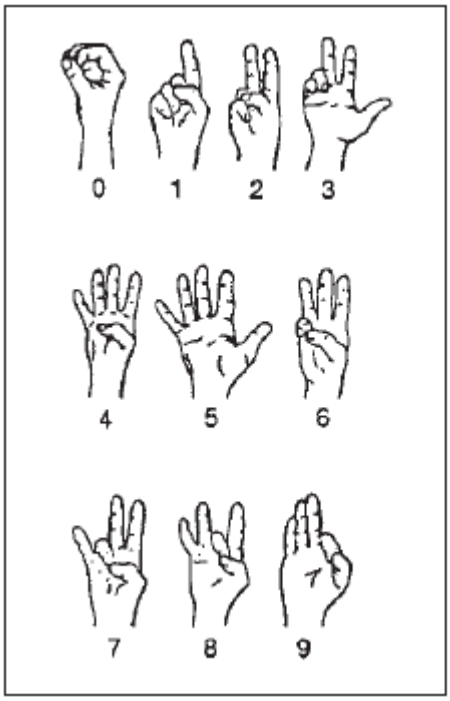
SITE SPECIFIC LINE PULL SIGNALS

Fill in As Required

HAND SIGNALS

	Meaning/Signal	Comment
	**STOP** Clenched fist.	
	**SOMETHING IS WRONG** Hand flat, fingers together, palm out, thumb down then hand rocking back and forth on axis of forearm.	This is the opposite of Okay. The signal does not indicate an emergency.
	**I AM OKAY or ARE YOU OKAY?** Thumb and forefinger making a circle with three remaining fingers extended (if possible).	Divers wearing mittens may not be able to extend three remaining fingers distinctly. Short range use.
	**OKAY ON THE SURFACE (CLOSE)** Right hand raised overhead giving Okay signal with fingers. **OKAY ON THE SURFACE (DISTANT)** Both hands touching overhead with both arms bent at 45° angle.	Given when diver is close to pickup boat. Given when diver is at a distance from the pickup boat.
	**DISTRESS or HELP or PICK ME UP** Hand waving overhead (diver may also thrash hand in water).	Indicates immediate aid is required.
	**WHAT TIME? or WHAT DEPTH?** Diver points to either watch or depth gauge.	When indicating time, this signal is commonly used for bottom time remaining.
	**GO DOWN or GOING DOWN** Two fingers up, two fingers and thumb against palm.	
	**GO UP or GOING UP** Four fingers pointing up, thumb against palm.	
	**I'M OUT OF AIR** Hand slashing or chopping at throat. **I NEED TO BUDDY BREATHE** Fingers pointing to mouth or regulator.	Indicates signaler is out of air. Signaler's regulator may be in or out of mouth.

	Meaning/Signal	Comment
	**COME HERE** Hand to chest, repeated.	
	**ME or WATCH ME** Finger to chest, repeated.	
	**OVER, UNDER, or AROUND** Fingers together and arm moving in and over, under, or around movement.	Diver signals intention to move over, under, or around an object.
	**LEVEL OFF or HOW DEEP?** Fingers and thumb spread out and hand moving back and forth in a level position.	
	**GO THAT WAY** Fist clenched with thumb pointing up, down, right, or left.	Indicates which direction to swim.
	**WHICH DIRECTION?** Fingers clenched, thumb and hand rotating right and left.	
	**EAR TROUBLE** Diver pointing to either ear.	Divers should ascend a few feet. If problem continues, both divers must surface.
	**I'M COLD** Both arms crossed over chest.	
	**TAKE IT EASY OR SLOW DOWN** Hand extended, palm down, in short up-and-down motion.	
	**YOU LEAD, I'LL FOLLOW** Index fingers extended, one hand forward of the other.	



NIGHT DIVING SIGNALS
(Buddy at Distance)

When buddy is near, use regular hand signals in front of light.

Something is wrong.
I require assistance.
(Large, rapid up-and-down motions with arm extended.)

I am Okay.
Are you Okay?
(Large, slow circles with light.)

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STANDARD OPERATING PROCEDURE
DSOP-10: UNDERWATER OPERATIONS IN MARINE HABITATS

1.0 PURPOSE

This Standard Operating Procedure (SOP) will be used to provide the minimum procedures for conducting underwater operations within areas containing marine habitats or sensitive/protected marine life. Awareness of these areas, and enacting specific guidelines and procedural limits, is critical to protect the overall marine environment and individual species.

2.0 SCOPE

This SOP applies to all Parsons site personnel, including contractor and subcontractor personnel, involved in the conduct of underwater operations. This SOP is intended to reflect general requirements needed to ensure the safety of marine habitats and species, and should be used in conjunction with approved project plans and other applicable guidance. The contents of this SOP should also be expanded in cases where specific local, state, or federal regulations exist.

3.0 PROTECTED MARINE SPECIES

Underwater environments may be populated with marine life protected by the Endangered Species Act (ESA) or Marine Mammal Protection Act (MMPA). It is illegal to kill, capture, or harass any endangered or protected marine species.

In addition to protected species, underwater environments may also contain abundant fish populations, active reef structures, and sensitive coral formations. These elements of the underwater environment should also be treated in a sensible and responsible manner.

All underwater operations will be planned and executed in a fashion that provides the best protection for the full spectrum of marine life, both protected and general in nature.

4.0 OPERATIONS IN PROXIMITY TO MARINE LIFE

It is anticipated that marine species inhabiting the designated project area may be encountered during execution of field operations. The following minimum procedures will be enacted to ensure the protection of these creatures.

- Boat operators will watch the water's surface for the presence of marine species, and maneuver in a manner to avoid any physical contact
- Diving and Remotely Operated Vehicles (ROV) operations will be conducted in a manner to avoid physical contact or harassment of any protected marine species
- If the boat or ROV is approached by inquisitive protected/endangered marine species while operating, the operator will cease to maneuver and wait for the species to leave the area. Boat engines will be placed in neutral.
- All underwater operations involving active-source SONAR instruments will cease if an adverse reaction from marine life is noted. These situations will be reported to the USAE Corporate Office.
- UXO SCUBA divers/snorkelers will perform underwater operations without handling, standing on, striking with equipment (such as analog metal detectors), corals or a consolidated hard bottom. SCUBA divers/snorkelers will maintain a distance of at least 2 ft above corals and consolidated hard bottoms while conducting survey operations. Analog metal detectors may come within close

proximity of the corals and consolidated hard bottom during analog surveys but must not come into contact with corals or consolidated hard bottoms.

- Sea conditions (swells, wind waves, shore breaks and tides) may impact the near shore survey zones and will be taken into consideration prior to SCUBA and snorkeling operations taking place. If sea conditions are unfavorable for the UXO SCUBA diver/snorkeler to maintain the minimum distance above the corals or if the sea conditions may cause the UXO SCUBA diver/snorkeler to unintentionally impact corals or consolidated hard bottom, the proposed underwater operation will be postponed until favorable conditions exist. If unfavorable conditions appear to be consistent for the survey area and upon concurrence from PM the operation for that survey area may be cancelled.
- Any unintentional contact with a marine species that results in a noticeable injury will be reported immediately to the USAE Corporate Office and appropriate authorities.

5.0 ANCHORING

USAE field teams should anchor boats in areas with sand bottoms, and avoid intentionally anchoring directly on rocks, boulders, reef, and existing coral structures.

In areas where sea grasses exist and water visibility allows boat operators to view bottom conditions, attempts will be made to deploy anchors in areas void of any grasses if possible. When operational and safety factors require anchoring in sea grass areas, the following procedures will be followed:

- Anchors will be seated in the sea bottom as quickly as possible, without extensive dragging that will unnecessarily impact sea grass
- When retrieving anchors, the boat will be maneuvered above the anchor in a direct line of pull, and the anchor will be lifted free of its emplacement without dragging/plowing the anchor across the bottom

Prior to commencing field operations, an inquiring should be made regarding any local anchoring restriction or specific procedures for the designated project site.

6.0 ADDITIONAL PROCEDURES

*Supplemental Standard Operating Procedures for Endangered Species Conservation and their Critical Habitat (*CESAJ *February 2014) will be followed in addition to the procedures listed in the work plan and its appendices. The above listed SOP can be found in this Appendix (Appendix K).* .

7.0 REFERENCES

- NOAA National Marine Fisheries Service, Office of Protected Resources, Website, November 2009

TITLE: STANDARD OPERATING PROCEDURE FOR EM UXO SURVEYS

CONTENTS **PAGE**

I. OBJECTIVE

The objective of this procedure is to collect EM data for use in the detection of specific targets, obstructions, submerged cultural resources, for the creation of EM contour maps, target lists, or as reference for other project activities. Similar procedures may be used for other regions or purposes with slight modifications as appropriate.

II. MATERIALS AND EQUIPMENT

1. EM console
2. TX/RX coil with attached cable of appropriate length
3. EM data cable
4. EM power cable and necessary accessories (batteries with jumpers, inverter, generator with extension cord and fuel)
5. Spare parts kit for EM
6. EM operators manual
7. Laptop computer with power supply
8. Inverter for computer
9. Computer hood or mount
10. GPS system (RTK or DGPS) which includes at a minimum: receiver, antenna, power cable, data cable, antenna cable

III. PROCEDURE

1. Preparation

1.1 The appropriate documentation pertaining to a specific project should be prepared and reviewed prior to commencement of survey work. This would include, but is not limited to, determining the exact area to be surveyed, coverage or lane spacing desired, access to the survey area, contact information, previous surveys results, expected hazards or hindrances. In general, parallel lines of equal spacing are sufficient to collect the required data. The spacing between parallel lines will vary depending on the desired coverage or scale of the site.

1.2 The horizontal coordinate system and lane spacing will be determined to set up the survey control software. The specific EM and positioning system to be used must be decided upon and the appropriate drivers configured in the survey control software.

1.3 A suitable vessel must be chosen based on the factors in 1.1. The proper sensor towing point on the vessel must be installed or configured based on the sensor to be used.

1.4 Lane spacing should be determined prior to commencing survey operations.

2. On-Site Equipment Setup and Calibration

2.1 If using RTK positioning, the base station must be setup. Perform a check of the positioning system over a known control point and ensure the calculated position is within 10 cm for RTK-DGPS of the given coordinates.

2.2 Launch the vessel and transfer all the necessary equipment.

2.3 Assemble the computer, positioning system, and EM system. At dockside, verify that each component is working individually and that the survey control software is receiving data from the GPS. Verify that the EM software is also receiving

positioning data.

2.4 Perform a static-spike test at the beginning of each day. To do this, start the EM system and allow it to warm up and stabilize. Record 1 minute of data without the object in position. Take a known object such as a shot put or appropriate industry standard object (ISO) and place it over the EM coil at a fixed height. Record 1 minute of data. Remove the object and record 1 more minute of data. Compare the value in millivolts (MV) with previous results and ensure they agree within 10 percent. Compare the results with previously tabulated results if available. If tabulated results are not available, the response test will be charted against previous responses for repeatability and stability of readings.

2.5 If an instrument verification strip (IVS) is used, perform the IVS as specified by the project.

2.6 If using the EM-ROV (for transects greater than 20 ft deep, possibly shallower if positioning can be maintained), after arriving at the survey area, go to the area that is up current from the start of the survey transect. If using ultra-short baseline positioning (USBL) for the EM-ROV, perform a speed of sound cast and enter values in the USBL software. Deploy the USBL transceiver. Verify functionality of all ROV systems. Deploy the EM-ROV. Verify tracking of the ROV via USBL. The ROV operator will monitor the forward camera and avoid all corals by either going over or going around the coral and then returning to the preplanned transect/altitude as soon as is safe. If underwater visibility does not allow the camera to see with sufficient clarity to insure no contact will occur, survey operations will not be conducted until conditions improve.

2.7 If using the shallow EM float (for transects less than 8 ft deep), deploy the float near the end of the planned transect. Set coil depth to be within 1 meter of the bottom based on the depth of the planned transect. Ensure buoyant material is on the tow/data cable and properly spaced to avoid the cable entangling in the bottom. If snorkelers will be propelling the float, verify that they are not wearing any metallic objects that could interfere with the data. The snorkelers are to insure that the coil does not come in contact with any coral through visual monitoring. If underwater visibility does not allow the snorkelers to see both the coil and seafloor with sufficient clarity to insure no contact will occur, survey operations will not be conducted until conditions improve.

2.8 If using the deep EM float (for transects between 8 ft and 20 ft deep), transit to near the start of the planned transect. Power up the fathometer and verify depth below the float is sufficient to erect the mast and lower the EM coil. Erect and secure the survey mast. Lower the coil to a depth of approximately 7 to 9 feet if possible. Verify the fathometer shows both the coil in the water column as well as the sea floor. Lower the coil to the appropriate altitude as specified in the work plan or verified at the IVS. Verify the camera is pointing forward and the image is clear. Begin surveying, logging both EM and fathometer data. Monitor the coil altitude

and adjust as necessary to stay at the appropriate survey altitude. Monitor the video feed and raise the coil or divert the transect to avoid contacting marine life. Vessel speed will not exceed what is required to allow sufficient time for the coil to be raised to avoid contacting marine life. Lower the coil or return to the transect as soon as is safely possible. If underwater visibility does not allow the camera to see with sufficient clarity to insure no contact with corals, underwater structures or consolidated hard bottom will occur, survey operations will not be conducted until conditions improve.

2.9 Go to an area known to be free of metallic targets or with the least likelihood of having a metallic target if possible. This can include an area just before the start of the planned transect. Review the quality of the records. The records from the EM platform should be consistent with little to no variation. If the records are full of spikes, there is interference and the configuration of the equipment needs to be changed (i.e. grounding, source of power, position of sensor, lay of cable, etc). Continue to troubleshoot until the desired record quality is achieved. Depending on environmental conditions, it may be necessary to run all the lines in the same direction.

3. Data Collection

3.1 Using Hypack software, load the current project in Hypack. Do another hardware test to ensure all of the ports and software components are properly configured. Start the Survey program.

3.2 Ensure sampling rate is 10 or more times per second. Survey speed should be no greater than 5 mph which will result in sample intervals no greater than 0.25 meters.

3.3 Ensure that the line to be surveyed is the active line. Begin the approach to the line with sufficient space to achieve a straight entry. Begin logging data at the start of the line in both Hypack and the EM software. Check to be certain the data is logging. Once at the end of the line, end logging and start a new file for the EM data. The line should increment or decrement to the next line to be run in Hypack.

3.4 Constantly monitor the EM record to ensure good consistent quality. Monitor the water depth and EM height to ensure the EM coil is at the appropriate altitude.

4. Quality Assurance

4.1 All raw survey data and information (e.g., field notes, external debris events) must be documented electronically or in a field note book. At the end of each day, check daily computer data from the Hypack system for error flags. Output all notes to an ASCII file and store with the raw records. Back-up copies of the raw electronic data and make copies of all field log entries.

4.2 Review the records and ensure all targets are recorded and annotated properly.

Process and contour the results of the EM survey to better determine target positions and linear objects as well as to ensure a single target detected on multiple survey lines is described as a single target.

4.3 Review data to ensure all required metrics are met (speed, cross-line sample distance, sled altitude, etc). If gaps are found or areas surveyed that do not meet the required metrics, resurvey to complete the project.

5. Deliverables

5.1 All raw data will be downloaded and preliminarily processed daily and converted into an M61 format by the field operators to check for overall data quality. Any major gaps in data should be identified during this timeframe to make any corrections or fill-ins the following day. The data will then be posted (at least) two places besides the computer used for data acquisition.

5.2 Subsequently, the data will be processed in detail, and evaluated. Single color-coded maps will be made for each day's activities. Once daily processing activities are completed, the data will be exported into a Geosoft XYZ ascii and JPEG or Geo-Tiff image format from each day's activities.

5.3 Once the areas are completely filled in, interpretation will consist of searching for areas which highlight large responding broad areas indicative buried debris or groups of items and marking those with polygons. Depending on the complexity and abundance of anomalies cluttered together, individual anomaly identifications may or may not be deemed necessary. Individual anomalies and polygon anomalies will be tabulated into a common spreadsheet.

5.4 Finally, after steps 5.1 - 5.3 are completed, all final maps, final data files, and final target files will be exported into XYZ and JPEG image formats as a group. After review and approval of data, a brief summary report will be provided highlighting project activities and deliverables of interest.

IV. REFERENCES

USACE. 1995. Geophysical Exploration for Engineering and Environmental Investigations. Department of the Army/U.S. Army Corps of Engineers. Washington, DC.

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DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
P.O. BOX 4970
JACKSONVILLE, FLORIDA 32232-0019

REPLY TO
ATTENTION OF

CESAJ-PM-M

FEB 25 2015

MEMORANDUM FOR SEE DISTRIBUTION LIST

SUBJECT: Final Supplemental Standard Operating Procedures (SOP) for Endangered Species Conservation and their Critical Habitat (Addendum 1 – February 2015), Defense Environmental Restoration Program for Formerly Used Defense Sites (DERP-FUDS) Property No. I02PR0068, Culebra, Puerto Rico

The Jacksonville District, U.S. Army Corps of Engineers is enclosing for your records a copy of the Final Supplemental SOP for Endangered Species Conservation and their Critical Habitat (Addendum 1 – February 2015). A copy of the draft Addendum was provided to the resource agencies via e-mail for review and comment on December 1st, 2014. Review comments from the National Marine Fisheries Service (NMFS) and the Puerto Rico Environmental Quality Board (EQB) were received on December 5th, 2014 and January 7th, 2015, respectively. Responses to comments as well as the revised Addendum 1 were provided to NMFS and EQB on February 13, 2015.

Should you need additional information, please contact me at 904-232-1758 or by e-mail at John.E.Keiser@usace.army.mil or Mr. Wilberto Cubero at 904-232-1426 or by e-mail at Wilberto.Cubero-Deltoro@usace.army.mil.

Sincerely,

Encls

John E. Keiser, P.E.
FUDS Program Manager
Military/Interagency &
International Service Branch

Distribution List Final Supplemental SOP for Endangered Species Conservation and their Critical Habitat (Addendum 1 – February 2015), DERP-FUDS Property No. I02PR0068, Culebra, Puerto Rico	
Ms. Wilmarie Rivera Federal Facilities Coordinator PR Environmental Quality Board 1375 Ponce de León Avenue San Juan, PR 00926-2604	Ms. Marelisa Rivera US Fish and Wildlife Service Road 301, Km 5.1 Boquerón, PR 00622
Dr. Lisamarie Carrubba NOAA Fisheries Caribbean Field Office Road 301, Km 5.1 Boquerón, PR 00622	Dr. Craig Lilyestrom Director, Marine Resources Division Department of Natural & Environmental Resources PO Box 366147 San Juan PR 00936-6147
Mr. Julio Vazquez US EPA Region 2 Special Project Branch/Federal Facilities Section 290 Broadway – 18th Floor New York, NY 10007-1866	Ms. Diane E. Wehner NOAA Office of Response and Restoration 290 Broadway Rm 2059 New York, NY 10007
Ms. Ana Roman US Fish and Wildlife Service Culebra National Wildlife Refuge Manager Road 301, Km 5.1 Boquerón, PR 00622	Mr. Richard Henry US Fish and Wildlife Service 2890 Woodbridge Ave. Edison, NJ 08837
Mr. Jose Rivera NOAA Fisheries c/o USACE Antilles Office 400 Fernández Juncos, Parada 7.5 Puerta de Tierra, PR 00901-3299	

FINAL

Supplemental Standard Operating Procedures for Endangered Species Conservation and their Critical Habitat

DERP-FUDS Property No. I02PR0068
Culebra, Puerto Rico

US Army Corps of Engineers
Jacksonville District

February 2014
(Addendum 1 February 2015)

ADDENDUM 1

SUPPLEMENTAL STANDARD OPERATING PROCEDURES
ENDANGERED SPECIES CONSERVATION AND HABITAT PROTECTION
DERP-FUDS PROJECT NO. I02PR0068, CULEBRA, PUERTO RICO

1.0 PURPOSE AND NEED

The purpose of this document is to 1) supplement, not replace, the *February 2014 Supplemental Standard Operating Procedures (SOPs) for Underwater Investigations for Defense Environmental Restoration Program for Formerly Used Defense Site (DERP-FUDS) Project No. I02PR006802, Culebra, Puerto Rico*, 2) serve as guidance for USACE and its Contractors in order to avoid or minimize impacts to listed species and their designated critical habitat and species proposed for Endangered Species Act (ESA) listing during geophysical surveys, intrusive investigations/MC environmental sampling, and controlled detonation activities, 3) satisfy the substantive requirements of the ESA, 4) incorporate newly listed species, and 5) update the POC list for coordination and reporting.

2.0 LISTED OR PROPOSED FOR LISTING SPECIES

A description of threatened or endangered species and their habitat as well as species proposed for listing that are known to occur or have the potential to occur in the waters around Culebra Island and adjacent cays have been discussed in the previously developed and coordinated SOPs listed below.

a. SOPs for Endangered Species Conservation and their Habitat – July 2008

b. Addendum to the July 2008 SOPs – April 2011

c. SOPs for Endangered Species Conservation and their Critical Habitat during Underwater Investigations – April 2012

d. Supplemental SOPs for Endangered Species Conservation and their Critical Habitat during Underwater Investigations – February 2014

Subsequent to the February 2014 supplement, ESA listing decisions became final and additional species have been proposed for listing as threatened or endangered under the ESA. The species for which ESA listing decisions are now final and additional species now proposed for ESA-listing are discussed below:

a. On September 10, 2014, the National Marine Fisheries Service (NMFS) published a final rule in the Federal Register (79 FR 53851) to list 20 coral species as threatened under the ESA (effective date October 10, 2014). Five of these species are known to occur in Puerto Rico including: Pillar Coral (*Dendrogyra cylindrus*), Rough Cactus Coral (*Mycetophyllia ferox*), Lobed Star Coral (*Orbicella annularis*), Mountainous Star Coral (*Orbicella faveolata*), and Boulder Star Coral (*Orbicella franksi*)(genus *Orbicella* formerly known as *Montastraea*). In addition, the determination to maintain the status of Elkhorn Coral (*Acropora palmata*) and Staghorn Coral (*Acropora cervicornis*) as threatened rather than changing their listing to endangered was included in this final rule. Please note: the listed species common names above were taken from the final rule (79 FR 53851) and supersede those in 2012 SOPs for Endangered Species Conservation and their Critical Habitat during Underwater Investigations – April 2012, Page 21 Section 3.13 Species of Corals Proposed for Listing under the ESA, Page 23: Section 3.13.2.1, and Page 24 Section 3.13.2.3.

b. On September 2, 2014, NMFS published a final rule in the Federal Register (79 FR 38213) to list the Central and Southwest (SW) Atlantic Distinct Population Segment (DPS) of Scalloped Hammerhead Shark (*Sphyrna lewini*) as a threatened species under the ESA. NMFS is also considering critical habitat for the Central & SW Atlantic DPSs. These DPSs include the U.S. Caribbean. NMFS does not currently have any explosive guidelines specific to sharks. For the scalloped hammerhead a conservative estimate is application of the predictive equations and example calculations for fish from 2014 SOPs, Appendix E, Section 4.2. However, this species isn't expected to be common in the work area given the shallow depths and overfishing. Because this is an underwater species that doesn't need to surface to respire, perhaps the highest potential for observation would be through diver survey prior to any intrusive work. However, sharks could still swim into the area and not be seen. Sharks should be far more resilient to pressure wave injury than air bladdered fish, turtles, and marine mammals because they have no swim bladder (or air containing organs). External injury (eyes, gills, scale loss, contusions) or auditory damage could occur if the shark is fairly close to the blast. However, mortal injury or death is unlikely. Therefore, the acoustic impact calculations for fish from the 2014 SOPs will be used to establish zones of influence for sharks during in-water detonation/blow-in-place activities.

c. On September 2, 2014, NMFS issued a proposed rule and request for comments (79 FR 51929) and announced a 12-month finding and listing determination on a petition to list the Nassau Grouper (*Epinephelus striatus*)

as threatened or endangered under the ESA. The 105 day document comment period ends on December 31, 2014.

d. On November 5, 2014, NMFS announced a 12-month finding (79 FR 65628) and listing determination on a petition to list the Queen Conch (*Strombus gigas*) as threatened or endangered under the ESA. NMFS completed the status review and determined that there was not enough evidence to warrant listing at this time.

3.0 MEASURES TO AVOID OR MINIMIZE POTENTIAL IMPACTS

The measures in the SOPs listed in Section 2.0 above will be implemented to minimize the risk of unintended impacts to these newly listed species, species proposed for ESA-listing, and all other threatened or endangered species and their habitat during RI/FS underwater investigation. Activities that may pose potential impacts to listed species include, but are not limited to running aground, accidental collision or vessel strike, personnel during snorkeling and diving operations, equipment [e.g. multi-beam, side scan sonar, remotely operated vehicle (ROV), hand-held magnetometers, electromagnetic (EM) platforms, and video cameras], intrusive investigations requiring excavation of the marine bottom, removal and transport of anomalies from underwater locations to terrestrial collection points, and accidental detonation.

By implementation of these measures, adverse impacts to listed species or their habitats are expected to be avoided or minimized. It should be noted that the Contractor will be required to implement these SOPs during any underwater work.

The POC list for coordination and reporting from the February 2014 Supplemental SOP has been updated and is presented below.

4.0 POINTS OF CONTACT FOR SOPs COORDINATION AND REPORTING

Name	Organization	Telephone/Email
Wilberto Cubero Project Manager	USACE, Jacksonville	Office: 904-232-1426 Wilberto.Cubero-delToro@usace.army.mil
José Méndez Forward Project Manager	USACE, Antilles Office	Office: 787-729-6877 Jose.M.Mendez@usace.army.mil
Paul DeMarco Biologist	USACE, Jacksonville	Office: 904-232-1897 Paul.M.DeMarco@usace.army.mil

Name	Organization	Telephone/Email
Wendy Weaver Archaeologist	USACE, Jacksonville	Office: 904-232-2137 Wendy.Weaver@usace.army.mil
Roland Belew Project Manager	USACE, Huntsville	Office: 256-895-9525 Roland.G.Belew@usace.army.mil
Kelly Enriquez Geophysicist	USACE, Huntsville	Office: 254-895-1373 Kelly.D.Enriquez@usace.army.mil
Sarah Dyer Technical Manager	USACE, Huntsville	Office: 256-509-3498 Sarah.e.dyer@usace.army.mil
Edwin Muñiz Field Supervisor	FWS	Office: 787-851-7297 Edwin_Muñiz@fws.gov
Marelisa Rivera Deputy Field Supervisor	FWS	Office: 787-851-7297 x. 206 Marelisa_Rivera@fws.gov
Susan Silander Project Leader Caribbean Islands National Wildlife Refuges Complex	FWS	Office: 787-851-7258 x. 306 Susan_Silander@fws.gov
Ana M. Roman Deputy Project Leader and Culebra NWR Manager	FWS	Office: 787-742-0115 / 787-306-1389 Ana_Roman@fws.gov
Lisamarie Carrubba Caribbean Field Office Protected Resources Division	NMFS	Office: 787-851-3700 x. 206 Lisamarie.Carrubba@noaa.gov
José Rivera Habitat Conservation Division	NMFS	Office: 787-405-3605 Jose.A.Rivera@noaa.gov
Diane Wehner Regional Resource Coordinator Office of Response and Restoration	NOAA	Office: 240-338-3411 Diane.Wehner@noaa.gov

Name	Organization	Telephone/Email
Wilmarie Rivera Program Manager	EQB	Office: 787-767-8181 ext. 6141 WilmarieRivera@jca.gobierno.pr
Julio F. Vazquez Remedial Project Manager	EPA Region II	Office: 212-657-4323 Vazquez.Julio@epa.gov
Nilda Jimenez Marrero Marine Resource Division	DNER	Office: 787-772-2022 njimenez@drna.gobierno.pr
Craig Lilyestrom, Director Marine Resource Division	DNER	Office: 787-772-2022 Craig.Lilyestrom@drna.gobierno.pr

US Army Corps of Engineers
Jacksonville District

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Appendices:

LIST OF ACRONYMS

DERP	Defense Environmental Restoration Program
DM	Decision Matrix
DNER	Department of Natural and Environmental Resources
EBS	Environmental Baseline Survey
EQB	Environmental Quality Board
EM	Electromagnetic
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESP	Explosives Site Plan
FS	Feasibility Study
FUDS	Formerly Used Defense Sites
FWS	U.S. Fish and Wildlife Service
GPS	Global Positioning System
MC	Munitions Constituent
MD	Munitions Debris
MDAS	Material Documented as Safe
MEC	Munitions and Explosives of Concern
MPPEH	Material Potentially Presenting an Explosive Hazard
MRA	Munitions Response Area
MRS	Munitions Response Sites
Navy	Department of Navy
NMFS	National Marine Fisheries Service
QC	Quality Control
RI	Remedial Investigation
ROV	Remote Operated Vehicle
SCUBA	Self Contained Underwater Breathing Apparatus
SLRA	Screening Level Risk Assessment
SOPs	Standard Operating Procedures
TPP	Technical Project Planning
UIT	Underwater Investigation Team
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
UXO	Unexploded Ordnance
WP	Work Plan

SUPPLEMENTAL STANDARD OPERATING PROCEDURES
ENDANGERED SPECIES CONSERVATION AND HABITAT PROTECTION
DERP-FUDS PROJECT NO. I02PR0068, CULEBRA, PUERTO RICO

1.0 INTRODUCTION

The U.S. Army Corps of Engineers (USACE) is conducting Environmental Baseline Surveys (EBS) on Culebra Island Munition Response Sites (MRSs) underwater portions. The EBS is the first of three (3) phases of the Remedial Investigation (RI) being conducted within these areas. The RI is comprised of the following phases:

a. Phase I – Hydrographic Survey and Underwater Visual Surveys.

b. Phase II - Geophysical Surveys to detect metallic anomalies.

c. Phase III - Intrusive Investigations/Munitions Constituents (MC) Environmental Sampling.

The overall objective of the RI/Feasibility Study (FS) is to determine the nature and extent of any contamination related to munitions and explosives of concern (MEC) and/or MC within the underwater portions of these MRSs. The main objectives of the underwater investigations are to 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 1) supplement, not replace, the *April 2012 Standard Operating Procedures (SOPs) for Underwater Investigations for Defense Environmental Restoration Program for Formerly Used Defense Site (DERP-FUDS) Project No. I02PR006802, Culebra, Puerto Rico* 2) serve as guidance for USACE and its Contractors in order to avoid or minimize impacts to listed, or proposed for listing, species and their designated critical habitat during geophysical surveys, intrusive investigations/MC environmental sampling, and controlled detonation activities, and 3) satisfy the substantive requirements of the Endangered Species Act (ESA).

3.0 LISTED OR PROPOSED FOR LISTING SPECIES

A description of threatened or endangered species and their habitat as well as species proposed for listing that are known to occur or have the potential to occur in the waters around Culebra Island and adjacent cays have been discussed in previously developed and coordinated SOPs. The following SOPs are being incorporated by reference into this document and they can be found in **Appendix A**:

a. SOPs for Endangered Species Conservation and their Habitat – July 2008

b. Addendum to the July 2008 SOPs – April 2011

c. SOPs for Endangered Species Conservation and their Critical Habitat during Underwater Investigations – April 2012

4.0 MEASURES TO AVOID OR MINIMIZE POTENTIAL IMPACTS

The following measures will be implemented to minimize the risk of unintended impacts to threatened or endangered species and their habitat during RI/FS underwater investigation. Activities that may pose potential impacts to listed species are, but not limited to running aground, accidental collision or vessel strike, personnel, snorkeling and diving operations, equipment (e.g. multi-beam, side scan sonar, remotely operated vehicle (ROV), hand-held magnetometers, electromagnetic (EM) platforms, and video camera), intrusive investigations requiring excavation of the marine bottom, removal and transport of anomalies from underwater locations to terrestrial collection points and accidental detonation.

By implementation of these measures, adverse impacts to listed species or their habitats are expected to be avoided or minimized. It should be noted that the Contractor will be required to implement these SOPs during any underwater work as well as the previously coordinated SOPs included in Appendices A.

4.1 General Conservation Measures

4.1.1 Date of Commencement: The Contractor will provide 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 Technical Project Planning (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 the SOPs. For additional information refer to **Appendix A**. 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, the Puerto Rico Coral Reef Conservation Law and the Regulation to Govern the Endangered and Threatened Species of the Commonwealth of Puerto Rico. ESA gives both the U.S. Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (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 self contained underwater breathing apparatus (SCUBA) divers or snorkelers can request that the designated and qualified personnel on the boat to enter the water to identify and determine if a suspected threatened or endangered species is present in the study area.

4.1.5 Reports: The Contractor shall maintain a log detailing endangered or threatened species sightings in terrestrial and marine habitats. The log shall include, but not be 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. **Appendix B** includes a guide with the minimum information required for the Daily Observer Log Sheet.

4.2 Non-Intrusive Geophysical Underwater Investigation Conservation Measures

The following supplements but does not replace conservation measures established in the SOPs listed in Section 3.0 above.

4.2.1 All transect sections with scattered coral, reef, or colonized hard bottom will be surveyed with a method which results in no contact with the sea floor or with coral heads that

extend close to the water surface. Detailed information on the appropriate equipment selection process will be provided in the WP and coordinated with the TPP Team. The equipment/system used in any underwater MRS portion will depend primarily on personnel safety, depth of water, and type of habitat present.

4.2.2 While several systems and EM platforms may be used during geophysical surveys, it is possible that in areas with varying amounts of submerged aquatic vegetation (e.g. seagrass) a system that is designed to come in contact with the sea floor may be used. For Quality Control (QC) purposes, prior to conducting the survey, a single transect across an area of submerged aquatic vegetation coverage will be surveyed using the proposed system. Qualified personnel will perform an assessment of the test area to determine if any adjustment is necessary to minimize disturbance to sand, macro algae and seagrass. After work is complete, the surveyed area will be inspected to ensure no impact to submerged aquatic vegetation has occurred.

4.2.3 In shallow water areas (1 to 4 feet) where contact with the bottom is not desired, the EM coil will be floated or will be suspended beneath a floating platform.

4.2.4 In areas with coral that are too deep for the floated system, or in areas containing coral heads with high relief, an ROV platform may be used to propel the EM coil along the transect while ensuring contact with the coral head is avoided. If the ROV EM platform is not suitable for selected transect segments these segments will be surveyed by divers or snorkelers as an instrument aided visual transect.

4.2.5 Divers/snorkelers will use handheld magnetometers to identify metallic anomalies, which may represent MEC or MPPEH. All equipment shall be used in a manner to avoid physical contact with corals.

4.2.6 QC will be established at all times to ensure appropriate pre-selected equipment is used throughout underwater investigation work as coordinated with TPP Team.

4.2.7 Anomalies along transects may be investigated upon discovery. Intrusive investigation will be conducted following measures listed in the next section (4.3).

4.3 Intrusive Underwater Investigation and Material Potentially Presenting an Explosive Hazard (MPPEH) Relocation Conservation Measures

Certified unexploded ordnance (UXO) divers/snorkelers will conduct the anomaly intrusive investigations. If the anomaly is at the surface, the investigation will be completed without disturbing the area or item, and if the anomaly is buried in sediments it will be uncovered by excavating down to the anomaly using hand tools, then the investigation will be performed to determine the vertical extent and boundaries of contamination and possible remedial actions.

Following are the measures to be implemented to protect listed species and their habitat during intrusive investigation. It should be noted that during all intrusive investigation phases qualified observers shall be present to scan the work area for sea turtles and marine mammals and take necessary measures to protect the species.

4.3.1 Excavations will be conducted in unconsolidated sediments and seagrass areas only. If the anomaly is located within coral or hardbottom areas the anomaly will be investigated visually only. However, if the anomaly is not encrusted in hardbottom or coral and can be easily removed by hand and has no coral colonization by listed or proposed corals, it can be removed and relocated to the designated processing area.

4.3.2 Divers will film and take pictures of the area around the anomaly to be investigated. If the anomaly is located in corals or hardbottom areas, divers will investigate an area with a three (3) meter radius, the center of which is the anomaly. Within that area, divers will determine the distance to and location of all listed and proposed coral. The pictures shall include measurements of distance between anomalies and listed or proposed corals and size of item. Care will be taken to avoid damaging corals or seagrass, if present.

4.3.3 If the anomaly is suspected to be MPPEH, a visual device will be placed temporarily next to the munition to provide a reference point for later investigation. This device shall have enough weight to remain in place without skipping along the bottom to avoid impact to corals until the investigation is complete. Once the investigation is complete, it will be removed.

4.3.4 UXO divers/snorkelers investigating anomalies within seagrass areas will be careful to maintain root systems as much as possible. Pre and post pictures shall be taken and shall include a measurement of the area investigated. Should intact plugs of seagrass be removed they will be replanted following the removal of the anomaly. As a possible method, the seagrass can be cut on three sides and rolled up. After work is complete, the excavated area will be filled with sand, if necessary, then the seagrass will be rolled back into place and staked with biodegradable stakes to enable the grass to reestablish quickly.

4.3.5 Each MPPEH item will be evaluated as a separate scenario. A Decision Matrix (DM) will be developed to provide timely decisions and methods of relocation and disposal. The DM will be included in the RI Phase III WP.

4.3.6 When feasible, if the anomaly is not munition related, the anomaly is not cemented in hard substrate, and ESA-listed or proposed corals are not attached to it, it will be brought to the surface and relocated to the designated terrestrial processing area for appropriate disposal. If non listed corals are attached, as feasible and as detailed in **Appendix C**, the recommended Coral Relocation and Reattachment Protocol will be followed.

4.3.7 No intrusive investigation, MEC/MPPEH removal, or MEC/MPPEH handling in MRSs adjacent to beaches will be conducted during the 48-hour period following the emergence of sea turtle hatchlings.

4.3.8 Anomalies or MPPEH Acceptable to Move: Anomalies that are 1) exposed or only shallowly buried in soft sediments, 2) are acceptable to move, and 3) its removal will not cause damage to listed species (e.g. listed corals are not attached) or their designated critical habitat will be relocated to the designated terrestrial processing site for disposal (see Section 4.4 for more information). Prior to removal, the UXO team must agree that the MEC/MPPEH is acceptable to move.

4.3.8.1 Prior to the anomaly/MEC/MPPEH removal effort, qualified personnel will verify the locations of listed and proposed corals, designated critical habitat and seagrass within the immediate vicinity. Listed and proposed coral species location will be identified with temporary underwater buoys or visual devices as a visual aid for the UXO team while setting up equipment for the removal. All removal actions shall be documented. Pre and post pictures of the area shall be taken with a scale measure next to the anomaly/MEC/MPPEH.

4.3.8.2 For soft sediment and seagrass areas, once an anomaly is reacquired, the MEC/MPPEH UXO investigation team will expose and recover the anomaly source using hand tools (such as spades, trowels, shovels). For coral and hardbottom areas, if the anomaly is not encrusted in hardbottom or coral and can be easily removed by hand and has no coral colonization by listed or proposed corals, it can be removed and relocated to the designated processing area. If non listed corals are attached, as feasible and as detailed in **Appendix C**, the recommended Coral Relocation and Reattachment Protocol will be followed. The MEC/MPPEH UXO investigation team will transfer recovered MEC/MPPEH to the shore or designated terrestrial location for processing and disposal.

4.3.8.3 Removal may occur by hand or by using lifting equipment (e.g. remotely with a lifting balloon). MEC that are acceptable to move but will cause an unacceptable risk to diver due size and weight of MEC will be moved remotely. Care will be taken to avoid damaging corals or seagrass during removal. However, corals that are not listed or proposed for listing, although it is not desired, may be damaged during MEC removal or disposal as a necessity. This may happen if corals are attached or in contact with the MEC item. As feasible and as detailed in **Appendix C**, the recommended Coral Relocation and Reattachment Protocol will be followed.

4.3.8.4 The terrestrial processing site will be located within the boundaries of the Munition Response Area (MRA). Its potential location will be provided in WP to the TPP. MPPEH items will not be transported out of the MRA.

4.3.9 Anomalies or MPPEH Not Acceptable to Move: Anomalies or MPPEH that are deeply buried or that are located in areas where removal of the item could result in damage to listed or proposed coral species or destruction or adverse modification of designated critical habitat will be accurately mapped by GPS and left in place.

4.3.9.1 These items will be marked by the placement of a solid clump next to it to provide a reference point for later investigation/action. For the purposes of these SOPs, a clump is defined as a heavy weight (such as a 7 pound mushroom anchor) that is placed 12-inches north of the item. The clump is not attached to a line or buoy but provides the divers with a visual reference for future identification. The clump location and placement shall not impact listed or proposed coral species. If the placement of a solid clump is not feasible (e.g. presence of listed species), the item will be accurately mapped by GPS.

4.3.9.2 The areas surrounding the anomaly or MPPEH will be filmed paying particular attention to corals and biology in the immediate vicinity. If the anomaly is located in corals or hardbottom areas, divers will investigate an area with a three (3) meter radius, the center of which is the anomaly. Within that area divers will determine the distance to and location of all listed and proposed coral. The pictures shall include measurements of distance between anomalies and listed or proposed corals and size of item. These films will be used later when identifying a suitable method for disposal. If it is determined that BIP is required and it is estimated that the potential blast impact radius is greater than 3 meters, additional investigation may be required.

4.3.10 Environmental Sampling: Samples will be taken at locations where Munition Debris (MD) or suspected MPPEH items are observed. Detailed information on the environmental sampling will be provided in the WP to the TPP Team. Any sampling work shall avoid impacts to protected species.

4.4 MEC/MPPEH Disposal/Detonation Site Conservation Measures

4.4.1 Prior to removal of MEC/MPPEH from underwater locations, the Contractor in coordination with USACE will establish a designated terrestrial MEC/MPPEH disposal/detonation site. All recovered underwater MEC/MPPEH will be transferred to this site for processing and inspection to determine disposal method. Following appropriate inspection procedures, items that do not pose a risk will be designated or reclassified to Material Documented as Safe (MDAS) and transported off of Culebra for final disposal.

4.4.2 The MEC/MPPEH processing and disposal/detonation site will be established on a beach to provide convenient access by UXO removal teams working in the offshore waters and to minimize disturbance of vegetation and protected species on Culebra. The site will not be located in lagoon areas.

4.4.3 Qualified and experienced personnel will inspect the beach that would be used for MEC/MPPEH processing and detonation for the presence of sea turtles, sea turtle nests, and signs of recent sea turtle activity. An area not recently used by sea turtles and at least 100 meters from any place of active sea turtle use would be selected as the detonation site to the maximum extent practicable. Daily beach surveys will be conducted by qualified personnel to determine whether sea turtles are using beaches within the MRS. It should be noted that the contactor shall follow additional conservation measures provided in the July 2008 (pages 6-9) and April 2012 (Section 4.2) SOPs.

4.4.4 During MEC/MPPEH transfer and processing, qualified observer would continue to survey the beaches for signs of sea turtle activity. No human activity would occur until beaches are clear of sea turtles. Any active sea turtle nests will be marked and a 100-meter protection zone will be created around each nest to prevent incidental damage during detonation. It should be noted that the contactor shall follow additional conservation measures provided in the July 2008 (pages 6-9) and April 2012 (Section 4.2) SOPs.

4.4.5 All MEC/MPPEH detonation/processing will be performed during daylight hours to minimize the possibility that hatchlings would emerge from the nests during working hours. Detonation will be delayed until 48 hours have passed from the time of hatchling observation on the beach.

4.4.6 There are listed and migratory seabird species that have the potential to occur in the project area. The Roseate Tern (*Sterna dougallii*) is listed as threatened and the Brown Pelican (*Pelecanus occidentalis*) was delisted due to recovery but is being monitored. A complete list of seabirds that occur in the project area is included in **Appendix D**. Prior to detonation, a qualified observer will check the beach and adjacent waters for the presence of protected and listed seabird species by scanning the area with 10 X 50 binoculars. The qualified observer will also survey the beaches for signs of bird nesting. If bird nests are found within the detonation site and/or blast impact area, no detonation will be conducted in that area. If any protected bird species are within 200 meters of the detonation site, MEC detonation will be delayed until after the animal(s) leave the area. In addition, if blast impacts will extend into nearshore waters, a qualified observer for sea turtles and marine mammals shall be required. If these species are observed the detonation shall be postponed until the animal has left the impact zone or more than 30 minutes have elapsed since it was last sighted.

4.4.7 Immediately prior to detonation, a qualified observer will scan the overhead sky for the presence of any birds. If birds are in flight within 100 meters of the detonation site, the detonation will be delayed until no birds are within 100 meters of the detonation site.

4.4.8 The MEC/MPPEH will be demolished and/or demilitarized by controlled detonation using explosives to be provided by local vendors on as-needed basis. When feasible, all demolition events will be covered with sandbags to mitigate the blast effects and to reduce the risk of shrapnel being ejected. Additional measures may be implemented based on the calculations to adjust and establish exclusion areas. Munition debris (MD) will be recovered after detonation for appropriate disposal.

4.5 In-Water Detonation/Blow-in-Place (BIP) Conservation Measures

In-water detonations of MEC/MPPEH, including BIP, may occur during this project. All BIPs shall be closely coordinated with TPP Team. In-water detonations present unique challenges to the avoidance of unintended adverse impacts on protected marine species. As such, in addition to the measures listed above and established in previous SOPs, special conservation measures are described in this section to reduce the potential for adverse impacts should underwater detonations occur. Additional measures will be provided in the WP and/or Explosive Site Plan (ESP) to the TPP Team.

4.5.1 When possible, the MEC/MPPEH will be relocated to the designated terrestrial processing site for disposal as long as it is acceptable to move and it can be physically moved. The Senior UXO Supervisor and UXO Safety Officer must agree that the item is acceptable to move.

4.5.2 Appropriate sand substrate areas will be chosen during all phases of the investigation as potential MEC disposal sites based on safety considerations and minimizing impacts to resources of concern to the maximum extent practicable. These areas will be used only if MEC/MPPEH are unstable or represent a safety concern.

4.5.3 Prior to any detonation (24 hours minimum), the Contractor, in coordination with USACE staff, shall contact NMFS, FWS, the Environmental Protection Agency (EPA), the Puerto Rico Environmental Quality Board (EQB), the Puerto Rico Department of Natural and Environmental Resources (DNER) and the U.S. Coast Guard (USCG) to inform them of a planned underwater detonation.

4.5.4 Detonations will be done during daylight hours only, and under conditions of good visibility that ensure the exclusion zone is clear of marine mammals and sea turtles.

4.5.5 No detonation shall occur when protected marine species (marine mammals, sea turtles and corals) are known or suspected within the exclusion zone. The exclusion zone

delineation will also consider the potential level of acoustic impacts following the Young's (1991) equation in **Appendix E**. It should be noted that the excerpts from NMFS's explosive guidance provided in Appendix E are in draft form and a complete review and approval process is still pending. The guidance is provided to assist with determinations of the potential extent of acoustic impacts to sea turtles and marine mammals so that decisions can be made as to which items cannot be detonated without further coordination with the TPP Team. The water surface within the entire exclusion zone will undergo a visual search for protected marine species a minimum of 30 minutes prior to detonation. Should a protected marine mammal or sea turtle species be observed, the detonation shall be postponed until the animal has been observed outside of the exclusion zone, or more than 30 minutes have elapsed since it was last sighted.

4.5.4 Constant vigilance over the exclusion zone will be maintained for a minimum of 30 minutes following a detonation, and a thorough water surface inspection of the zone shall be completed immediately following a detonation to search for injured or dead protected marine species and surrounding coral and hardbottom habitat impacts. Impacts to coral and hardbottom habitat will be documented using pictures and measures and the information provided to the TPP Team. Should an injured or dead protected species be observed, immediately contact the appropriate response hotline (Marine Mammals: (877) 433-8299; Sea Turtles: (727) 824-5312; and DNER (787) 645-5593). Emergency handling procedures for an injured sea turtle or mammal will be provided by NOAA.

4.5.5 All observed stranding of protected marine species should be reported to the appropriate hotline, regardless of whether or not the stranding is the result of a detonation or other component of the project.

4.5.6 Constant vigilance for the presence of protected marine species during all aspects of the project, particularly in-water activities, is required.

4.5.7 Visual surveys within the vicinity of the work areas for that day shall be made prior to the start of work each day, and prior to resumption of work following any break of more than one half hour.

4.5.8 To the extent practicable and depending the ordnance type, appropriate techniques will be implemented to avoid and minimize damage to marine habitat. Detailed information will be provided in the ESP to the TPP Team.

4.5.9 All in–water work shall be conducted following the marine mammals and sea turtles avoidance measures established above and in previously coordinated SOPs.

5.0 POINTS OF CONTACT FOR SOPs COORDINATION AND REPORTING

Name	Organization	Telephone/Email
John Keiser Project Manager Formerly Used Defense Sites Program	USACE, Jacksonville	Desk: 904-232-1758 John.E.Keiser@usace.army.mil
José Méndez Forward Project Manager	USACE, Antilles Office	Desk: 787-729-6877 Jose.M.Mendez@usace.army.mil
Iván Acosta Chief, Special Projects Section	USACE, Jacksonville	Desk: 904-232-2050 Ivan.Acosta@usace.army.mil
Wilberto Cubero Environmental Scientist	USACE, Jacksonville	Desk: 904-232-2050 Wilberto.Cubero-delToro@usace.army.mil
David McCullough Archaeologist	USACE, Jacksonville	Desk: 904-232-3685 David.L.McCullough@usace.army.mil
Roland Belew Project Manager	USACE, Huntsville	Desk: 256-895-9525 Roland.G.Belew@usace.army.mil
Teresa Carpenter Technical Manager	USACE, Huntsville	Desk: 256-895-1659 Teresa.M.Carpenter@usace.army.mil
Kelly Enriquez Geophysicist	USACE, Huntsville	Desk: 254-895-1373 Kelly.D.Enriquez@usace.army.mil
Edwin Muñiz Field Supervisor	FWS	Desk: 787-851-7297 Edwin_Muñiz@fws.gov
Susan Silander Project Leader Caribbean Islands National Wildlife Refuges Complex	FWS	Desk: 787-504-5938 Susan_Silander@fws.gov
Ana M. Roman Deputy Project Leader and Culebra NWR Manager	FWS	Desk: 787-742-0115 / 787-306-1389 Ana_Roman@fws.gov

Name	Organization	Telephone/Email
Lisamarie Carrubba Caribbean Field Office Protected Resources Division	NMFS	Desk: 787-851-3700 Lisamarie.Carrubba@noaa.gov
José Rivera Habitat Conservation Division	NMFS	Desk: 787-405-3605 Jose.A.Rivera@noaa.gov
Julio F. Vazquez Remedial Project Manager	EPA Region II	Desk: 212-657-4323 Vazquez.Julio@epa.gov
Nilda Jimenez Marrero Marine Resource Division	DNER	Mobile: 787-645-5593 njimenez@drna.gobierno.pr
Craig Lilyestrom Marine Resource Division	DNER	Desk: 787-999-2200 ext. 2689 craig_02@icloud.com
Damaris Delgado Bureau of Coast, Reserves and Refuges	DNER	Desk: 787-999-2200 ext. 2107 ddelgado@drna.gobierno.pr
Wilmarie Rivera Program Manager	EQB	Desk: 787-767-8181 ext. 6129 WilmarieRivera@jca.gobierno.pr

APPENDIX A

SOPs for Endangered Species Conservation and their Critical Habitat during Underwater Investigations – April 2012

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

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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 Explosives 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.

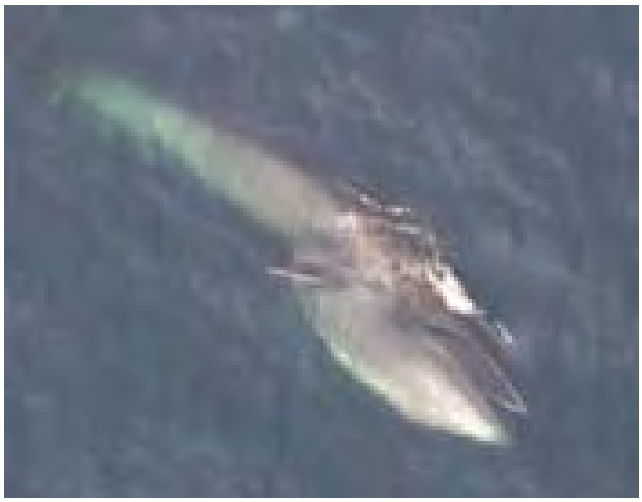


Figure 11. Sei Whale
Source: http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/seiwhale.htm#more

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*)

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**).

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

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**).

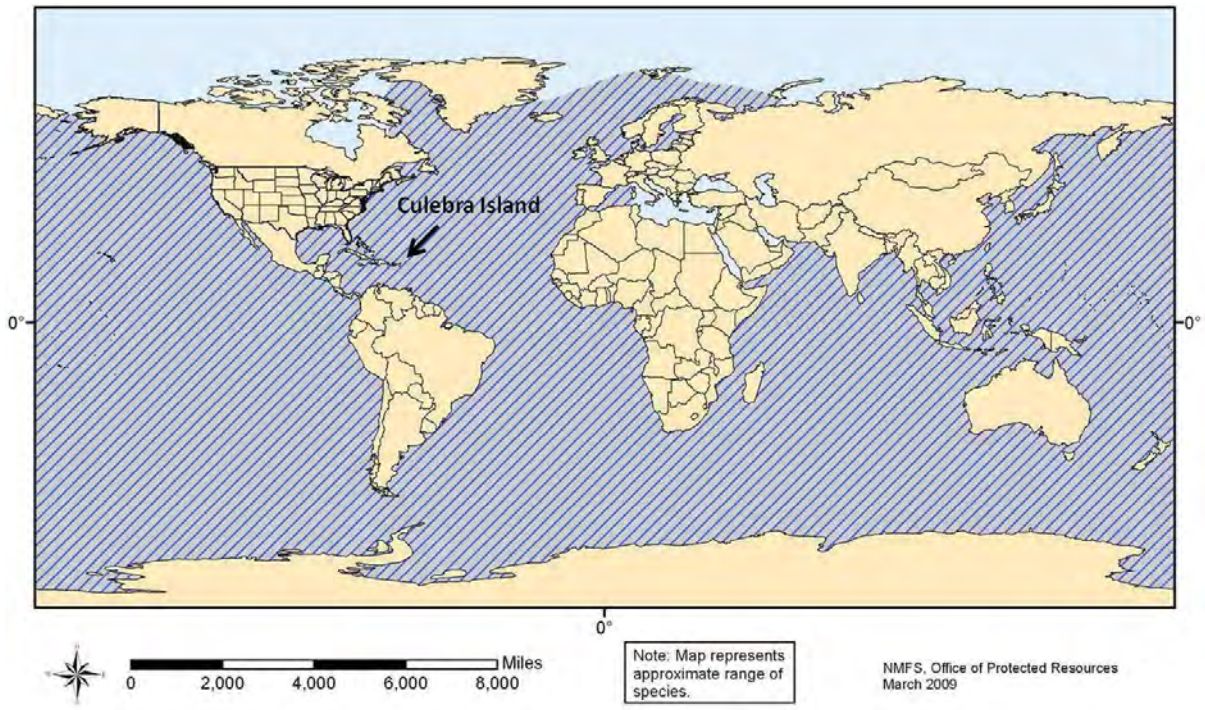


Figure 14. Approximate range map for Humpback, Sei, Sperm and Blue whales.

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

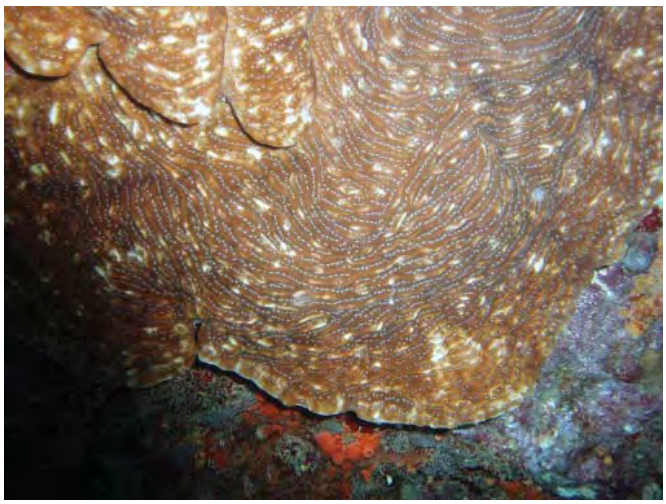


Figure 19. Lamarck's Sheet Coral
Source: http://coralpedia.bio.warwick.ac.uk/en/corals/agaricia_lamarcki.html

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**).

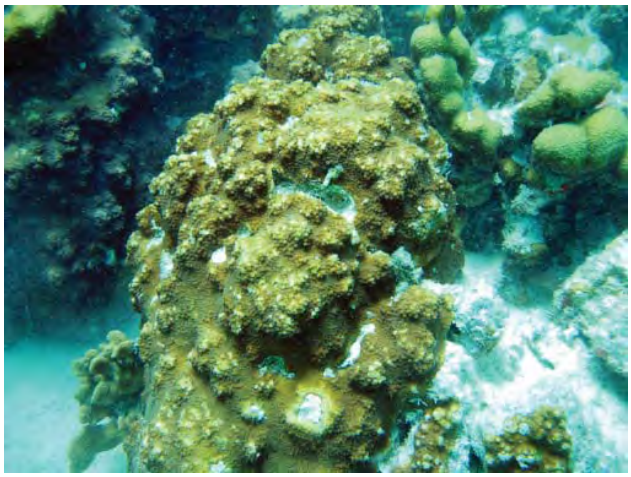


Figure 22. *Monstastraea franki*
Source: http://coralpedia.bio.warwick.ac.uk/images/Montastraea%20franksi01.JPG

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.

5.0 POINTS OF CONTACT FOR SOPs COORDINATION AND REPORTING

Name	Organization	Telephone/Email
Tom Freeman Project Manager	USACE, Jacksonville	Desk: 904-232-1040 Thomas.R.Freeman.III@usace.army.mil
José Méndez Forward Project Manager	USACE, Antilles Office	Desk: 787-729-6877 Jose.M.Mendez@usace.army.mil
Iván Acosta Chief, Special Projects Section	USACE, Jacksonville	Desk: 904-232-2050 Ivan.Acosta@usace.army.mil
Wilberto Cubero Environmental Scientist	USACE, Jacksonville	Desk: 904-232-2050 Wilberto.Cubero-delToro@usace.army.mil
David McCullough Archaeologist	USACE, Jacksonville	Desk: 904-232-3685 David.L.McCullough@usace.army.mil
Roland Belew Project Manager	USACE, Huntsville	Desk: 256-895-9525 Roland.G.Belew@usace.army.mil
Teresa Carpenter Technical Manager	USACE, Huntsville	Desk: 256-895-1659 Teresa.M.Carpenter@usace.army.mil
Kelly Enriquez Geophysicist	USACE, Huntsville	Desk: 254-895-1373 Kelly.D.Enriquez@usace.army.mil
Edwin Muñiz Field Supervisor	FWS	Desk: 787-851-7297 Edwin_Muñiz@fws.gov

Name	Organization	Telephone/Email
Susan Silander Project Leader Caribbean Islands National Wildlife Refuges Complex	FWS	Desk: 787-504-5938 Susan_Silander@fws.gov
Ana Roman Deputy Project Leader and Culebra NWR Manager	FWS	Desk: 787-742-0115 / 787-306-1389 Ana_Roman@fws.gov
Lisamarie Carrubba Director, Caribbean Field Office	NMFS	Desk: 787-851-3700 Lisamarie.Carrubba@noaa.gov
José Rivera Habitat Conservation Division	NMFS	Desk: 787-405-3605 Jose.A.Rivera@noaa.gov
Julio F. Vazquez Remedial Project Manager	EPA Region II	Desk: 212-657-4323 Vazquez.Julio@epa.gov
Damaris Delgado Bureau of Coast, Reserves and Refuges	DNER	Desk: 787-999-2200 ext. 2107 ddelgado@drna.gobierno.pr
Wilmarie Rivera Program Manager	EQB	Desk: 787-767-8181 ext. 6129 WilmarieRivera@jca.gobierno.pr

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.

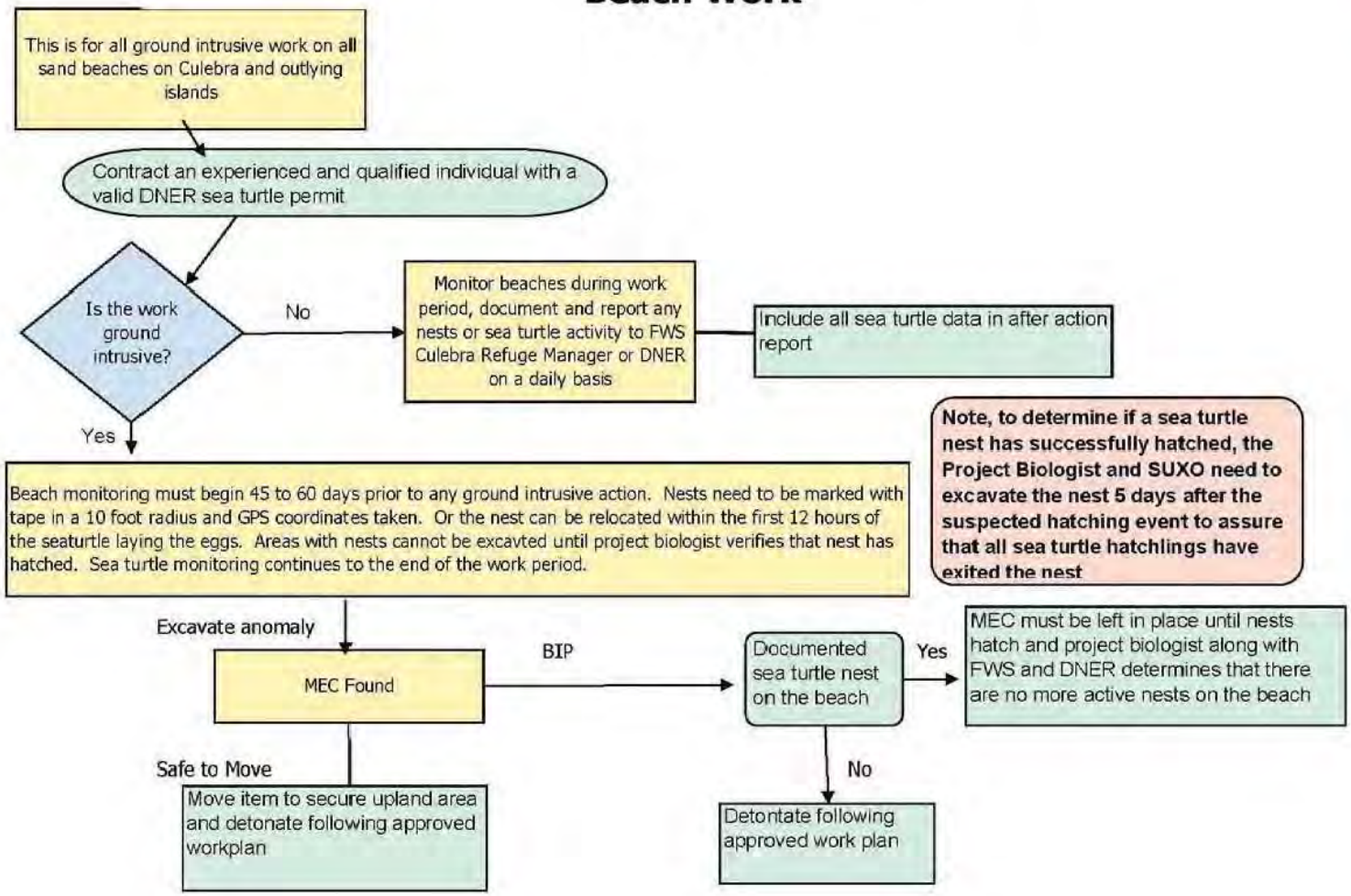
Prior to commencement of clearance activities, including vegetation removal and removal of unexploded ordnance, on Culebra, Culebrita, Cayo Norte and Cayo Luis Peña the contractor shall appoint a Project Biologist whose qualifications shall be submitted for the approval of the contracting officer and 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.

Point of Contact for SOP Coordination

José Méndez, Project Manager
Jose.Mendez2@usace.army.mil
787-729-6893

Iván Acosta, Environmental Engineer
Ivan.Acosta@usace.army.mil
904-232-1693

Nelson Colón, Biologist
Nelson.R.Colon@usace.army.mil
904-232-2442

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.

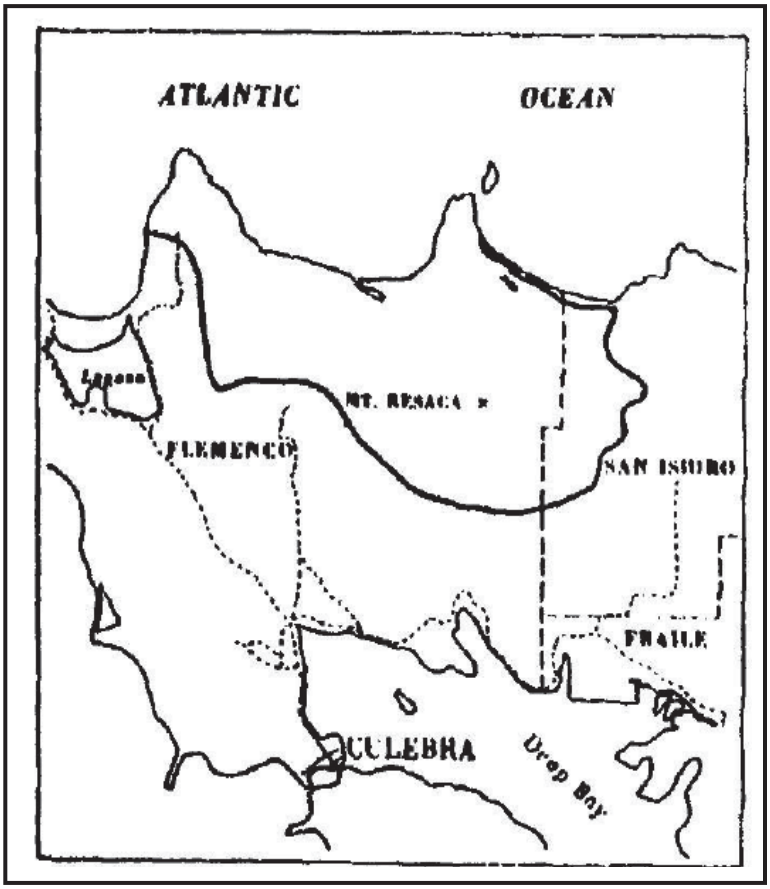

Figure 4. Boundaries of the critical habitat designated for the Culebra Island Giant Anole. Source: Critical Habitat Designations for PR and USVI (FWS 2007).

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:

Thomas R. Freeman, Project Manager
Thomas.R.Freeman.III@usace.army.mil
Telephone: (314) 331-8785

José Méndez, Project Manager
Jose.M.Mendez@usace.army.mil
Telephone: (787) 729-6877

Iván Acosta, Chief Special Projects Section
Ivan.Acosta@usace.army.mil
Telephone: (904) 232-2050

Wilberto Cubero, Environmental Scientist
Wilberto.Cubero-delToro@usace.army.mil
Telephone: (904) 232-2050

U.S. Fish and Wildlife Services:

Edwin Muñiz, Field Supervisor
Edwin_Muniz@fws.gov
Telephone: (787) 851-7297

Ana Roman, Refuge Manager
Ana.Roman@fws.gov
Telephone: (787) 742-0115 or (787) 306-1389

National Marine Fisheries Service:

Lisamarie Carrubba, Director Caribbean Field Office
Lisamarie.Carrubba@noaa.gov
Telephone: (787) 851-3700

P.R. Department of Natural and Environmental Resources:

Roberto Matos, Refuges and Reserves
rmatos@drna.gobierno.pr
Telephone: (787) 999-2200 x.2718

Damaris Delgado López
ddelgado@drna.gobierno.pr
Telephone: (787) 999-2200

P.R. Environmental Quality Board:

Wilmarie Rivera, Federal Facilities Coordinator
WilmarieRivera@jca.gobierno.pr
Telephone: (787) 767-8181 x.6129

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APPENDIX B

Guide with the minimum information required for the Daily Observer Log Sheet

DAILY OBSERVER LOG SHEET
DERP-FUDS PROPERTY NO. I02PR0068
CULEBRA, PUERTO RICO

PROJECT INFORMATION	
Contractor:	Munition Response Site#:
USACE Contract#:	Project Location:
Observer Name (and Company):	Observer Location:
Date: Time:	Shift Start: Shift End:
Sunrise: Sunset:	Crew:

Weather and Visibility Information								
Location	Time	Glare	Water Clarity	Seas (wave height)	Visibility	Wind Speed and Direction	Conditions on Land	Estimated % Cloud Cover

Sighting Log								
Time	Location Coordinates	Species	Total Number	Adults	Juveniles	Closest Distance to Vessel	Activity or Behavoir and Direct of Movement	Time Last Seen

Daily Summary				
Species	Total Number	Total Number Outside 50 feet	Total Number Inside 50 feet	Action Taken

Remarks:

_____

_____

Observer Signature: _____

APPENDIX C

Recommended Coral Relocation and Reattachment Protocol

Coral Relocation and Reattachment Protocol
for
DERP-FUDS Project No. I02PR006802,
Culebra, Puerto Rico

In order to minimize impacts to coral species, non-listed corals with diameters >4.0 in (>10.2 cm), or branched corals will be detached and relocated, to the extent possible, to the area where they are already located in adequate substrate where deemed safe from the expected impact prior to munitions and explosives of concern (MEC) and/or Material Potentially Presenting an Explosive Hazard (MPPEH) removal or disposal. If corals that are listed or proposed for listing are attached to MEC/MPPEH, no relocation or MEC/MPPEH removal effort will be conducted. Instead, additional coordination with the Technical Project Planning (TPP) Team is a requirement for situations where ESA-listed corals or corals proposed for listing are present in areas or on MEC/MPPEH in such a way that the removal of MEC/MPPEH would affect these corals.

For non-listed corals measuring 10 cm or more in diameter or branching corals, the following protocol has been developed as a guideline to decrease coral stress during transplant. It is recommended that two teams or individuals be utilized during the relocation process: one team/individual responsible for removing corals and a second team/individual mobilized and prepared for reattachment activities.

GENERAL CONSIDERATIONS FOR CORAL HANDLING AND TRANSPORTATION

- Each coral may be carried by hand or in a bucket to the relocation site.
- In order to reduce stress to the coral from transport and to increase the likelihood of success, the coral colonies should remain submerged in seawater at all times.
- Corals should be handled as little as possible.
- Detached coral colonies should not be in contact with each other to prevent additional harm to their structures and tissue.
- If a bucket or container is used for transportation and transportation will be above water (such as on a vessel to get from the removal site to the transplant site), the seawater should be routinely changed to avoid prolonged exposure to increased water temperatures.
- Corals should be reattached the same day they are removed; they should not be stored overnight in transport containers.
- Prior to any relocation, photograph (two pictures - one from the top and one from the side) the corals with a ruler or other object showing the size of the colony in the photograph. This can be used to determine whether there is any tissue loss or death during the relocation.

- Record the coordinates where the coral is removed from and the species being relocated.
- Clear all encrusting organisms from the edges of the corals.
- Prevent damage to the edges of corals.
- When possible, remove the entire coral colony in one piece.
- When removal of the entire colony is not possible, a partial removal of the colony will be completed to maintain the phenotypic genetic composition of corals from the investigation site. In this case, field notes should indicate this decision was made.
- Notes should be made regarding orientation of the coral in its natural setting to mimic that position at relocation site. The water depth at which the corals are transplanted should also be the same as those from which corals are removed.
- Place corals upright in transport containers, avoiding contact with other corals.
- Avoid touching coral tissue with bare hands. Gloves should be worn while handling the corals.

Recommended tools for removal and reattachment:

- rubber or dive gloves
- putty knife
- other thin bladed tools with beveled edges
- baskets or buckets
- chisels with thin blades
- chipping hammer
- underwater paper to record and track coral movements
- wire brush
- masonry nails
- Portland Type II cement and/or marine epoxy

IDENTIFICATION OF ADEQUATE RELOCATION SITE

The selection of the relocation site should consider the following:

- The substrate is hard bottom, free of sediment bedload
- No fire corals (*Millepora* spp.), sponges or harmful algae in the vicinity that could hamper coral colony survival and growth.
- High benthic topographic relief
- No predators observed in the vicinity
- The size of the site allows for the relocation activity to be conducted without harming other corals. Keep in mind the preparation of the site, coral colony size and the materials used to reattach the coral.

CORAL RELOCATION

Once the specific reattachment locations have been identified, the following protocol/guidelines should be followed during the reattachment process:

- Document the site coordinates and substrate type and depth
- Prepare the reattachment surface with a wire brush, removing biota, such as algae, and any sediment to expose rock substrate. Care should be taken to avoid contacting existing corals with wire brush.

For massive corals:

- Drive masonry nails, at least three, into the substrate at the site where the coral colony will be placed. Larger corals will require additional nails.
- Prepare a thick mixture of Portland Type II cement with molding plaster added, as necessary, to accelerate hardening of cement. Marine epoxy could be used instead of cement.
    - Place cement/epoxy over the masonry nails. The amount of cement should be enough for the colony to be inserted in the mixture so that there are no empty spaces between the coral colony and the mixture.
    - Insert the detached coral in the cement mixture, exerting some downward pressure.
    - Minimize exposure of coral skeleton by placing cement in voids or along dead coral edges.

- For branched corals:
    - Using wire and/or cable ties to fasten the colony to the masonry nails.
    - The colony should not move once fastened. If it does, epoxy could be added in certain points.
    - Corals may also be attached to appropriate substrate with wire and/or cable ties or by wedging fragments into small crevices and voids.

- Document the reattachment process by taking pictures of the colony, from the top and the side once the process is finished, including a scaled reference item in the picture. Take notes on the method used to reattached the colony.

The following links can be used as reference for the process described above:

- http://www.youtube.com/watch?v=_XaUttAUHv4 (NOAA 2009)
- http://www.youtube.com/watch?v=qRlfOu7fERw (NOAA 2011)

Once all of the transplantation activities have been completed, a detailed effort should be undertaken to map the transplanted colonies. A map of all reattached corals shall be developed and submitted to the TPP Team. This map must be geo-referenced using high accuracy GPS technology, show locations and depths of corals, and should be created immediately upon completion of the transplantation project, while coral transplants are still easily identifiable. Geo-referencing may be accomplished either by 1) geo-referencing each individual coral location or 2) referencing a central marker or staked GPS position, relative to which all corals are mapped. Still photography shall be used to document transplantation activities.

APPENDIX D

List of seabirds that occur in the Project Area

Culebra National Wildlife Refuge
U. S. Fish and Wildlife Service

Culebra Archipelago's Seabirds

Fifteen species of seabirds nest on fourteen islands and cays of the Culebra Archipelago and other 12 species occasionally visit the archipelago and surrounding waters at different times of the year (as showed in table 2 and 3). This fact makes to the present day the Culebra NWR one of the most important reserves in the Caribbean for seabirds. As part of the current management activities, the Service protects and conserves these essential nesting areas for seabirds. However, there are some aspects that increase habitat vulnerability for these species, as predators and human disturbances.

Table 2. Culebra Archipelago Seabirds

Species Name	Nesting?	Species Name	Nesting?
Audubon's Shearwater	Yes	Least Tern	Yes
Masked Booby	Yes	Great Shearwater	No
Brown Booby	Yes	Manx Shearwater	No
Red-footed Booby	Yes	Wilson's Storm-Petrel	No
White-tailed Tropicbird	Yes	Leach's Storm-Petrel	No
Red-billed Tropicbird	Yes	Double-crested Cormorant	No
Laughing Gull	Yes	Common Tern	No
Royal Tern	Yes	Arctic Tern	No
Sandwich Tern	Yes	Pomarine Skua	No
Cayenne Tern	Yes	Black Noddy	No
Roseate Tern	Yes	Herald's Petrel	No
Bridled Tern	Yes	Brown Pelican	Yes
Sooty Tern	Yes	Magnificent Frigatebirds	No*
Brown Noddy	Yes		

*need to be confirmed, potential areas for nesting occur

Tabla 3. Seabird areas on Culebra Archipelago

Seabird areas on Culebra Archipelago	Bird Name	Observed or Nesting	Nesting Period	Resident or Migratory
Flamenco Peninsula	Sooty Tern	nesting	March to September	Migratory
Luis Peña Cay	Audubon's Shearwater	nesting	February to July	Migratory
	White-tailed Tropicbird	nesting	February to September	Migratory
	Red-billed Tropicbird	nesting	May to September	Migratory
Del Agua Cay	Audubon's Shearwater	nesting	February to July	Migratory

	White-tailed Tropicbird	nesting	February to September	Migratory
	Bridled Tern	nesting	April to August	Migratory
	Brown Noddy	nesting	April to August	Migratory
Ratón Cay	Audubon's Shearwater	nesting	February to July	Migratory
	Red-billed Tropicbird	nesting	May to September	Migratory
	Roseate Tern	nesting	April to July	Migratory
	Bridled Tern	nesting	April to August	Migratory
	Brown Noddy	nesting	April to August	Migratory
Yerba Cay	Audubon's Shearwater	nesting	February to July	Migratory
	Red-billed Tropicbird	nesting	May to September	Migratory
	Roseate Tern	nesting	April to July	Migratory
	Bridled Tern	nesting	April to August	Migratory
	Sooty Tern	nesting	March to September	Migratory
	Brown Noddy	nesting	April to August	Migratory
Lobo Cay	Audubon's Shearwater	nesting	February to July	Migratory
	White-tailed Tropicbird	observed	February to September	Migratory
	Red-billed Tropicbird	observed	May to September	Migratory
Lobito Cay	Audubon's Shearwater	nesting	February to July	Migratory
	Red-billed Tropicbird	nesting	May to September	Migratory
	Laughing Gull	nesting	April to September	Migratory
	Royal Tern	nesting	May to July (Sept to April)	Migratory
	Sandwich Tern	nesting	May to July (Sept to April)	Migratory
	Cayenne Tern	nesting	May to July	Migratory
	Bridled Tern	nesting	April to August	Migratory
Noroeste Cay	White-tailed Tropicbird	nesting	February to September	Migratory
	Bridled Tern	nesting	April to August	Migratory
	Sooty Tern	nesting	March to September	Migratory
	Brown Noddy	nesting	April to August	Migratory
Molinos Cay	White-tailed Tropicbird	nesting	February to September	Migratory
	Red-billed Tropicbird	nesting	May to September	Migratory
	Roseate Tern	nesting	April to July	Migratory
	Bridled Tern	nesting	April to August	Migratory
	Sooty Tern	nesting	March to September	Migratory
	Brown Noddy	nesting	April to August	Migratory
Alcarraza Cay	Audubon's Shearwater	nesting	February to July	Migratory
	Red-billed Tropicbird	nesting	May to September	Migratory
	Masked Booby	nesting	Throughout the year	Resident
	Brown Booby	nesting	Throughout the year	Resident
	Bridled Tern	nesting	April to August	Migratory
	Sooty Tern	nesting	March to September	Migratory
	Brown Noddy	nesting	April to August	Migratory

Matojo Cay	Audubon's Shearwater	nesting	February to July	Migratory
	Red-billed Tropicbird	nesting	May to September	Migratory
	Royal Tern	nesting	May to July (Sept to April)	Migratory
	Laughing Gull	nesting	April to September	Migratory
	Sandwich Tern	nesting	May to July (Sept to April)	Migratory
Geniquí Cays	Red-billed Tropicbird	nesting	May to September	Migratory
	Brown Booby	nesting	Throughout the year	Resident
	Laughing Gull	nesting	April to September	Migratory
	Bridled Tern	nesting	April to August	Migratory
	Brown Noddy	nesting	April to August	Migratory
	Red-footed Booby	nesting	Throughout the year	Resident
Culebrita Island	Audubon's Shearwater	nesting	February to July	Migratory
	White-tailed Tropicbird	observed	February to September	Migratory

General comments:

As showed in table 3, throughout the year, the Culebra Island offshore cays receive a lot of seabirds for nesting, roost or just visit the cays and surrounding waters for feeding. Some of these species are observed during the year as regular residents or visitors: Red-footed Booby, Brown Booby, Magnificent Frigatebirds, and Brown Pelican. The first two species nest regularly in cays and the last species need to be confirmed for nesting but are regularly observed roosting on trees, shrubs or flying over the cays.

Seabirds are pelagic birds. This means that they just come to land to nest and after that, these pass the rest of the time flying over the ocean looking for food. The nesting season of seabirds consists of the period of time that birds are present or near lands doing courtships, nesting area selections, nesting periods, etc. This period is finished when fledglings or juveniles abandon the colony area. The most critical months in Culebra Island for seabirds are from February to August. During this period, the seabirds, and depending on the species, are in the process of courtship, selection of nesting areas, laying eggs, feeding their chicks, and protecting their fledglings from predators. Areas more used by birds in the Culebra Archipelago are Yerba, Molinos, Alcarraza, Geniqui, Lobito, Agua, Raton and Matojo cays and Flamenco Peninsula.

The most common and dangerous perturbations in the seabirds colonies are predators and human disturbances. In the Culebra offshore cays, introduced predators such as cats and rats, can eat eggs and chicks. Also, other predators (i.e., goats and deer) in the cays can manipulate and change the nesting habitat by grazing. Human disturbances as loud noise made by jet skis, boats, and other sources, or just the presence of one or more persons near the colony (ies) may cause abandonment of nests by adults which may cause eggs overheat and predated by ants, rats or cats. It is very important not to disturb the colonies during nesting season. Any work or activity necessary to do near or in colony areas, should be completed outside of nesting period.

APPENDIX E

Equation to calculate the potential extent of acoustic impacts from underwater detonations

2. Overview of Impacts to Protected Species

Underwater explosions may affect marine life by causing death, injury, temporary threshold shifts (TTS or recoverable hearing loss), or behavioral reactions, depending on the distance an animal is located from a blast. An underwater explosion is composed of an initial shock wave, followed by a succession of oscillating bubble pulses. A shock wave is a compression wave that expands radially out from the detonation point of an explosion. At a distance from a detonation, the propagation of the shock wave may be affected by several components including the direct shock wave, the surface-reflected wave, the bottom-reflected wave, and the bottom-transmitted wave. The direct shock wave results in the peak shock pressure (compression) and the reflected wave at the air-water surface produces negative pressure (expansion). For an explosion with the same energy and at the same distance, an underwater blast is much more dangerous to animals than an air blast. The shock wave in air dissipates more rapidly and tends to be reflected at the body surface; in water the blast wave travels through the body and may cause internal injury to gas-filled organs due to impedance differences at the gas-liquid interface.

Beyond the distance from a detonation causing injury, explosives use in designated critical habitat, during certain times of year, or occurring in other biologically important habitats (e.g., migration corridors, spawning and nesting areas, and juvenile habitats) could have potentially adverse consequences on animals. In response to noise, behavioral reactions could potentially result in impairment of feeding, sheltering, reproduction, or other biologically important functions of animals. Exposure to a noise can also result in temporary or permanent hearing impairment, depending on the sound pressure level and exposure duration. Therefore, the hearing abilities of animals and behavioral disturbance are important considerations when assessing the potential impacts from projects resulting in noise.

2.1. Effects on Sea Turtles

Explosions are known to injure and kill sea turtles (Duronslet et al. 1986, Gitschlag 1990, Gitschlag and Herczeg 1994, Klima et al. 1988, O'Keefe and Young 1984). NMFS studied the effects of offshore oil and gas structure removals using 23 kg (50 lb) of nitromethane (Klima et al. 1988). Loggerhead (*Caretta caretta*) and Kemp's ridley (*Lepidochelys kempii)* sea turtles were located at distances of 213.4 m (700 ft), 365.8 m (1,200 ft), 548.6 m (1,800 ft), and 914.4 m (3,000 ft) from the platform removed with explosives. The charges were placed inside platform pilings at a depth of 5 m below the mudline. Four sea turtles within 365.8 m of the detonation were unconscious, as well as an individual at 914.4 m (3,000 ft). Sea turtles were expected to have drowned if not recovered from the water following the detonation. All turtles exposed to the blast exhibited everted cloacas and vasodilation lasting 2-3 weeks.

The sea turtle ear appears to be adapted to both aerial and aquatic environments. Sea turtles have a primitive reptilian ear and are considered to be hearing generalists, having limited hearing abilities at lower frequencies. Although there is some variation in sea turtle hearing measurements between species and size classes (Ketten and Bartol 2006), the available data suggest that species of sea turtles are likely sensitive to frequencies from approximately 100 Hertz (Hz) to 2,000 Hz (Lenhardt 1994, Lenhardt et al. 1996, McCauley et al. 2000a and 2000b, Moein et al. 1994, O'Hara and Wilcox 1990), with greatest underwater hearing sensitivities below 1,000 Hz (Ketten and Bartol 2006). Behavioral reactions to the sound produced from

explosions may be important if they occur in biologically important areas such as foraging areas, near nesting beaches during nesting season, or in developmental juvenile habitats.

2.3. Effects on Marine Mammals

Blast damage in marine mammals has been investigated using both submerged terrestrial mammals (Goertner 1982, Yelverton et al. 1973, Richmond et. al 1973) and cadavers (Myrick et al. 1990, Ketten et. al 2003). At close ranges to a detonation, mortality and life threatening injuries may occur. At increasing distance from the blast, the effects of the shock wave lessen, but effects such as hearing loss and behavioral responses may still occur. There are a variety of factors that may affect noise effects on marine mammals. Marine mammals are at greatest risk of injury when they are at the same depth as, or slightly above, the explosion (Keevin and Hempen 1997). Risks drop off quite sharply above and below this depth; however, the pressure waves produced from an explosion may propagate very differently, depending on environmental factors. Additionally, smaller marine mammals are more susceptible to blast injury than larger animals at the same exposure levels. Frequently occurring or repeated detonations over a given time period may cause behavioral changes that disrupt biologically important behaviors or result in TTS.

The hearing abilities of marine mammals are generally classified as lower-frequency hearing for mysticetes (baleen whales) and higher-frequency hearing for odontocetes (toothed whales). Based on anatomical studies, mysticetes are believed to generally hear sounds in the 0.01 to 20 kHz range, depending on the species (e.g., Helweg et al. 2000, Parks et al. 2001, 2007). Odontocetes generally hear over a much broader range of higher frequencies from approximately 0.2 to 180 kHz (e.g., Cook et al. 2006, Erbe 2002, Houser and Finneran 2006, Kastelein et al 2003, Szymanski et al. 1999) with best hearing between approximately 5 and 100 kHz, depending on the species. Increasingly, more hearing measurements are becoming available for more odonotcete species and have been summarized elsewhere (Nedwell et al. 2004); however, the general range of hearing abilities described above can be used for planning projects that result in infrequent, impulsive sounds from underwater detonations of explosives.

2.4. Behavioral Reactions to Detonations

At ranges beyond those causing injury, animals are susceptible to behavioral disturbances from underwater noise in the frequencies of their hearing range. Explosions produce loud, broadband noise that is audible to many species, but the main frequencies produced are often influenced by the medium being blasted (e.g., rock, concrete, and pilings) and blasting technique (e.g., placement inside or outside the structure, burial or borehole depth, and type of charge). Important behavioral effects on feeding, resting, and reproduction should always be considered during project planning.

Based on the duration of noise produced from construction activities, repeated exposure to acoustic energy (e.g., pile driving, geophysical surveys, dredging, and vessel noise) could potentially result in a broader range of behavioral effects than single, impulsive energy waves, such as those resulting from detonations. Detonations resulting in a single, instantaneous detonation would not be expected to result in significant behavioral disturbance; however, temporary reactions or startle responses to the noise may occur. Likely reactions to a single detonation may range from no reaction (Madsen and Møhl 2000), annoyance, attraction to or

avoidance of the noise, or a startle response from the sudden onset of the noise (SRS Technologies 2001). Observed reactions could include diving, surfacing, schooling, increased respiration, or swimming away from the noise (Collins et al. 2001, Richardson et al. 2001, Nowacek et al. 2007). The effects of startle responses are usually temporary and minor, although sudden onset of impulsive noises may have potentially adverse consequences (Jehl and Cooper 1980, SRS Technologies 2001).

Recommended exposure levels in which behavioral reactions are expected appear in Table 1. Single, discrete detonation events are generally not expected to result in significant changes in behavior under most circumstances; however, certain life history stages or behavioral states need consideration when assessing impacts of noise. In the southeast U.S., project areas in or near known spawning grounds, calving areas, nesting beaches, important foraging areas, migration corridors, or designated critical habitat may be more likely to disturb animals. These areas may have seasonal or environmental characteristics that are important to protected species. NMFS is available to assist with identifying any areas of potential concern near a project area.

Table 1. Onset of behavioral responses to a single impulsive noise.

Impact Zone	Cetaceans[a]	Sea Turtles[b]	Fishes[c]
Harassment (Behavior)	$\geq$ 160 dB_{rms} re 1 µPa	166_{rms} dB re 1 µPa or 155 dB re 1 µPa-s	160_{peak} dB re 1 µPa

[a]Recommended interim criteria for marine mammals

[b]Based on McCauley et al 2000a

[c]Recommended level based on data from Skalski et al. 1992.

Although most single detonations typically don't result in significant behavioral changes, the level of behavioral response of an animal can be strongly dependent on the repetitiveness of the disturbing stimulus. As a guiding principal, projects involving multiple detonations per day should be evaluated for their potential to significantly affect the behavior of an animal. For any projects in which repetitive explosions may occur, the potential for adverse behavioral effects must be evaluated on a project-by-project basis with NMFS.

3. Defining Zones of Influence

Defining zones of influence allows NMFS and project planners to estimate the potential area affected and determine appropriate mitigation measures for protected species.

1. **Mortality Zone:** The distance from a detonation within which mortality may occur.

2. **Injury Zone:** the distance from a detonation within which non-lethal injury may occur, but mortality is not expected.

3. **Danger Zone:** The distance from a detonation within which both injury and mortality may occur.

4. **Harassment Zone (TTS):** the distance from a detonation within which temporary hearing loss may occur.

5. **Harassment Zone (Behavior):** the distance from a detonation within which behavioral reactions may occur.

6. **Watch Zone:** an additional buffer zone that may be monitored to detect animals that are heading towards the impacted area. The watch zone radius may vary depending on the type of project and species potentially occurring in the project area.

Different zones of influence should be considered when determining the range of effects from any given noise. Useful terms to describe zones of influence and estimate probable impacts from explosions (and avoidance of) are 1) a mortality zone, 2) an injury zone, 3) a danger zone (mortality and injury zones combined), 4) a harassment zone (TTS), 5) a harassment zone (behavior), and 6) a watch zone (Figure 1). Defining zones of influence is also important to establish common terminology to discuss potential impacts to protected species. The term *impact zone* may also be used in reference to the distance from an explosion within which the potential for adverse effects may occur, including the potential for mortality, injury, and harassment.

4. Calculating Zones of Influence

NMFS' Southeast Region currently accepts three general methods to calculate zones of influence, depending on the activity type: 1) energy and pressure thresholds; 2) unconfined blasts; and 3) confined blasts using stemmed charges. The zones of influence needed for a project area and how they are estimated will vary depending on the method used, as well as project-specific details.

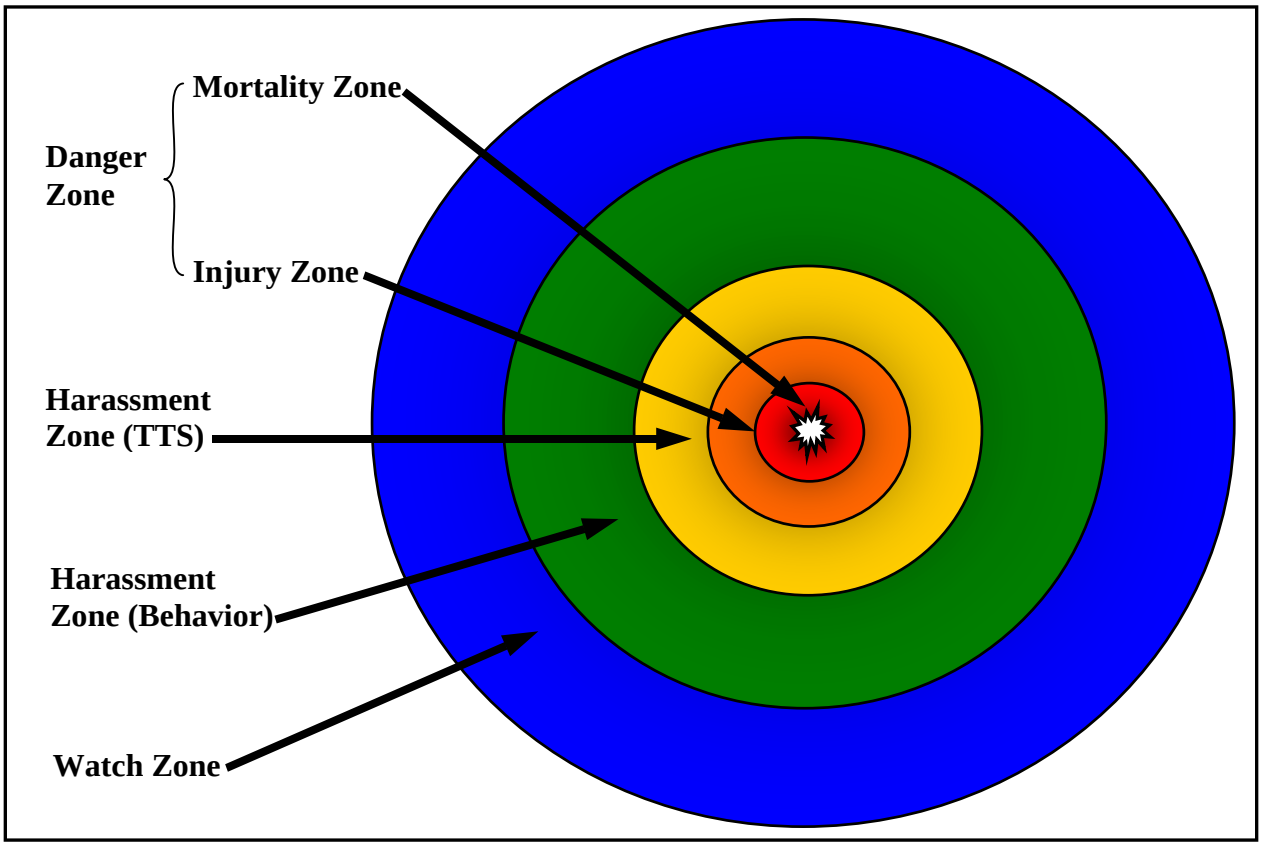

Figure 1. An example of zones of influence from explosives detonated in open water.

4.1. Energy and Pressure Thresholds

Threshold criteria for marine mammals and sea turtles were initially established for ship shock trials of the SEAWOLF submarine and the WINSTON S. CHURCHILL vessel, and description and derivation of these criteria can be found in the environmental impact statements prepared for these activities (Department of the Navy 1998 and 2001). Recently, these criteria have been revised and are currently undergoing further review by NMFS and may be applied to other protected vertebrate species. Standard impulsive and acoustic metrics used in this document are defined below.

Peak Pressure: peak pressure is commonly used to measure maximum positive pressure or peak amplitude of impulsive sources with units of psi.

Positive Impulse: Positive impulse is the time-averaged pressure disturbance from an explosive source with units in psi-ms.

Sound Exposure Level (SEL): SEL is the time cumulative sum of squares pressure divided by the duration of the sound. SEL levels have units of dB re 1 $\mu Pa^2 \cdot s$ and other an assessment of risk to multiple exposures, such as pile driving.

Energy flux density (EFD): EFD is the time integral of the squared pressure divided by

the impedance. EFD levels have units of dB re 1 $\mu Pa^2 \cdot s$.

1/3-Octave band: The 1/3 octave selected is the hearing range at which the subject animals' hearing is believed to be most sensitive.

It is noteworthy that the EFD and SEL metrics are converted to decibels in a slightly different way, but are very similar. The SEL and EFD metrics often are used to refer to the same quantity, namely, the time integral of square pressure divided by the product of sound speed and density. This definition for EFD, however, is not strictly correct for complex pressure fields; SEL may be a more appropriate metric in an analysis of potential impacts from explosive sources. However, both SEL and EFD are reported in the literature and are comparable metrics. NMFS recommends that SEL should be used whenever possible.

Marine Mammal and Sea Turtle Mortality Thresholds
To determine the potential physical injury from explosions, pressure thresholds are used based on the mass of the animal. Studies with animals have shown that as the mass of the animal increases, the pressure required to result in lung injury increases. Pressure is commonly measured as positive impulse or peak pressures. Threshold levels can be established to estimate distances from an explosion in which different impacts varying in severity may occur, that may characterize levels at which harassment, injury, or death may be expected. Although body mass is associated with blast injury, there is no not association with auditory and behavioral effects discussed below. Predictive equations for lung injury Equation 1 and example thresholds based on body mass of sea turtles and marine mammals appear in Table 2.

The recommended threshold level for the onset of mortality in sea turtles and marine mammals from explosions (Yelverton and Richmond 1981) is given by:

1% mortality can be estimated by: $LN\ I = 2.588 + 0.386\ Ln\ M$, and

50% mortality can be estimated by $LN\ I = 3.019 + 0.386\ Ln\ M$

where I is positive impulse (psi-ms) and M is body mass (kg).

Example 4.1
Using the above equation to find the threshold level at which the onset of mortality (1%) is expected for a 27 lb (10 kg) juvenile green sea turtle in the Laguna Madre, Texas, we find:

<u>10 kg green sea turtle</u>
$LN\ I = 2.588 + 0.386\ Ln\ (10)$
$LN\ I = 2.588 + 0.889$
$LN\ I = 3.477$

Finding the inverse natural log to solve for impulse (I) yields:
$I = e^{3.477}$
$I = 2.71828^{4.33}$

I = 32.36 psi-ms

In general, smaller animals and their associated smaller impulse values result in larger impact zones. This equation does not consider the possible effects of animal depth; however, it is generally applicable to general estimating the onset of mortality for blasting projects in coastal areas, and it is highly conservative since it estimates the injury range at which only 1% of animals would be expected to experience lung injury. Following the calculation of the appropriate threshold level, the shock wave needs to be modeled to determine the range from the detonation at which the threshold level will be realized. These calculations are complex and require knowledge of the project details, environment, shock wave theory and modeling. These calculations are discussed in greater detail in Department of Defense (2001 and 2007).

To predict auditory effects from single explosions, two different acoustic energy thresholds (dual criteria) may be used to predict effects to sea turtles and marine mammals: a sound exposure level (SEL) and a pressure threshold (Table 2). The auditory criteria resulting in permanent

Table 2. Zones of influence for marine mammals and sea turtles from explosions.

Impact Zone	*Criterion Definition*	**Threshold Level**
Mortality Zone	Onset of severe lung injury (1% of animals; dependent on body mass)	Ln I = 2.588 + 0.386 Ln M[a]
Injury Zone	Onset of PTS	≥46 psi, 230 $_{peak}$ dB re 1 μPa, or 198 dB re 1 μPa^2-s
Harassment Zone (TTS)	Onset of TTS	≥23 psi[b], 224_{peak} dB re 1 μPa[c]; or 183 dB μPa^2-s at frequencies in any 1/3 octave band above 100 Hz for odontocetes and sea turtles; or above 10 Hz for mysticetes.

[a]Yelverton and Richmond 1981
[b]Finneran et al 2002
[c]Southall et al. 2007

threshold shift (PTS or non-recoverable hearing loss) and TTS are applicable to single detonation events that do not result in repeated exposures to noise. Since auditory effects have not been shown to be associated with the size of the animal, specific threshold levels can be used.

However, repeated exposures to noise resulting from consecutive detonations of explosions may result in different threshold levels, this does not typically occur and is limited to some types of military testing and training exercises and special blasting requirements of some construction projects. Longer durations to noise exposure may result in greater magnitude effects on animals, and may require additional consideration when conducting a risk assessment. In general, longer duration noises have a greater likelihood to result in hearing loss, than shorter, impulsive noises of the same intensity.

Some specific models have been developed for some activities using these criteria (e.g., explosive removal of offshore oil and gas structures in the Gulf of Mexico) and are discussed elsewhere (Dzwilewski and Fenton 2003). When deciding which criteria to use, each threshold level must be calculated to determine the more conservative criteria that yields the larger zone of influence. NMFS currently recommends that the SEL be estimated to account for the total energy produced during detonations; however, peak pressure is also acceptable. In cases where empirical data exist, dual criteria exist for the impact threshold. If SEL levels are not used, the equivalent dB unit of measurement used should always be clearly reported.

Summary of Threshold Criteria

These criteria may be used to establish impact zone areas in which probable impacts can be expected, and appropriate mitigation measures designed to avoid or minimize the risk of harm to protected species. A discussion of the calculations conducted for these criteria are provided in the environmental impact statement prepared for the shock trial of the *Mesa Verde* (Department of Defense 2008). NMFS regards these criteria (Table 3) as the preferred approach to estimating impacts on sea turtles and marine mammals; however, potential impacts to sturgeon and the smalltooth sawfish are more difficult to quantify by discrete threshold levels and is dependent on the size class and/or life history stage of fishes in the project area. Additionally, many project planners often do not have the necessary information on the project to model the required distance at which the thresholds are realized. In absence of all the information necessary to complete the calculations, reasonable assumptions may be necessary to model shock wave propagation and determine dual criteria thresholds for protected species.

With information on the noise characteristics of the detonation and species affected, accurate estimates of impact zones can be determined for sea turtles and marine mammals. Some limitations of the criteria include assumptions about the propagation of shock waves, depth of charge, and variations in propagation environments at different project areas. Although specific threshold criteria can be set for protected species, modeling of threshold levels from explosions may be limited by modeling capabilities, and conservative assumptions regarding impact zones and potential effects to species may be needed. Because there are many other variables to consider, NMFS may request field verification measurements to be made prior to establishing final zones of influence when a large degree of uncertainty exists.

4.2. Unconfined Blasts

Unconfined or open-water blasts include a wide variety of explosives uses for construction, demolition, and other marine projects. For unconfined blasts, precise injury zones cannot be calculated without calculating pressure measurements. These equations are considered very conservative; and, therefore, are acceptable for protected species mitigation during project planning. Young (1991) developed predictive equations based on observed safe ranges (radius) from a detonation, and be used to predict the danger zone for protected species:

$$\text{Fish Danger Zone (ft)} = 95\ (\text{fish weight in lb})^{-.13}(\text{max lb/delay})^{.28}(\text{depth of charge in ft})^{.22}$$

$$\text{Sea Turtle Danger Zone (ft)} = 560\ \sqrt[3]{\text{max lb/delay}}$$

$$\text{Calf Porpoise Danger Zone (ft)} = 578\ (\text{max lb/delay})^{.28}$$

20-ft Whale Danger Zone (ft) = 327 (max lb/delay)$^{.28}$

The equation to estimate danger zones for fishes is based on data from open-water blasts in shallow water. Although it is based on a limited range of conditions, the equation is appropriate for sturgeon due to their association with riverine and coastal shallow-water habitats. Although the above models are based on observed safe ranges from an explosion where no apparent injury or mortality was observed, they do not precisely predict differing levels of effects within the range between the detonation point and safe distance (e.g., the specific distances in which mortality and injury are expected are not known). However, these models are very conservative predictors to avoid serious injury and mortality. NMFS considers the equations developed by Young to be very conservative at avoiding serious injury and harassment. Although they were not developed to predict distances to avoid non-serious injury (PTS), these effects of PTS may be found within these conservatively estimated danger zones.

Many variables are often unknown in planning phases, and these models are useful for predicting safe ranges to avoid mortality when more precise harassment zone modeling cannot be completed. NMFS may request an estimation of these zones of influence for section 7 consultation under the ESA, or when applying for an incidental harassment authorization under the MMPA if determined to be necessary. In such cases, a conservative estimate of a non-serious injury and harassment zone should be estimated based upon available information from similar projects or field measurements. If sufficient information is available, a more rigorous analysis of environmental impact modeling for zones of influence should be completed.

Example 4.2
A hypothetical demolition project plans to remove an existing two-lane causeway and construct a new six-lane causeway over an estuarine bay. A total of 8 blast events will be conducted over a 30-day period. For one detonation sequence, a total net explosive weight (NEW) of 200 lb (60-lb, two 50-lb, and a 40-lb charge) will be detonated with three 25 ms delays between each detonation. The charges will be detonated at a depth of 20 ft to sever support structures for removal. The species occurring in the project area and information for the detonation sequence appears in the table below.

Species in Project Area	Abundance in Bay (0)	Charge Weights/Series (lb)	Max. NEW/25 ms Delay
Gulf sturgeon	60	40	60
green sea turtle	3	50	
Kemp's ridley sea turtle	2	50	
loggerhead sea turtle	18	60	
bottlenose dolphins	37		

Subadult Gulf sturgeon utilize the project area during the scheduled blasting activities of January-February. Subadult sturgeon foraging in the area have weights ranging from 0.7 lb to 5.3 lb (Clugston et al. 1995).

Example Calculations

The equations to predict the danger zone for fishes, sea turtles, and dolphins to mortality and serious injury can be solved for each species by:

$$\text{Fish Danger Zone (ft)} = 95\,(.70)^{-.13}(60)^{.28}(20)^{.22}$$
$$= 95\,(1.05)(3.15)(1.93)$$
$$= 95\,(6.38)$$
$$= 606 \text{ ft}$$

$$\text{Sea Turtle Danger Zone (ft)} = 560\,\sqrt[3]{60}$$
$$= 560\,(3.91)$$
$$= 2{,}192 \text{ ft}$$

$$\text{Dolphin Calf Danger Zone (ft)} = 578\,(60)^{.28}$$
$$= 578\,(3.15)$$
$$= 1{,}821 \text{ ft}$$

In the above example, the Gulf sturgeon danger zone (606 ft) is much smaller than that predicted for sea turtles (2,192 ft) and dolphins (1,821 ft). For sea turtles and dolphins, size of animals and depth of charge are not needed to solve the equation because they are based upon observed safe ranges. Although this may be convenient to solving the calculation, the resulting danger ranges for sea turtles and dolphins are conservatively large as a result. The danger zones predicted for sea turtles and marine mammals using these equations for explosive charges < 1,000 lb result in quite larger distances than those calculated using the energy and pressure criteria, and often approximate, but are slightly more conservative than, harassment zones predicted by the dual criteria thresholds for TTS. However, additional distances may be needed to account for these potential effects if they are determined to be beyond the danger range.

Visually Observable Species

For visually observable species, the size of the area to be monitored is usually determined by the species affected over the largest area, which in the above example are sea turtles. When estimations of zones of influence are necessary using the equations developed by Young, it may be desirable to compare the zones of influence predicted with the safe range equations with similar projects that have calculated more precise zones of influence for sea turtles and marine mammals using the dual criteria thresholds (Table 1). Field measurements are desirable requirements of operation plans of common types of activities to verify the predicted zones of influence.

Species Not Visually Observable

The most sensitive size class is accounted for by using the lowest mass of subadult Gulf sturgeon in the area (0.70 lb). Since sturgeon cannot be effectively monitored by visual observers, physical barriers, bubble curtains, or reducing the NEW of the charge might be considered by project planners. If such measures cannot be effectively deployed, seasonal restrictions may be an appropriate measure to avoid potential mortality altogether. The Young equation is considered appropriate for Gulf sturgeon because it was developed based on data for shallow-

depth, open-water explosions. In addition to their common association with shallow-water habitats, sturgeon generally spend most of their time on the bottom, where fishes are less vulnerable from open-water explosions (Young 1991), but not necessarily from buried charges. However, this open-water equation conservatively estimates safe ranges for species of sturgeon. It is important to note that as depth of the charge increases or the mass of the fish decreases, the distance of the safe range from the explosion will increase for a charge of equivalent NEW. Keevin and Hempen (1997) provide a thorough summary of other models to estimate lethal zones for fishes when additional parameters are known.

In summary, NMFS' Southeast Regional Office considers these conservative equations sufficient for mitigation planning purposes to avoid injury and mortality when more precise calculations of zones of influence cannot be completed. Additional considerations of impacts associated with non-lethal injury and harassment may be necessary, and may be dependent on the details of the project.

4.3. Confined Blasts Using Stemmed Charges

Confined blasts in boreholes are a method in which the explosive charge is placed in a borehole and capped with an inert material such as angular rock or crushed stone. Confined borehole blasting or stemmed charges are used primarily during channel and harbor deepening. Confined blasts increase the work done by the explosives while decreasing the amount of pressure released into the water column (Hempen et al. 2005, Nedwell and Thandavamoorthy 1992). Detonations in open water will produce both higher amplitude and higher frequency shock waves than contained detonations; thus, the technique of stemming charges results in reduced pressures and lower aquatic organism mortality than the same explosive charge weight detonated in open water (Hempen et al. 2007, Nedwell and Thandavamoorthy 1992).

The inert material must be irregularly shaped since regularly-shaped materials may be expelled during detonation and will not effectively "dampen" the blast wave. To be effective, the stemming material should be within 1/20 to 1/8 of the borehole diameter. The stemming material is not acceptable if it contains more than 10% fines (smaller than 1/20 of the borehole diameter). Stemming material should be placed at a minimum vertical length of three borehole diameters above the placed charge within sound rock or concrete. Since this approach has been based on specific measurements of underwater rock blasting projects, blasting methods that do not follow established methods for confined blasting should use an unconfined blast model to determine the appropriate impact zone or estimate zones of influence, such as that provided in section 4.2 above, or conduct field experiments to measure pressure and energy propagation from the specified blasting method so that new models may be derived.

The following equations are recommended to estimate the zones of influence for confined, stemmed charges (Hempen et al. 2007, Jordan et al. 2007):

Danger Zone Radius (ft) = 260 $\sqrt[3]{\text{lb/delay}}$

Harassment Zone Radius (ft) = 520 $\sqrt[3]{\text{lb/delay}}$

Watch Zone Radius (ft) = three times the distance of the mortality and injury zone

Example 4.3

Using the same blast scenario provided in example 4.2, but with confined, stemmed blasts instead of open-water, the zone of influence equations yield:

Danger Zone Radius (ft) = $260\sqrt[3]{60}$
= 1,018 ft

Harassment Zone Radius (ft) = $520\sqrt[3]{60}$
= 2,036 ft

Watch Zone Radius (ft) = $3(260\sqrt[3]{60})$
= 3,054 ft

Based on studies to date (Hempen et al. 2005, Nedwell and Thandavamoorthy 1992), the above equation is believed to be highly conservative in estimating zones of influence for protected species, and mitigation based on this model has been tested in the field (Jordan et al. 2007). A limitation of this model, as with the above open-water blast equations, is that it does not estimate threshold levels for various types of effects from a confined blast, but estimates a conservative safe range from injury and mortality for all species. Although there would be a greater risk of mortality the closer an animal comes to the point of detonation, the distance is conservatively protective since both injury and mortality are assumed to have an equal chance of occurring if an animal were within the danger zone.

Hempen et al. (2007) estimated a mortality zone for fishes based on a low lethal level of 40 psi for stemmed charges. NMFS believes this level may be appropriate for larger size classes of fish, but not for smaller size classes (see Figure 2). If only large animals are found in a project area, the 40-psi criteria may be appropriate. NMFS recommends the equations above be used for estimating impacts to all size classes during project planning.

5. Assessing Impacts to Protected Species

Analytical frameworks are useful decision-making tools for protected species management. Analytical frameworks can be used to break down, or deconstruct, an activity into individual components, identify the potential effects of the noise components in the environment, and determine the level of risk posed by the noise-producing activity (Figure 4). Each noise component can be characterized by considering many factors such as the propagation characteristics of the noise, the environmental characteristics and habitat type, and species found in the area. Once all the important variables of the action and species are considered, a risk

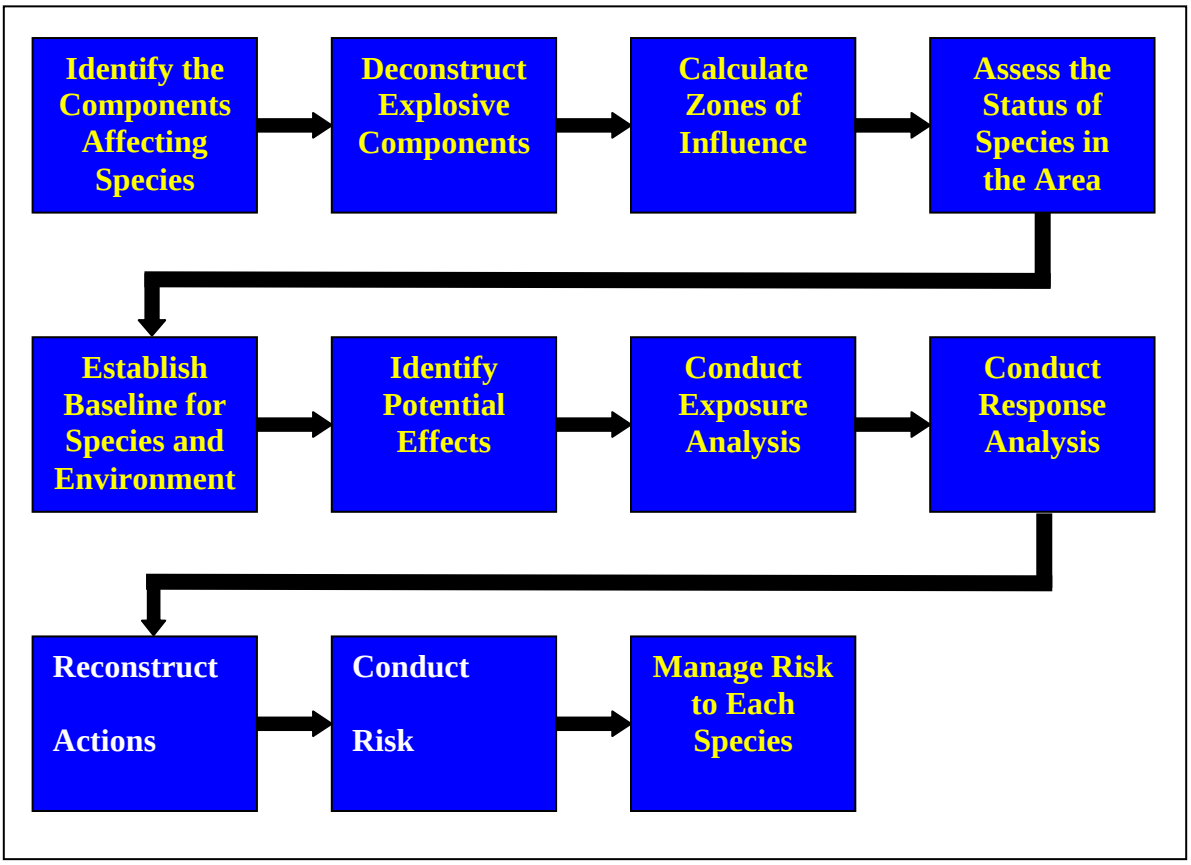

Figure 4. A general analytical framework to assess risk to protected species from explosions.

assessment is performed to determine the probability of undesirable effects occurring, and any measures to minimize or avoid those effects can then be considered.

Analytical frameworks utilize mathematical models or conceptual approaches to assess the potential risks to different species. The types of effects routinely considered include the potential for injury or death, the potential for harassment to occur, and habitat effects resulting from the activity. Information on any protected species in the project area is needed to properly assess any potential impacts. Information such as species abundance, animal behavior, hearing abilities, habitat characteristics, critical habitat designations, and other available information in the project area need to be considered. For example, a project can be deconstructed into its main components such as time of year, project duration, charge weights, number of explosions per day, and other variables (see *Summary of Information Needed* section below). Noise from the project can further be deconstructed into pressure units (psi) and dB units (EFD). Using the threshold criteria or models discussed in previous sections, zones of influence can be calculated to determine probable effects to protected species or critical habitat. For any effects that need mitigating, a number of different mitigation tools may be used to avoid or minimize impacts to protected species and their habitats.

Information Needed to Assess Impacts

A complete description of the activity and an assessment of impacts to protected species from explosives should be submitted with a request for consultation or incidental take authorization to NMFS. NMFS may also consider other actions associated with the use of explosives that may affect protected species such as vessel traffic, dredging, construction noise, effects on habitat quality, and other potential effects of the action. Any additional activities that may result in impacts to protected species or those identified in consultation with NMFS should also be identified. An analysis of all activity components that may affect protected species should be conducted, and those resulting in potentially adverse affects identified. For explosives use, a detailed blasting plan should be submitted with, or integrated within the impact analysis for a particular activity. The information needed for NMFS to assess activities using explosives includes:

- A description of the types of targets or structures on which explosives will be used;
- The type of explosives used;
- Details of the use of delays, stemming, charge placement, and depth of detonation;
- The total number of detonations or detonation sequences for the project, and number per day;
- The maximum explosive weight detonated per 25 ms period for each detonation sequence;
- The number of delays used and delay time for each detonation sequence;
- The time of year (months) the blasting is planned; and
- The total number of days blasting is expected to occur;
- A description of habitat in which explosives will be used including depth, salinity, water temperature, substrate type, and biota;
- A description of protected species and habitat in the project area;
- A summary of potential effects to species and habitat from the activity;
- An estimation of the zones of influence to protected species indicating the method by which they were calculated. Models and mitigation methods may be approved on a case-by-case basis, or as new information becomes available regarding blast modeling or exposure criteria for protected species;
- An analysis of effects to protected species;
- An analysis of effects on protected species habitats and primary constituent elements (PCEs) of any critical habitat, if designated in the project area;
- A proposed mitigation/monitoring plan for the project; and
- Observer qualifications

A well-prepared blasting plan can partially fulfill the recommendations for biological assessments (BAs) and environmental assessments (EAs). Guidelines on the preparation of a BAs and EAs, and information regarding section 7 consultation can be found on the Southeast Regional Office web site at http://sero.nmfs.noaa.gov/pr/pdf/BA_guide_comboeh081105.pdf.

Information regarding applying for an incidental take authorization under the Marine Mammal Protection Act may be found at http://www.nmfs.noaa.gov/pr/permits/incidental.htm.

6. Measures to Reduce the Risk of Harm to Protected Species

Environmental mitigation should be a part of every blasting plan and include appropriate measures identified in the risk assessment for the species and habitats found in the project area. For common activities requiring explosives, such as oil and gas structure decommissioning, some standard recommendations have been developed in coordination with NMFS. A "suite" of measures that applies to all the protected species found in a project area is desirable for flexibility in project planning, as well as for species-specific management needs. Because fish are not readily observable, visual surveys alone cannot avoid impacts; therefore, additional mitigation should be considered when protected species of fish are present in a project area. The suite of measures below should be considered when preparing protected species mitigation measures for blasting plans. Implementation of these measures does not necessarily ensure that all impacts will be avoided. Project-specific recommendations may be discussed during consultation with NMFS.

1. Establish zones of influence based upon protected species found in the project area, using an appropriate model.

2. The lowest NEW per detonation should be used to complete the work for a particular construction, severance, or demolition activity. Using smaller NEWs is associated with smaller impact zones where protected species (listed species and marine mammals) could be harmed. Shaped and fracturing charge designs are being developed and refined by the demolition industry that increase the efficiency of the work, resulting in smaller NEWs than for "bulk" charges. Water gel explosives have a lower detonation velocity, generating less shock energy than some other high-detonation velocity explosives (e.g., dynamite) and have lesser impacts on aquatic animals.

3. The use of delays should be maximized between individual blasts to separate the total NEW into a blast episode, creating a series of discrete, consecutive blasts. A blast episode consists of a single blast or a series of blasts that are detonated with a delay to lower the overpressure at a received distance in the environment. Discrete detonations using delays effectively reduce the zones of influence. For delay intervals less than 25 milliseconds (ms), NMFS recommends that zones of influence for protected species be estimated by calculating the distances for the summed explosive weight detonated per 25 ms period.

4. The use of bubble curtains, physical barriers, and other mitigation techniques to dampen the shock wave from detonations should be considered. The effectiveness of mitigation techniques may vary depending on the environment (e.g., currents and water depth), number and NEW of the explosives used, and other project details. Bubble curtains dampen or attenuate the sound transmitted through the bubble curtain. A bubble curtain for explosives may consists of shock-resistant materials at various depths and distances from an explosion. The bubble curtain should be effective at reducing pressure to levels below those resulting in harm to the species found in the project area.

5. The perimeter of impact zones should be established and demarcated (e.g., with landmarks or brightly colored buoys) for visual reference when conditions permit. Land- or ship-based observations may use binoculars and the naked eye to monitor the zones of influence. Fixed focus, vector binoculars are useful to establish distance from the project site and identify species. When aerial surveys are proposed, an aerial survey plan should be submitted to NMFS for approval with the mitigation plan.

6. Qualified observers should be used that have completed an approved training program to monitor the zones of influence. Each observer should be equipped with a two-way radio dedicated to protected species communication, polarized sunglasses, binoculars, a red flag or other backup communication, and any necessary data recording equipment.

7. Monitoring should be conducted from the highest vantage point(s) and/or other locations that provide the best, clear view of the entire zone of influence. These vantage points may be on the structure being removed or on nearby surface vessels such as crew boats.

8. A sufficient number of observers should be used to effectively monitor the established zones of influence under variable charge sizes and environmental conditions. The number of observers used may be dependent on numerous factors including whether aerial or vessel/shore-based observations are used, the size of the zones of influences, distance from shore, sea state, and observer fatigue.

9. For large zones of influence, or to augment visual observations, passive acoustic monitoring may be utilized to detect vocal species of marine mammals when animals are not readily observable at the surface. However, passive listening should not be used as a replacement for an adequate number of visual observers.

10. If divers are used during the demolition, they should be instructed to scan subsurface areas around the removal site for the presence/absence of protected species during the course of removal operations.

11. The chief observer should have authority to immediately halt activities should a protected species be observed within the impact zone, or is in the watch zone and in imminent danger of injury by heading toward the impact zone.

12. Surveys should be conducted before and after each blast episode. The duration and method of surveys should be determined in consultation with NMFS. Post-detonation observations are to start at the removal site and proceed in the direction of wind and current movement from the blast location.

13. Surface and/or aerial protected species surveys should be conducted in environmental conditions adequate for effective visual observation. Aerial surveys should be conducted during daylight hours and cease when marine conditions are not adequate for visual observations, or when the pilot/removal supervisor determines that helicopter operations must be suspended. Detonations should be delayed until conditions improve sufficiently for monitoring to be effectively completed.

14. When a protected species is sighted or heard within the impact zone, detonations should be postponed until it is verified to be outside of the impact zone.

15. Blasting should be limited to daylight hours (between one hour after sunrise and one hour before sunset). If pre-detonation and post-detonation surveys are to be conducted, pre-detonation surveys shall not begin prior to sunrise and detonations must not occur if the post-detonation survey cannot be concluded prior to sunset.

16. Detonation of scare charges to intentionally harass sea turtles or marine mammals into leaving a project area is prohibited. Scare charges using detonation cord are potentially harmful to fishes (California Department of Fish and Game 2002) if the mass of the explosives is not considered. In some cases, scare charges may be necessary to reduce the risk of mortality to sturgeon and smalltooth sawfish in the immediate area of a blast. Detonation caps not exceeding 0.5 g (Collins et al. 2001) may be approved on a case-by-case basis for use as scare charges for sturgeon and smalltooth sawfish. Scare charges not exceeding 0.5 g are also recommended to avoid the attraction of marine mammals, sea turtles, and piscivorous fishes that are stunned or wounded by the scare charge.

17. All protected species entering the impact zone should be allowed to move out of the area under their own volition. Enticing marine mammals to bow-ride or intentionally harassing animals into leaving the area is prohibited.

18. All “shock-tubes" and detonation wires should be recovered and removed after each blast.

19. The chief observer should submit a post-project report within 30 days of completion of the project to the permitting agency. The report should include project information, including but not limited to, a description of the project and explosives used, survey information, environmental conditions, and observations of protected species. Reports should be available to NMFS upon request.

20. Report dead or injured protected species to your local stranding network contacts. A list of sea turtle stranding responders is available at http://www.sefsc.noaa.gov/seaturtleSTSSN.jsp.
    A list of marine mammal stranding network responders for each state is available at http://www.nmfs.noaa.gov/pr/health/networks.htm or may be reported to the marine mammal stranding hotline at 877-433-8299.
    All other dead or injured protected species should be reported to NMFS’ Southeast Regional Office by telephone at (727) 824-5312, or by FAX at (727) 824-5309.

Additional Considerations

The following mitigation measures may be recommended under some circumstances to avoid impacts to important habitats and behaviors of protected species.

1. Avoid blasting techniques in regions that may affect any primary constituent elements of critical habitat designated for a listed species.

2. When blasting in inshore habitats, blasting should be conducted at low tide, above the water line to reduce the transmission of energy into the water column.

3. Sequence work to minimize impacts to biologically important areas such as migration corridors, important foraging areas, spawning habitats, near nesting beaches, calving areas, or in juvenile or developmental habitats protected species. These considerations may involve temporal or seasonal considerations when blasting in biologically important habitats.

4. No debris from the blasting operations should be left on the seafloor unless the structure is to be decommissioned as an artificial reef. The amount of debris scattered by blasting should be minimized to the greatest extent practicable (e.g., the use of blast mats). Methods should be used to minimize benthic and habitat disturbances such as removing structures below the mudline, use of blasting mats, and removing debris off the seafloor with appropriate methods, and in consultation with NMFS.

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APPENDIX L. DIVE OPERATIONS PLAN

This appendix contains a copy of the Dive Operations Plan for this project.

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ACRONYMS AND ABBREVIATIONS

ACDE	Association of Commercial Diving Educators
APP	Accident Prevention Plan
AHA	Activity Hazard Analysis
ASR	Archives Search Report
CFR	Code of Federal Regulation
CGA	Coast Guard Administration
CMS	Caribbean Marine Services
cu	cubic
DAN	Divers Alert Network
DDC	District Diving Coordinator
DDESB	Department of Defense Explosives Safety Board
DNER	Department of Natural and Environmental Resources
DoD	Department of Defense
DOT	Department of Transportation
DQO	Data Quality Objective
DS	Diving Supervisor
DSOP	Dive Standard Operating Procedure(s)
EBS	Environmental Baseline Survey
EM	Electromagnetic
EMP	Emergency Management Plan
EOD	Explosive Ordnance Disposal
ESA	Endangered Species Act
ESP	Explosives Site Plan
°F	Degrees Fahrenheit
FSW	Feet of Seawater
ft	foot (feet)
FUDS	Formerly Used Defense Site
GPS	Global Positioning System
GSA	General Services Administration
ISO	Industry Standard Object(s)
IVS	Instrument Verification System
MC	Munitions Constituents
MDAS	Material Documented as Safe
MEC	Munitions and Explosives of Concern
MOB	man overboard
MPPEH	Material Potentially Presenting an Explosive Hazard
MRS	Munitions Response Site(s)
NAUI	National Association of Underwater Instructors
NATO	North Atlantic Treaty Organization
ORM	Operational Risk Management
OSHA	Occupational Safety and Health Administration

PADI	Professional Association of Diving Instructors
PFD	personnel flotation device
PR	Puerto Rico
PWS	Performance Work Statement
QC	Quality Control
RCC	Rescue Coordination Center
RI/FS	Remedial Investigation/Feasibility Study
ROV	Remotely Operated Vehicle
SCUBA	Self Contained Underwater Breathing Apparatus
SOP	Standard Operating Procedure
SS	Snorkeling Supervisor
SUXOS	Senior Unexploded Ordnance Supervisor
TPP	Technical Project Planning
USACE	U.S. Army Corps of Engineers
USA	USA Environmental, Incorporated
USAESCH	US Army Engineering and Support Center, Huntsville
USBL	ultra-short baseline
USCG	U.S. Coast Guard
USFWS	U.S. Fish and Wildlife Service
UXO	Unexploded Ordnance
UXOQCS	Unexploded Ordnance Quality Control Specialist
UXOSO	Unexploded Ordnance Safety Officer
VHF	Very High Frequency
WP	Work Plan

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1.0 PROJECT OBJECTIVES

The Dive Operations Plan is an appendix to the Work Plan (WP) for Culebra Island, Puerto Rico (Formerly Used Defense Site (FUDS) Project Number I02PR0068) under Contract No: W912DY-07-D-0062, Task Order No. 0010, from the U.S. Army Corps of Engineers (USACE), Engineering and Support Center, Huntsville (USAESCH).

This Dive Operations Plan reflects the procedures and methods Parsons will utilize to perform underwater operations in support of a Remedial Investigation (RI)/Feasibility Study (FS) of the intended investigation sites.

This RI/FS is designed to perform an in-depth study to gather the data necessary to determine the nature and extent of known contamination at the sites, assess risk to human health and the environment, and establish criteria for cleaning up the sites.

1.1 PURPOSE AND SCOPE

This RI is being performed under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and is part of the overall Remedial Action Process. The primary purpose and scope is to perform an underwater investigation operation which completes a combined land and underwater RI. The underwater investigation is to determine the nature and extent of possible contamination of MPPEH/MC resulting from DoD use, located both on and below the surface of the seafloor. The end goal is to gain acceptance of a Decision Document (DD) for the areas investigated.

1.2 PROJECT LOCATION

Project location is Culebra Island, MRS 07 (Cayo Culebrita) and MRS 02 (surrounding cayos: Cayo Lobo, Cayo Lobito, El Mono, Cayo Del Agua, Cayo Yerba, Cayo Raton, Cayo Alcarraza, Cayo Los Gemelos, Cayo Piedra Stevens, Cayo Tiburon, Cayos Geniqui, and Cayo Sombrerito), all located approximately three-quarter miles off the northern, western and eastern coasts of Culebra Island. Figure 1-1 provides the site location for each MRS. For additional site description see Section 1 of the Work Plan.

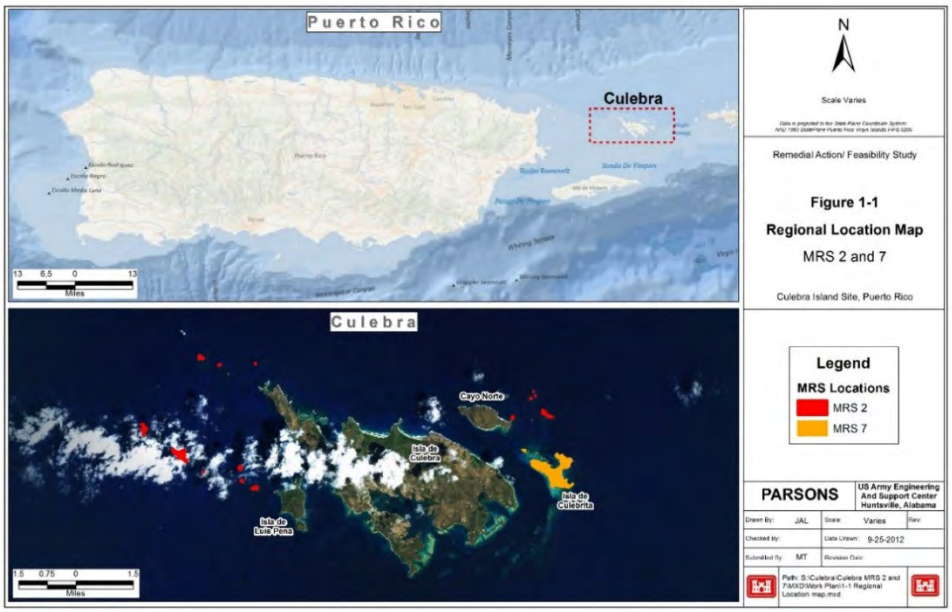

Figure 1-1: Culebra Location Map

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2.0 DIVING OPERATIONS PLAN

The following section describes the Diving Operations Plan which provides a general overview of the tasks to be performed for the Underwater RI/FS MRS 02 and MRS 07.

If, for any reason, the dive plan is altered in mission, depth, personnel, or equipment, the USACE District Diving Coordinator (DDC) will be contacted in order to review and accept the alteration prior to actual operation (Ref EM 385-1-1 Section 30).

2.1 UNDERWATER OPERATIONS

Underwater operations within the MRS 02 and 07 boundaries will be completed during three phases of work:

- Phase 1: Environmental Baseline Survey (EBS) with EBS Report (completed on October 2013 and not considered to be part of this Dive Operation Plan)
- Phase 2: Underwater Geophysical Survey
- Phase 3: Underwater Intrusive Investigations and Environmental Sampling

Phase 2 and 3 will utilize the following systems/equipment and be comprised of the listed actions:

- Unexploded Ordnance (UXO) Divers with SCUBA
- VideoRay Underwater Remotely Operated Vehicle (ROV)
- Underwater Geophysics (underwater EM 61 and underwater analog metal detectors)
- Snorkel operations
- Dive vessel with support boat
- Remote raise tow and beach (or relocate to a suitable underwater site for disposal) MEC/MPPEH items per Explosives Site Plan (ESP)
- MEC/MPPEH Explosive Disposal Operations

SCUBA dives will be conducted in order to complete the following RI/FS tasks:

- Installation of underwater Instrument Verification System (IVS) associated with the Electromagnetic (EM) geophysical survey
- Visual and analog metal detector assisted surveys of the seafloor
- Excavation of chosen subsurface anomalies
- Explosive disposal operations of underwater MEC/MPPEH items
- Collection of marine sediment samples

Snorkeling will be conducted in order to complete the following RI/FS tasks:

- To push the EM Float along the assigned DGM transects
- Visual and analog metal detector assisted surveys of the seafloor
- To assist in the placement of anchors, buoys, and clumps on the seafloor to ensure there is not impact to critical habitat (CH).
- To perform other water borne operations in which SCUBA is not required.

The Dive Supervisor (DS) will determine the number of divers required to complete each task, though no more than three divers is anticipated to be in the water at any given time. Applicable requirements for tending the dive team, such as with a witness float will be dependent on the team structure, site conditions, and ensuring the safety of diving personnel.

Underwater operations may also include a VideoRay ROV, which may be utilized to support and/or supplement diving operations, and to provide underwater video when divers using cameras are not practical.

2.1.1 PHASE 2 UNDERWATER GEOPHYSICAL SURVEY (TRANSECTS)

Phase 2 field activities will consist of performing geophysical surveys along the re-aligned RI transects established during Phase 1 (See Work Plan Appendix B, Figures B-1 through B-13). The objective of these activities will be to collect EM anomaly data while creating the least amount of impact possible to the CH.

For transects containing Listed Threatened or Endangered Species, the survey methodology used will be employed in a manner to cause minimal impact to the underwater environment. The underwater EM geophysical coil will be deployed using two types of system platforms. As there is not a single EM system that will meet the objectives of the data quality objectives (DQOs) multiple platforms will be used to survey the designated areas.

The system used in any given area will depend primarily on depth of water and habitat type present. Based on the analysis of all of the EBS data, USA has assigned proposed EM platforms to each of the RI transects/segments based on benthic habitat. Work Plan Appendix B, Figures B-14 – B-18 illustrate the EM platform deployment for MRS 02 and 07, with each color coded to indicate the proposed EM platform that will be used. Descriptions of each EM platform are provided in the following subparagraphs, and methods/procedures for deployment are contained in Appendix K, Diving Standard Operating Procedure (DSOP) 12.

2.1.1.1 EM Floating Platform (Snorkelers support is required)

An EM Floating Platform (see Figure 2-1) system is intended for use during surveys of the following:

- Along approximately 7.19-miles of underwater transects
- In shallow water areas where contact with the bottom is not desired. There are two configurations for the EM Float. The large float is rafted alongside the tow vessel or towed and does not require snorkeler support. The small float is pushed/towed by snorkelers. Both systems are linked to the tow vessel by the DGM cables and strain relief line and are monitored by computer as the DGM information is collected.

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Figure 2-1: EM Floating Platform

2.1.1.2 EM ROV (No diver support required)

An EM ROV system (see Figure 2-2) is intended for use during surveys of the following:

- Along approximately 16.91-miles of underwater transects
- In areas with coral that is too deep for the floated system, or in areas containing coral heads with high relief

The ROV is equipped with a pressure sensor, altimeter, pitch sensor, roll sensor, and video cameras so real time monitoring of the coil and ROV dynamics will be monitored to ensure no threatened or endangered species are disturbed during the survey. The EM coil will be mounted in front of the ROV so it will be visible in the camera view at all times, so as to visually monitor objects ahead of station. Positive control will be maintained of the ROV at all times as it is maneuvered around bottom types/obstacles (coral heads/ boulders). Accurate positioning for the ROV and coil will be supplied by an ultra-short baseline (USBL) system set up between the survey vessel and the ROV system.

Figure 2-2: EM ROV Platform

2.1.1.3 Instrument Verification Strip (IVS) (Dive Team support required)

Under the direction of the Site Geophysicist, Parsons will establish IVSs to perform underwater EM transects, and a land based IVS for the Analog metal detectors and the Diver Deployed EM System which will be used during analog and dig phases of work. The IVS design can be found in the Work Plan Section 3.2.2.4.

- The EM IVS will be established for the use of the DGM platforms during phase 2. Three IVSs will be placed by divers during Phase 2. The site will be have been surveyed by the DGM team to be free of metal debris however as an added level of safety the divers will perform anomaly avoidance while burying the ISOs. There will not be any underwater IVSs established for Phase 3.
- The location of the first and last ISO items will be initially marked with weighted buoys dropped from the surface. The divers will then go down and attach a measured line between the clumps. The line will be drawn taut and the ISOs will then be buried per the IVS design. Following construction of the IVS, the clumps and buoys, will be recovered but the measured line will be anchored in place as a highway line for a visual reference to be used by the DGM team.
- During Phase 3 a land based IVS will be will be established on MRS 09 Beach or suitable site in an area free from metal debris. The UXO SCUBA divers will process through the land IVS with their analog metal detectors per the Phase 3 Work Plan.

2.1.2 PHASE 3: INTRUSIVE INVESTIGATIONS AND ENVIRONMENTAL SAMPLING

2.1.2.1 Visual and Analog Instrument Aided Transect Survey with Intrusive Investigation (Dive Team support is required)

The visual and analog instrument aided transect surveys will be used when the above EM 61 platform options are not suitable due to site conditions, or when additional transects have been added to bound a

MEC high density area. Analog transect surveys will be executed during the Phase 3 Intrusive Investigations and Environmental Sampling.

Transect segments that were not completed by one of the EM 61 platform methods will be completed by defining SCUBA transect segments to be surveyed/investigated. These transect segments will fill in and complete a transect by executing an instrument aided visual survey with the use of the Minelab Excalibur, White's, or an equivalent detector (see Figure 2-3). A floating line suspended between two clumps/buoys used in a jack stay configuration will be suspended high enough in the water column to be used as a guide for the divers to stay on course within the transect, but not too come in contact with the corals or ocean floor. The following general statements apply to the SCUBA transect segments:

- When swimming over unconsolidated sediments an analog metal detector will be used to identify anomalies which may not be visible.
- Any anomalies discovered in unconsolidated sediments during these transect segments will be investigated by hand, and at the time of discovery. The depth of excavation will be limited to the capability of the diver and the type of sediment. Depth of excavations will not exceed 24 inches.
- If seagrass is present, intrusive investigation in seagrass areas will follow the procedures identified in the Work Plan, Appendix K (Final Supplemental SOPs for Endangered Species Conservation and their Critical Habitat with Addendum 1 (CESAJ, February 2015) –See para 4.3.4).
- The MEC/MPPEH item will undergo further investigation after the transects have been completed. Should an MEC/MPPEH item be discovered during the analog/visual survey on rock or coral bottoms as much detail will be gathered at that time without touching the munition or the habitat that surrounds the item.
- Should an anomaly be investigated and it is determined to be non-munition related debris, the item will be brought to the surface for proper disposal in a local landfill. The item to be recovered must be of size and nature that it can be easily brought to the surface by a diver. If the item has become part of the CH it will not be removed and will remain in place.

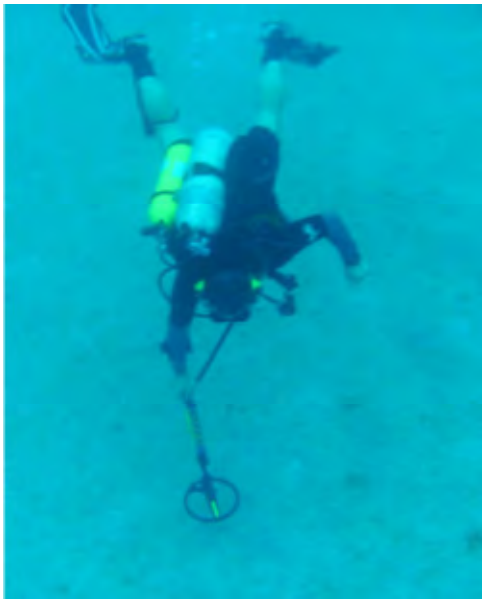

Figure 2-3: UXO SCUBA Diver using a Minelab Excalibur

2.1.2.2 Underwater Intrusive Investigations

Phase 3 consists of conducting underwater intrusive investigations of selected anomalies located along the transects that were mapped as part of Phase 2. Parsons anticipates utilizing UXO SCUBA divers to perform intrusive investigations of these anomalies. As investigation of the anomalies will potentially involve handling MEC/MPPEH items, all precautions will be taken to ensure safe operations will be executed. For the purposes of the RI, all anomalies will be treated as MEC until determined to be Material Documented as Safe (MDAS) or non-munition debris.

Prior to the intrusive investigations effort, a qualified marine scientist will provide training on Appendix K, "***Final Supplemental SOPs for Endangered Species Conservation and their Critical Habitat with Addendum 1 (CESAJ, February 2015)***", to educate the field team on the protective actions and avoidance measures applicable to the project. Following the initial training the marine scientist will reinforce the guidelines within the SOP during the daily tailgate safety brief.

Selected DGM transect targets within high density areas will be investigated by the UXO SCUBA divers. The intrusive investigation will determine if the high density area is MEC related. If the high density area is determined to contain MEC transect segments for additional intrusive investigation will be added at half the distance between the planned DGM transects and on either side of the high density area. Additional transects radiating out from the high density area may also be required to further determine the extent of the high density area. The additional transect segments and radial transects will be executed by analog and dig.

To mark a MEC item to be investigated, or an anomaly selected to be excavated, use the following steps as a guide:

- Marking the position of a known MEC item that is on the surface of the seafloor.
  - Trimble Pro-XRT DGPS antenna is to be mounted over the gunnel of either the port or starboard side of the vessel.
  - As the vessel approaches the known GPS coordinate, it maintains its heading while maintaining a speed which is fast enough to maintain the bearing but slow enough to limit errors when the clump is lowered into the water.
  - The navigator, who is watching the monitor, will tell the helmsman to correct headings as needed during the approach. The gunnel which has the Pro-XRT DGPS antenna mounted should pass directly over the MEC item and the navigator will instruct the UXOT assigned to lower the clump and buoy. This will be done as quickly as possible. If the area is known to be sand or grass the clump may consist of a mushroom anchor and 8 inch buoy (approx. size). If the area is known to have corals that are not on the List of Threatened or Endangered Species then soft diver weights with a peanut buoy attached will be used. If the Phase 1 survey results indicates Listed Species of Coral are present in the area to be marked, an untended snorkeler with a waterproof GPS such as the Garmin GPS map 76cx or similar will snorkel over the EM MEC item and will lower the soft diver weight to the bottom as close to the mark as possible while avoiding corals and MEC.
  - When the UXO SCUBA divers enter the water, a larger clump with buoy may be taken down to replace the peanut buoy, if used, providing a more substantial mark. The divers will place the clump as close to the MEC as possible without impacting the MEC or corals.
- Marking the position of an anomaly selected to be excavated, use the following steps as a guide:
  - Trimble Pro-XRT DGPS antenna is to be mounted over the gunnel of either the port or starboard side of the vessel.
  - As the vessel approaches the known GPS coordinate, it maintains its heading while maintaining a speed which is fast enough to maintain the bearing but slow enough to limit errors when the clump is lowered into the water.

- The navigator who is watching the monitor will tell the helmsman to correct headings as needed during the approach. The gunnel which has the Pro-XRT DGPS antenna mounted should pass directly over the anomaly and the navigator will instruct the UXOT assigned to drop the clump and buoy. This will be done as quickly as possible. If the area is known to be sand or grass the clump will consist of a mushroom anchor and 8 inch buoy (approx. size). If the area is known to have corals that are not on the List of Threatened or Endangered Species then soft diver weights with a peanut buoy attached will be used. If the Phase 1 survey results (see Appendix B, Figures B-16 and B-17) indicates Listed Species of Coral are present in the area to be marked, an untended snorkeler with a waterproof GPS such as the Garmin GPS map 76cx or similar will snorkel over the EM MEC item and will lower the soft diver weight to the bottom as close to the mark as possible while avoiding corals and MEC.
- When the UXO SCUBA divers enter the water, a larger clump with buoy may be taken down to replace the peanut buoy, if used, providing a more substantial mark. The divers will ensure they don't place the clump on corals.

The EM anomalies within the high density transect segments selected for investigation will be marked by lowering a clump with buoy as close as possible to the transect anomaly GPS coordinates (as described above). The dive boat will use Trimble Pro-XRT DGPS to mark the anomaly but an error of up to 10 ft can be expected due to sea state, winds, currents and the drift of the mark. If the EM anomaly is not located with the 10 ft radius of the clump it will be considered a no find. A no find rate greater than 15% will flag a root cause analysis.

- Underwater man portable EM sensor. This system will be used as an alternate means to investigate DGM anomalies but will not be used on consolidated hardbottoms or areas where it could cause damage to corals or seagrass areas. Reacquisition of an EM anomaly will follow the process of marking the location as described above, UXO SCUBA divers deploying with the man portable EM sensor searching closest to the clump (the clump may have to be temporarily moved so as not to interfere with the EM sensor), and then gradually moving outward until the largest EM anomaly within a 10 foot radius is located. The UXO SCUBA diver will excavate next to the contact until the item is uncovered and identified. If the EM anomaly is MEC, it will be photographed; the surroundings will be filmed, paying particular attention to corals. The DGM anomaly location will be used as the EM anomaly position.
- Underwater White or suitable substitute. The analog metal detectors if the primary means for investigating DGM anomalies during Phase 3. To mark the EM anomaly from the vessel, the steps provided for marking a GPS coordinate in coral and rock bottom types will be used. No excavation will take place in rock and coral. If the EM anomaly is on the surface of the coral and rock it will be investigated. If the EM anomaly is MEC it will be photographed, the surroundings will be filmed paying particular attention to corals, the DGM anomaly location will be used as the EM anomaly position. If the EM anomaly is determined to be subsurface (underneath coral or rock) it is to be recorded as such. The full 10 foot radius will be investigated with the Analog instrument.
- Post-intrusive DGM review. Post intrusive DGM review will be performed as an operational check. The Site or Project Geophysicist will review the intrusive results reported for each selected anomaly. If, in their judgment, the reported object (size, weight, burial depth, quantity) agrees with the DGM signature, then a "pass" for the intrusive results will be recorded. If they believe that the reported object does not meet the DGM signature, the Geophysicist will flag the target for re-investigation by the intrusive team. The Site Geophysicist will review all reported No Finds. A No Find rate greater than 15% in an MRS will flag a root cause analysis and Client notification.

Intrusive investigation in seagrass areas will follow the procedures identified in Appendix K (***Final Supplemental SOPs for Endangered Species Conservation and their Critical Habitat with Addendum 1 (CESAJ, February 2015)*** – See Section 4.3).

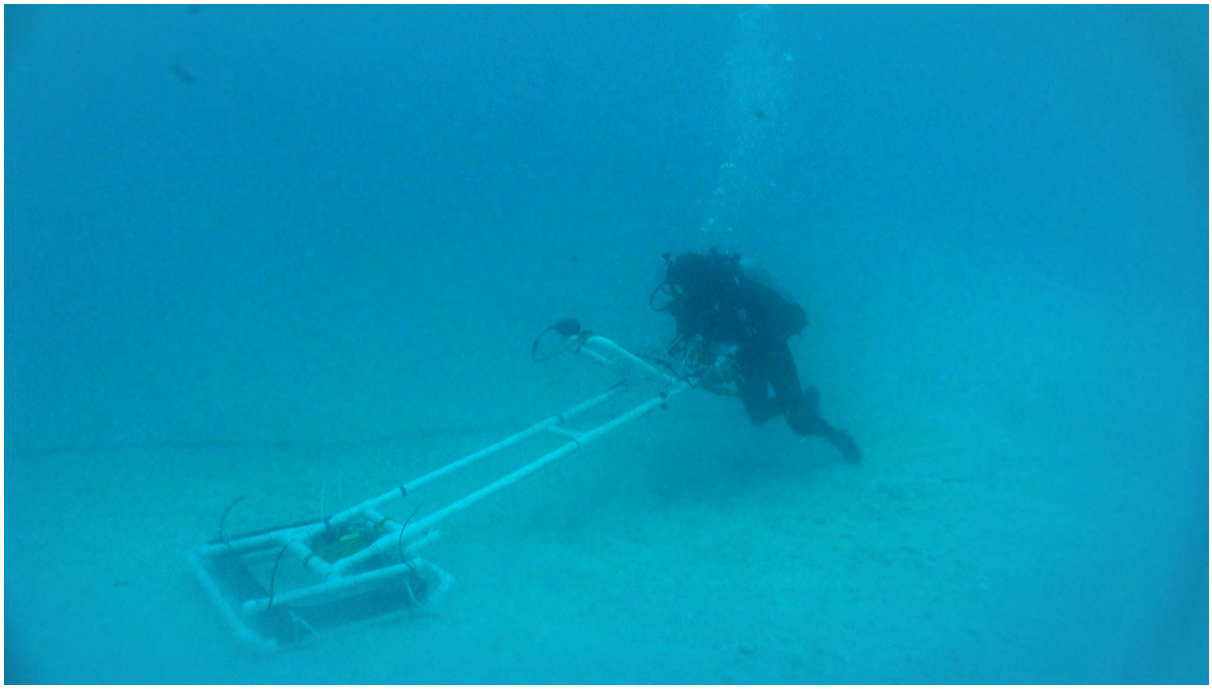

Figure 2-4: Diver Deployed EM System

2.1.2.3 Reacquire and Investigation of Suspected MPPEH items from Phase 1.

Suspected MPPEH items that were captured on video during Phase 1 will be reacquired by using the Trimble Pro-XRT DGPS to get the vessel as close to the recorded positions. Boat motion, current and wave action will limit the accuracy of the reacquisition. The Phase 1 camera GPS location or the Phase 2 DGM anomaly location will be recorded as the MPPEH/MEC position. UXO SCUBA divers will search immediately around the clump and continue their search outward until the suspect MPPEH has been located. If it is not located within 10 ft of the clump, the suspect MPPEH will be marked a second time using a new clump, leaving the original clump in place as a reference. Once the suspect MPPEH has been located, the UXO SCUBA divers will investigate and document the location, type and position of the MPPEH item. If it is determined to be MPPEH/MEC, a risk analysis will be performed. If the item is MD, it will be removed. If the anomaly is deemed MPPEH or MEC and unacceptable to move, it will be marked by a clump to assist in the reacquisition during the disposal phase of work. If the item cannot be located or identified as the Phase 1 anomaly it will be noted.

2.1.2.4 Inspection Class ROV Operations (No diver support required)

An inspection class ROV, separate from the EM ROV platform, may be used for a collection of optional underwater tasks, depending upon the situation, site conditions, and on-site determinations made by Parsons field managers. Situations where the ROV may be used to supplement underwater operations include, but are not limited to, the following:

- Visual investigations
- Visual surveys
- Quality Control (QC) and safety observations
- Post MEC/MPPEH explosive disposal verifications

As applicable, a peanut buoy (small buoy with small lead weight) will be laid at the anomaly GPS coordinate or general location to be investigated. The ROV Investigation Team will then dive the ROV on the anomaly/location, providing video of the targeted anomaly and the surrounding marine habitat. The ROV has a tethered range of 550-ft, and possesses a forward looking sonar and video. Data is captured via a computer located on the surface. The ROV also possesses real time GPS navigation with corrected position fixes through the GPS antennas located on the unit's tether (see Figure 2-5).

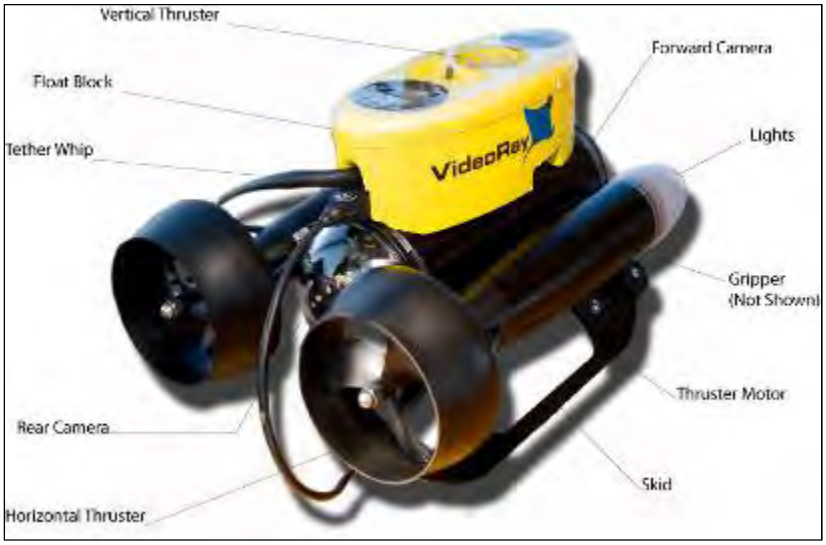

Figure 2-5: Video Ray

2.1.2.4.1 Risk Analysis

A risk analysis will be developed for each MEC/MPPEH. The risk analysis will take into account human health and safety, Natural Resources as described within the Appendix K: "***Final Supplemental SOPs for Endangered Species Conservation and their Critical Habitat with Addendum 1 (CESAJ, February 2015)***". The analysis will also provide recommendations and options for the removal and disposal of the munition. In relation to any encountered MEC/MPPEH item, no actions will be completed to remove, explosively dispose of, or leave in place (if leave in place, the risk analysis will recommend with or without cement encapsulation and will provide justification) without USACE notification and concurrence. MEC will only be moved or disposed of during the last phase of the project.

2.1.2.4.2 Underwater Explosive Disposal Operations

Should underwater explosive disposal operations be required to address MEC/MPPEH, the requirements are set forth within the Phase 3 Work Plan Section 3 and the ESP.

2.1.2.5 Environmental Sampling

As part of the underwater investigation of the Culebra Island RI activities, marine sediment samples will be collected from the coastal waters and marine inlets to evaluate the presence of Munitions Constituents (MC) resulting from Department of Defense (DoD) activities. The location and number of the samples collected will be determined by MEC/MD findings during intrusive operations. Refer to The Phase 3 Work Plan Appendix E Sampling and Analysis Plan for additional information.

- A marine sediment sample will be collected by a UXO SCUBA diver each time a new munition type is found (i.e., 4.2-inch mortar, 5-inch projectile, BDU-33 practice bomb, etc.). For additional

underwater findings of an already sampled munition type, samples will be collected at a rate of 10%.

- Samples will be collected beneath the munition if the item has been determined that it is acceptable to move, otherwise, the sample will be collected adjacent to the munition. It is anticipated that any MC exceedances encountered will be highly localized. Therefore, each sample collected will have a companion step out sample collected at a distance of 4-feet from the initial sample.
- Sediment samples will be collected from a depth interval of 0 to 6 inches in areas where sufficient media is present. The amount of sufficient media is anticipated to be in areas with one inch or more of sediment.
- Samples will only be collected in unconsolidated sediments. If only coral, rocks, or bedrock are present, no samples will be collected. All efforts will be made not to harm or harass species located directly adjacent to sample locations.
- QA/QC samples consisting of Field Duplicates, QA Splits, MS/MSD, Equipment Blanks and Temperature Blanks will be collected at the frequency stipulated in Table E-1 of the FSP, Appendix E.1. When using the hand auger (with disposable sleeve), one equipment blank will be collected per MRS.

Two sampling procedures are planned and will be chosen based on the strength of current/wave action at the sample collection area. If the current/wave action at the sample location is non-existent to mild (i.e. in inlets and at depths deeper than influence of wave action), and results in minimal dissipation of particles, samples will be collected with a disposable plastic hand trowel and placed in a zip-loc bag for transport to the surface. If the current/wave action is strong enough to significantly dissipate particles upon collection, a hand auger with a plastic sleeve will be used to collect samples.

2.1.2.6 Diving Platform

Caribbean Marine Services (CMS), as a subcontractor to USA, will provide the boat services for SCUBA and Snorkeling Operations. The vessel “Soluzion” is a US Coast Guard (USCG) Inspected 29-ft long small boat with a beam of 9 ft (see Figure 2-5). Alternate vessels to “Soluzion” may be used should it be required. The replacement vessel will be able to meet similar capabilities as the primary vessel. This vessel will be used for all SCUBA and Snorkeling tasks. CMS also will provide a 17-ft (see Figure 2.5) and a 22-ft work boat in supporting roles, to shuttle equipment or provide perimeter security. A USCG Captain will be operating the Snorkel and SCUBA Dive vessel at all times.

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Figure 2-5: Vessels to be used in Support of the RI Fieldwork

During SCUBA and snorkeling operations the support/safety vessel will remain in proximity to the SCUBA divers or snorkelers, with the distance dependent on the conditions of the site.

The support/safety vessel will be ready to respond to any emergency.

The support/safety vessel will also display a standard red/white dive flag to indicate the presence of personnel in the water performing SCUBA diving or snorkeling.

The support/safety vessel will be equipped with all USCG required equipment for the size of the vessel. Very High Frequency (VHF) radios will be in good working condition. The vessel will also have a throw bag and/or ring buoy attached to at least 70 ft of line, and will be capable of performing a rescue of

SCUBA divers or snorkeler in an emergency situation. The vessel, or the support work boats, will also be used to warn other vessels that approach the site of the presence of SCUBA divers or snorkelers, and direct them away from the site.

2.2 PROJECT AND FIELD MANAGEMENT

The Parsons Management Team will provide overall management of field operations, as well as provide corporate oversight of safety and quality control programs, meeting the requirements identified in the Performance Work Statement (PWS).

2.2.1 PROJECT MANAGER

The Project Manager will provide administrative management for all Parsons employees, vendors and tiered subcontractors. The Project Manager will also generate and submit operational, personnel, and performance reports to the Parsons Corporate Office. In performing the underwater operations management function, this individual reports directly to the Parsons Program Manager.

2.2.2 SITE MANAGER/SENIOR UXO SUPERVISOR

The Site Manager (Phase 2) or Senior UXO Supervisor (SUXOS) (Phase 3) will supervise all field activities while on the work site. The Site Manager and SUXOS will ensure conformance to the RI/FS Work Plan and all of the associated plans. For Phase 3 (Intrusive Investigation), the SUXOS will be SCUBA Dive Qualified. The Site Manager and SUXOS will report administratively and operationally to the Project Manager.

2.2.3 DIVING SUPERVISOR

The Project Manager will designate the Diving Supervisor in writing. The Diving Supervisor is a USA employee. During diving operations, the Diving Supervisor will have the operational authority and responsibility to conduct the dive operations per the RI/FS Work Plan, Dive Operations Plan, and USA Dive Safe Practices Manual. The Diving Supervisor will report administratively and operationally to the SUXOS.

2.2.4 UXO SAFETY OFFICER (UXOSO)

Phase 2 and 3 RI field work will utilize a UXOSO and a UXO Quality Control Specialist (UXOQCS) as a combined position UXOQCS/UXOSO. The UXO QCS/UXOSO is a Parsons employee. This section defines the UXOQCS/UXOSO duties as the UXOSO. The UXOSO has responsibility for enforcement of the overall safety aspects of the Remedial Investigation field work. The UXOSO will provide daily safety briefs and conduct safety audits of all activities in the Diving Phase of the Project. The UXOSO will be responsible to the Parsons Director of Safety for all safety related issues. The UXOSO will have stop work authority in any matter related to the safety of personnel and equipment involved with the project. Specific duties will include:

- Daily Safety Brief,
- Daily Safety Inspections,
- Weekly Safety Audit,
- Conducting initial site safety orientation training,
- Periodic safety training on relevant safety subjects,
- Completing appropriate Accident Investigation and Accident/Incident Reports, as required
- Acting in an advisory capacity with the Project Manager on safety related issues
- Working directly with the Dive Supervisor and SUXOS to ensure safe completion of operational tasks.

2.2.5 TECHNICAL DIVING TECHNICIANS

Technical diving technicians are divers such as biologist, technical specialists and diving personnel that are required to participate in diving operations but are not exposed to the risks of DGM Intrusive Investigations. Technical diving technicians will not be part of a UXO diving team when the divers will be handling or may come into contact with MEC. Technical diving technicians will be accompanied by a UXO Diving Technician and will be attached to the UXO Diving Technician with a buddy line. The Technical Diving Technicians will be certified in SCUBA by one of the following:

- Professional Association of Diving Instructors (PADI)
- National Association of Underwater Instructors (NAUI)
- U.S. Navy Diving and Salvage Training Center
- U.S. Forest Service Snorkel Safety Program.
- Other nationally accepted diving training program (acceptance will be determined by the DDC).

2.2.6 UXO DIVING TECHNICIANS

USA UXO divers will be qualified and designated, in writing. They will be current in diving qualifications, periodicity, and have current diving medical certification. All USA UXO Diving Supervisors, UXO Diver Technicians, and Tenders will be certified in SCUBA by one of the following agencies:

- A commercial diving School
- A military School
- A Federal School (e.g., USACE)
- An Association of Commercial Diving Educators (ACDE)-accredited school.

Each dive team member will have the experience or training necessary to perform assigned tasks in a safe and healthful manner.

Each dive team member will have experience or training in the following:

- A graduate of U.S. Naval Explosive Ordnance Disposal (EOD) School, if engaged in munitions response diving operations;
- The use of tools, equipment and systems relevant to assigned tasks;
- Techniques of the assigned diving mode, diving operations and emergency procedures.
- All dive team members will be trained in cardiopulmonary resuscitation and first aid (American Red Cross or equivalent).

Parsons/USA will not require a dive team member to be exposed to hyperbaric conditions against the employee's will, except when necessary to complete decompression or treatment procedures.

2.2.6.1 Standby Diver

A standby diver is required for all SCUBA diving operations. The standby diver will be equipped with the same equipment as the primary diver. The Diving Supervisor may act as the standby diver tender.

2.2.6.1.1 Standby Diver Qualifications

The standby diver will be a fully qualified diver, assigned for back-up or to provide emergency assistance, and will be ready to enter the water immediately. A standby SCUBA diver will don all equipment and be checked by the Diving Supervisor. The standby diver may then remove the mask and fins and have them ready to don immediately for quick deployment. At the discretion of the Diving Supervisor, the standby diver may also remove the SCUBA tank. The standby diver will receive the same briefings and

instructions as the working diver, will monitor the progress of the dive, and will be fully prepared to respond if called upon for assistance.

2.2.6.2 Buddy Diver

A buddy diver is the diver's partner for a SCUBA diving operation. The buddy divers are jointly responsible for the assigned mission. Each diver will track of depth and time during the dive. Each diver will watch out for the safety and well-being of his buddy and will be alert for symptoms of diving illness. A diver will keep his buddy within sight and not leave his buddy alone except to obtain additional assistance in an emergency. If visibility is limited, a buddy line will be used to maintain contact and communication. If SCUBA divers get separated and cannot locate each other, both divers will surface immediately.

2.2.6.3 Diver Tender

The tender is the surface member of the diving team who works closely with the diver on the bottom. At the start of a dive, the tender will check the diver's equipment and air supply for proper operation and will dress the diver. Once the diver is in the water, the tender will constantly tend the lines (as applicable) to eliminate excess slack or tension. The tender will exchange line-pull signals with the diver, will keep the Diving Supervisor informed of the line-pull signals and amount of tending line over the side, and will remain alert for any signs of an emergency.

2.2.6.3.1 Diver Tender Qualifications

The tender should be a qualified diver. When circumstances require the use of a non-diver as a tender, the Diving Supervisor will ensure that the tender has been thoroughly instructed in the required duties. If a substitute tender is to be employed during an operation, the Diving Supervisor must make certain that the substitute is adequately briefed before assuming duties.

2.2.7 SNORKELERS

All UXO technicians, marine biologists, and other personnel functioning as survey snorkelers will be qualified as open water divers by a nationally recognized organization, such as one of the following:

- Professional Association of Diving Instructors (PADI)
- National Association of Underwater Instructors (NAUI)
- U.S. Navy Diving and Salvage Training Center
- U.S. Forest Service Snorkel Safety Program.

The USA Snorkeling Supervisor (SS) will maintain personnel files on each snorkeler, to include copies of qualifications, training records, and certificates of qualifications that support the individual's placement and position. Prior to initial assignment or any change in duties/assignment, the SS will review the individual's qualifications, training records, and certificates to ensure that the individual is qualified to perform required tasks.

2.2.8 FIELD TEAM COMPOSITION

Underwater RI Field Teams will consist of the following personnel:

- Phase 2: IVS Install
  - Site Manager
  - Dive Supervisor: UXO Diving Qualified Technician III (Dive Supervisor/recorder)
  - UXO Diving Qualitied QCS/SO
  - UXO Diving Qualified Technician II/III (Standby Diver)

  - Small Boat Coxswain
  - Team Biologist
  - Site Geophysicist (on site)
  - UXO Diving Qualified Technician II/III (two divers)
- Phase 2: Underwater Geophysical Survey
  - EM Float
    - UXOQCS/UXOSO
    - (2-3) EM ROV or EM Sled or EM Cart Operators
    - Small Boat Coxswain/s
    - Team Biologist
    - Site Geophysicist
    - Site Manager or SUXOS (Not required to be on the vessel)
    - Snorkelers (UXO Technicians are not required) trained in the use of the EM 61 Float system to guide the EM Float ***(two Snorkelers) (one snorkeler may be the UXOQCS/SO as long as snorkeler certification requirements are met)***
- Phase 3: Visual and Analog Instrument aided transect Survey with intrusive investigation (to be used when EM options are not suitable due to site conditions)
  - SUXOS
  - Dive Supervisor (Dive Supervisor/recorder)
  - UXO Diving Qualified QCS/SO
  - UXO Diving Qualified Technician II/III (Standby Diver)
  - Small Boat Coxswain/s
  - UXO Diving Qualified Technician II/III (two divers, one tender)
- Phase 3: Reacquire and Intrusive Investigation Phase
  - ROV Visual Investigation
    - UXOQCS/SO
    - UXO Technician II/III (ROV Operator)
    - UXO Technician II/III (ROV Tender)
    - Small Boat Coxswain/s
    - SUXOS manages all field operations and is not required to be on the vessel but will maintain direct communication
  - SCUBA Intrusive Investigation Team
    - SUXOS
    - Dive Supervisor (Dive Supervisor/recorder)
    - UXO Diving Qualified QCS/SO
    - UXO Diving Qualified Technician II/III (Standby Diver)
    - Small Boat Coxswain/s
    - UXO Diving Qualified Technician II/III (two divers, one tender)
  - SCUBA Biota Survey Team
    - SUXOS
    - Dive Supervisor (Dive Supervisor/recorder)
    - UXO Diving Qualified QCS/SO

- Marine Scientist Dive Qualified
- UXO Diving Qualified Technician II/III (Standby Diver)
- Small Boat Coxswain/s
- UXO Diving Qualified Technician II/III (two divers, one tender)

– Snorkeling Operations
- SUXOS
- UXOQCS/UXOSO
- Snorkelers (two snorkelers)

– Underwater Demolition Team (SCUBA)
- SUXOS
- Dive Supervisor (Dive Supervisor/recorder)
- UXO Diving Qualified QCS/SO
- UXO Diving Qualified Technician II-III (Standby Diver)
- Small Boat Coxswain/s
- UXO Diving Qualified Technician II-III (two divers, one tender)
- Puerto Rico Certified Blaster

2.2.9 ASSIGNED TEAM PERSONNEL

Below, Table 2-1 reflects the related snorkeling positions, and personnel assigned to those positions:

Table 2-1: Assigned Team Personnel

Position	Name 1	Name 2	Name 3	Name 4	Name 5	Name 6
Site Manager	Jae Yun					
Dive Supervisor	Jeff Moleski					
UXOQCS/SO (DV)	Harry Craig					
UXO TECH (DV)	Simeon Edwards	Anthony Perrone	Druso Daubon			
Biologist	Rolando Soler					
Snorkeler	Mark Padover	Jamie Taylor	Harry Craig			
Small Boat Coxswain	Matt Shappell	Mark Padover	James Karwacki	Gene Thomas		

2.3 METHOD OF FIELD OPERATION

2.3.1 SCUBA

Normal working dive limit: 100-fsw. Diving operations must stay within no-decompression limits. Sea state is normally limited in wave height to 4 feet, and current to 1 knot maximum. Current greater than 1 knot requires Operational Risk Management (ORM) analysis. At a minimum, the divers(s) must be tended or have a witness float.

2.3.1.1 SCUBA Divers Equipment

At a minimum, each diver must be equipped with the following items to safely conduct an open-circuit SCUBA dive:

- Independent emergency "bail-out" cylinder with separate regulator and pressure gauge with a minimum 30 cu ft of air
- Face mask
- Buoyancy compensator devise capable of keeping the diver face up, and oral and manual activated inflation device and an exhaust valve
- Weight belt or weight assembly capable of quick release
- Knife
- Swim fins
- Submersible pressure gauge
- Submersible wrist watch
- Depth gauge
- SCUBA cylinder with Octopus regulator
- Protective Clothing. A diver needs some form of protection from cold water, from heat loss during long exposure in water of moderate temperature, and from the hazards posed by marine life and underwater obstacles. Wet suit, dive skins, or other suitable clothing that covers the torso and legs to at least the knees will be worn.
- Each SCUBA diver will wear a safety harness with a positive buckling device, attachment point for a line, and a lifting point to distribute the pull force of the line over the diver's body while maintaining the body in a heads-up vertical position when unconscious or inert.
- A timekeeping device will be used for recording diving times for all SCUBA diving operations. Each dive supervisor and diver will have a timekeeping device. When two-way voice communications are used, the dive supervisor, at a minimum will have a timekeeping device.

SCUBA air cylinders will comply with the following requirements:

- Air cylinders of seamless steel or aluminum that meet United States Department of Transportation (DOT) 3AA and DOT 3AL specifications are approved for used on USACE projects.
- Each cylinder used on USACE projects must have identification symbols stamped into the shoulder of the tank.
- SCUBA tanks used on USACE projects must be visually inspected internally at least annually, and hydrostatically tested at least once every 5 years in accordance with DOT and the United States Coast Guard Administration (CGA) regulations; test dates will be stamped into the shoulder of each tank.

SCUBA cylinders will be refilled as required by a local, recreational dive provider. The USA Dive Supervisor will ensure that the local facility maintains an inspection/sampling certificate for applicable air purity standards (see Attachment 3).

2.3.2 SNORKELING

Snorkeling team will be made up of no less than two persons; snorkeler, and observer/assistant. Additional support personnel may be required based on site hazards and conditions. Snorkeling team plans and procedures will be developed and enacted by the Dive Supervisor who will be qualified and experienced in snorkeling.

Each snorkeler will be equipped with a professional grade diving mask and snorkel. Snorkelers will wear apparel which provides appropriate environmental protection. The apparel must include fins.

Snorkeling will only be done on the surface of the water. No submerging or diving of any kind will be permitted. Untethered, scientific snorkeling, and snorkeling in waters greater than 5-feet deep has been allowed by special request to the DDC for this project (approval documentation is available upon request). Snorkeling during this project will include the following:

- Appropriate AHAs
- The snorkelers must be escorted by a boat. The boat, when in waters deeper than 5 feet, must remain within 50 ft of the snorkelers
- Two snorkelers will work as both observer/assistants to each other and will remain within 50 ft of each other
- Snorkelers must wear a device providing a minimum of 15.5 pounds (7 kg) of positive buoyancy (Type III personnel flotation device (PFD), fully inflated snorkeling vest, etc.).
- A throw device that can reach out to 70 feet is available on the boat for emergencies
- Areas of extreme water velocity and turbulence will be avoided

2.3.3 FIRST AID AND EMERGENCY EQUIPMENT

The following list of equipment is in addition to the USCG required safety and emergency equipment that will be on a vessel:

- First Aid Kit meeting the requirements of Section 3, OSHA 29 CFR
- An O2 resuscitation system capable of delivering oxygen for 30 minutes, or until emergency medical assistance can be administered (UXO Divers must maintain their current O2 Provider certification)
- A Stokes Litter or backboard with floatation capability

2.3.4 ANTICIPATED DAILY ACTIVITIES

Working hours are anticipated to start as early as possible each day. Water work cannot begin prior to 0700 but much of the morning preparation may be completed prior to 0700 if the SUXOS deems necessary. By starting the workday early, it provides the opportunity to get as much of the fieldwork completed prior to the trade winds picking up in the late morning (1030 – 1100 AM). Work hours will usually be 10-hour workdays. Completion of the fieldwork will depend on condition of the weather/ocean, and the work schedule will need to remain flexible.

The SUXOS will have the latitude to change the work schedule to encompass whatever the day's weather will allow, but will stay within USACE regulations for allowable workdays and stand-down periods. The SUXOS will be expected to take advantage of all weather related opportunities. In some cases working on the leeward side of the work sites may be the only opportunity to complete tasks. The SUXOS will reserve the leeward side of the work sites for days when the windward side is unsafe to work due to weather conditions.

Daily activities should include:

- Conduct pre-operations notifications. This includes: USACE, Puerto Rico Medical Center, St Thomas Hyperbaric Chamber, Culebra Police Department, USCG and FAA (contact for demolition coordination). Phone numbers are located in Section 3: "The Emergency Management Plan".
- Arrival at boat pier or ramp (depending on the operations being conducted)
- Check out boat condition, required USCG safety equipment, fuel, battery, etc.
- Inspect equipment to be used for the day's evolutions and equipment load out

- Ensure all personnel are present prior to departure (Geophysics/ROV/SCUBA Operations etc.)
- Daily Tailgate Safety Brief by UXOSO
- Pre-Dive Brief by Dive Supervisor (SCUBA Only)
- Refresher from Team Biologist on natural resource concerns for the projected work sites
- Personnel assignments
- If applicable, proceed to the IVS and perform checks
- Depart for work site
- Conduct any scheduled safety exercises (MOB, Fire on Board, Injured diver etc.)
- Perform work/tasks
- Dive Supervisor completes dive records or daily work logs
- Return to launch site (Side Scan Sonar/ROV/SCUBA Operations only)
- Clean/stow equipment, refuel as necessary
- Debrief daily activity, preview next day's activities.

2.3.5 WATER CONDITIONS

Anticipated water surface and subsurface conditions consist of the following:

- Water temperature ranges from 78 °F to 81 °F in winter months to 82 °F to 84 °F in summer months
- Tides range from 0.5 to 2 ft
- Underwater visibility from 15 to 60 ft
- Currents - see description below
- Surface conditions - see description below.

Given the varying geographic locations of the waterborne areas of each MRS, current and surface wave conditions will fluctuate.

The prevailing winds emanating from the east-northeast typically result in windward sites having more robust wave action than those on the leeward side of Culebra. The diving depths for the established transects do not exceed 100-feet of seawater (fsw) per nautical charts. The largest percentage of the diving will be conducted in waters 50-fsw and less.

The majority of the intended dive sites experience minimal current. Tidal currents of less than 1-knot can be expected on both MRS. It is anticipated that current speeds within the channels that separate the main landmass of Culebra from the neighboring island will increase during mean low and mean high tide tidal flows.

2.3.6 SENSITIVE MARINE HABITAT

Each dive site may contain sensitive underwater elements, consisting of corals, sea grasses, and a collection of fish, turtles, and other species. Table 2-2 lists the Culebra Marine Natural Resource Concerns.

Table 2-2: Culebra Marine Natural Resource Concerns

Listed Threatened or Endangered Species	
Loggerhead Sea Turtle (***Caretta caretta***)	Lamarck's Sheet Coral (***Agaricia lamarcki***)
Green Sea Turtle (***Chelonia mydas***)	Boulder Star Coral (***Montastraea annularis***)
Leatherback Sea Turtle (***Dermochelys coriacea***)	Mountain Star Coral (***Montastraea faveolata***)
Hawksbill Sea Turtle (***Eretmochelys imbricata***)	***Montastraea franksi***

Antillean Manatee (***Trichechus manatus***)	Pillar Coral (***Dendrogyra cylindrus***)
Humpback Whale (***Megaptera novaeangliae***)	Elliptical Star Coral or Pineapple Coral (***Dichocoenia stokesii***)
Fin or Finback Whale (***Balaenoptera physalus***)	Rough Cactus Coral (***Mycetophyllia ferox***)
Sei Whale (***Balaenoptera borealis***)	Bonefish ***(Albula spp.)***
Sperm Whale (***Physeter macrocephalus***)	Dusky Shark (***Carcharhinus obscurus***)
Blue Whale (***Balaenoptera musculus***)	
Elkhorn Coral (***Acropora palmata***)	
Staghorn Coral (***Acropora cervicornis***)	
Nassau Grouper (***Epinephelus striatus***)	
Goliath grouper (***Epinephelus itajara***)	
Sea horses (***Hippocampus spp***.)	

Section 6 of the RI/FS Work Plan, along with Appendix K, "***Final Supplemental SOPs for Endangered Species Conservation and their Critical Habitat with Addendum 1 (CESAJ, February 2015)***", discusses the concerns, guidance, and methods for conducting underwater operations around sensitive habitat, and avoidance procedures for Listed Threatened or Endangered Species. If the field team determines the procedures identified in the Work Plan or Appendix K, ***"Final Supplemental SOPs for Endangered Species Conservation and their Critical Habitat with Addendum 1 (CESAJ, February 2015)*** may not provide adequate protection for those species identified in Table 2-2, the field team will contact the PM and the PM will inform the USACE of the field team's concerns. The USACE will coordinate with the Regulator and Stakeholders to identify solutions.

2.3.7 FIELD SCHEDULE

The field schedule is provided for review and planning purposes. The dates are approximate and may shift depending on the review periods of the work plans, additional needs for coordination with Stakeholders or Regulators, weather, or other unplanned impacts to the schedule. Table 2-3 provides the field schedule for both Phase 2 and 3 fieldwork.

Table 2-3: Field Schedule

Mobilization Phase II DGM Team	TBD
U/W EM Survey	TBD
U/W EM Survey Demobilization	TBD
Mobilization Phase III Intrusive Investigation DDC Mobilization	TBD
U/W Intrusive Investigation/ MC Sampling	TBD
Demobilization	TBD

3.0 EMERGENCY MANAGEMENT PLAN

As required in Section 30.A.19 of EM 385-1-1 (Safety and Health Requirements Manual), the Emergency Management Plan (EMP) specific to the Culebra RI/FS MRS 02 and 07 project site is provided as follows:

3.1 LOCATION AND PHONE NUMBERS FOR THE NEAREST RECOMPRESSION CHAMBERS

Table 3-1: Contact Information for Recompression Chambers located in Puerto Rico

Primary Chamber	Alternate Chamber
Puerto Rico Medical Center Centro Medico San Juan, PR Puerto Rico Medical Center PO Box 2129 787-777-3535/3827 (phone) ext.: 6476/6475/6068 787-777-3702 (fax) hiperbarica@asempr.org Director: Juan Angel Nazario, M.D 24hr Phone: 787 390-3243 Chamber #: 787 777-3535 x6475 or 6481 Office #: 787 777.3700	Schneider Regional Medical Center, 9048 Sugar Estate St Thomas, Virgin Islands 00802 340-776-8311

3.1.1 EMERGENCY CONTACT INFORMATION

Table 3-2: Contact Information for the US Coast Guard Rescue Coordination Center (RCC)

U.S. Coast Guard RCC (*24 hour Regional Contacts for Emergencies)*			
RSC San Juan (Sub-Center of RCC Miami)	Commander Sector San Juan San Juan, Puerto Rico	Southeast portion of the Caribbean Sea	(787)289-2042/2041 VHF Channel 16

Table 3-3: Emergency Telephone Numbers

Emergency Telephone Number	911
Culebra Police	787-742-3501
Culebra Hospital and Local Ambulance	787-742-3511/0001
Divers Alert Network (DAN) telephone number*	919-684-9111
DAN Medical Information Line	919-684-2948
*DAN's Emergency Hotline staff members are on call 24 hours a day, 365 days a year, to provide information, assist with care coordination and evacuation assistance.	
Key Project Personnel:	
Roland Belew (PM - USACESCH)	256-895-9525
Thomas Freeman (PM – USACE, SAJ)	904-232-1040
Kelly Enriquez (Project Geo – USAESCH)	256-895-1373
Teresa Carpenter (Technical Manager - USAESCH)	256-895-1659
Wilberto Cubero (PM and Environmental Scientist – USACE, SAJ)	904-232-2750
Patti Berry (PM-Parsons)	678-969-2410/404-673-9158
TBD (UXOSO – Parsons)	
Thomas Bourque (PM – USA Environmental)	941-746-5375/808-255-2320

3.1.2 DIRECTIONS TO CULEBRA HOSPITAL

A local medical facility and ambulance service is available on the island of Culebra, and is capable of treating urgent medical issues. Directions to the local medical facility on Culebra:

- Located near the island ferry landing, at the end of C. William Font street
- C. William Font Street extends up the hill, past the collection of local government buildings
- The medical building is identified by a Red Cross symbol, and is marked by a “Recetas” (prescriptions) sign

Figure 3-1 indicates the location of the Culebra Hospital:

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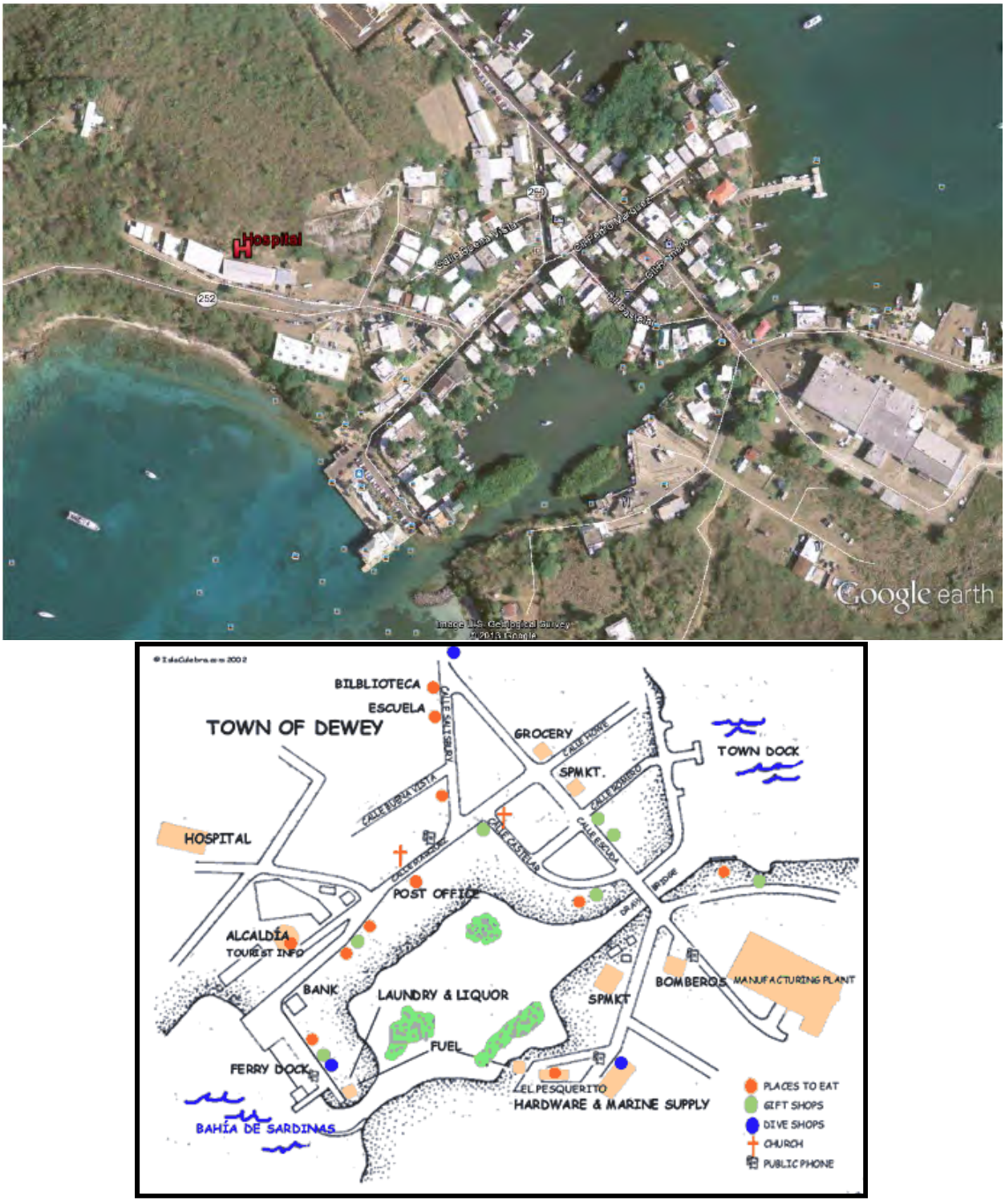

Figure 3-1: Directions to Culebra Hospital

Any injury will first be addressed on-site by First Aid/cardiopulmonary resuscitation (CPR) qualified personnel. As required, injured divers who cannot perform physical functions will be extracted from the water unto land and/or the dive platform by the safest means possible. This procedure may range from placement of the injured diver onto a floating backboard, or hand lifting the diver from the water.

Once recovered, the DS will direct the commencement of immediate medical treatment, and assign specific tasks to individual team members as applicable.

The DS will work with local emergency support units to ensure the fastest care at the closest medical facility for all injuries.

3.1.3 EMERGENCY COMMUNICATIONS:

The following emergency communication procedures will be used for the Culebra RI/FS MRS 02 and 07.

- Prior to the commencement of each workday when snorkeling operations are planned, the UXOSO will ensure that communication element (phone and VHF radio) are functioning, in order to contact local agencies required to support an emergency medical situation.
- The dive boat and support boats will be equipped with cellular telephones and VHF Radios. Cellular telephone service is available at the project site, however, if there is a failure in this means of communication, the VHF radio will be used to contact support personnel on the shore who will then notify emergency first responders.

3.1.4 EMERGENCY PROCEDURES

The Dive Supervisor will responsible for coordinating all SCUBA diving related injuries and will make assignments for the dive team and crew to provide assistance. The vessel will be under the control of the Captain and the vessel's Captain is ultimately responsible for the welfare and safety of all personnel and the vessel. During a diving related injury there will be a clear separation of authorities: The Dive Supervisor will be responsible for the injured diver/snorkeler and the Captain of the Vessel will be responsible for ensuring the injured diver or snorkeler is expedited safely to the nearest harbor for transport via medivac or ambulance. The Dive Supervisor and the vessel's Captain will coordinate their roles prior to field operations beginning.

The following subsections reflect immediate actions relating to injuries and hazardous events.

3.1.4.1 Injured SCUBA Diver or Snorkeler Actions

The support/safety vessel will be available during all diving and snorkeling operations in order to quickly respond to any emergencies. If an injured diver/snorkeler is capable of climbing onto the support/safety vessel, the individual will do so and be taken to a shore-based location where emergency response personnel will be summoned. If an injured diver/snorkeler is not capable of climbing onto the support/safety vessel, the diver/snorkeler will be placed on a floating spine board and the crew will pull the diver/snorkeler onto the vessel or the diver/snorkeler may be lifted without the backboard into the vessel if no further injury will occur.

3.1.4.2 Unconscious Diver/Snorkeler

- In the event of an unconscious diver/snorkeler the boat will immediately be notified by the swim partner by waving his/her hands over his/her head when on the surface.
- The swim partner will provide an immediate assessment of the condition of the diver/snorkeler while moving the unconscious diver/snorkeler into deeper water for boat pick up.
- If conditions allow, the second diver/snorkeler will provide rescue breathing or apply direct pressure on wounds while waiting for the boat vessel to complete its approach. At a minimum, the second diver/snorkeler will ensure the unconscious diver/snorkeler's head remains out of the water at all times.

- Upon arrival of the boat, a line will be secured around the unconscious diver/snorkeler to ensure the victim does not float away from the vessel. The vessel will be shut down while the unconscious diver/snorkeler is brought next to the vessel. The vessel Captain needs to ensure enough seaway as the vessel will be adrift.
- The second diver/snorkeler will assist putting the unconscious diver/snorkeler on the spine board if needed. If the unconscious diver/snorkeler can be pulled aboard the vessel without the use of the spine board, and without further injury, then the spine board will not be required.
- Once the unconscious diver/snorkeler is on the vessel initial first aid/stabilization will take place and emergency first responder agencies will be notified. The boat will immediately head to the closest harbor for ambulance pick up or medivac. In all cases first aid/stabilization procedures will be provided and will continue until emergency response personnel arrive.

3.1.4.2.1 Injured and Unconscious Diver/Snorkeler Drills

On the first day of diving or snorkel operations the team will perform the deployment and recovery of SCUBA divers or snorkelers. Proper deployment (using the dive ladder at all times for boarding or entering the water) will be demonstrated and the Vessels Captain will rehearse picking up the snorkelers in the safest manner for the vessel used. Engines must be in idle and shut down prior to divers/snorkelers making their final approach to the vessel. In most cases it is always a best practice for the captain to place the boat just upwind/up-current of the snorkelers to allow the vessel to drift down onto the snorkelers.

- Recovery procedures will be rehearsed in a safe environment (bay or protected area with no sea state) prior to field operations being conducted. The recovery training scenarios will be the recovery of an injured diver/snorkeler and the recovery of an unconscious diver/snorkeler. The rehearsals will continue until a safe means is perfected for completing each scenario. Approval that a suitable solution for recovery has been attained and well-rehearsed resides with the DDC, or the UXOSO in the case of the snorkeler rehearsals. Rehearsals will be witnessed by the UXOSO and the UXOSO will log the training events.
- Refresher training on the diver/snorkeler recovery operations will be conducted as stated above on the first day of each week in which diving or snorkeling is to be conducted.
- The SCUBA drills will be witnessed by the DDC during the SCUBA training phase, and once the SCUBA Dive Team is cleared for operations, the drills will be witnessed by the UXOSO, The snorkeler drills will be witnessed by the UXOSO

3.1.4.3 Injuries Requiring Recompression Treatment

In the event a diver suffers an injury requiring recompression treatment, the injured diver may require marine or air transport to the Hyperbaric Chamber located at the ***Puerto Rico Medical Center*** (see Figure 3-2)

For these cases where air transport is required, the USA Dive Supervisor will complete the following procedures:

- Immediately place the individual on Emergency Oxygen supply.
- Contact USCG RCC via VHF Channel 16, or the numbers listed within the table, to request support and explain the diving emergency.
- Ensure the first responder is notified of the diver-related injury and the need for additional emergency oxygen.
- Transport the injured diver to the designated extraction point, and notify the response unit of this location (name of site or latitude/longitude coordinates).
- Maintain a record of the injured diver's time/depth profile, to be provided to the treatment facility.

- Ensure the injured diver is accompanied to the treatment facility by another member of the dive team.
- Direct the helicopter crew to fly at an altitude of 1,000 ft or less if possible to avoid further complications.

Figure 3-2: Recompression Chambers Locations

The requirement to transport divers requiring recompression treatment by aircraft entails unique planning elements. The USA DS will pre-identify an air extraction point that is within close proximity to the dive location, and be prepared to communicate this location to medical response teams as required during response to an injury. The following considerations will apply.

- Extraction point should be an open area, free of overhead power lines that would restrict helicopter maneuverability.
- Dive team will carry a handheld GPS unit in order to capture latitude/longitude coordinates of extraction point.

If initial transport of injured diver to an extraction point is not possible, air extraction by lift basket is possible but should be considered a last resort due to increased risk to the dive team and air crew.

Complete records of the event will be generated, and will include the following:

- Description of work being accomplished/information on possible cause
- Descriptions of signs and symptoms (including depth and time of onset)
- Description and results of treatment
- Name, address, and phone number of attending physician.

3.1.4.4 Discovery of Fire

- On-site personnel will immediately enact firefighting actions
- If the fire is on a vessel supporting diving/snorkeling personnel, the Dive Supervisor will assess if directing the divers/snorkelers to the vessel will place them in danger, or if it is safer for the divers/snorkelers to remain in the water while the vessel's Captain directs firefighting actions
- Once firefighting efforts are complete, all diving/snorkeling operations will be terminated until the proper operations of all associated equipment can be verified, personnel safety is assured, and confirmation is achieved that a re-flash of the fire will not occur.

3.1.4.5 Adverse Weather Conditions

- The vessel's Captain will suspend boat operations in adverse weather conditions if he/she feels the safety of the vessel and crew are at risk. The Dive Supervisor will suspend diving or snorkeling operations if adverse weather conditions could pose a risk to the UXO team. The UXOSO can terminate any field operations if he/she feels conditions are not safe. If the vessel is able to relocate to another work site which will allow for safe operations, or if the vessel can move out of the weather pattern and allow it to pass by without risk to the vessel and crew, then operations will be resumed.
- For lightning conditions, all personnel will exit the water and seek shelter within land-based vehicles/structures. It may be possible if the lightning is far enough away, for the vessel to head to safe harbor outside of a 10-mile radius from the storm, and then move back to operations when the storm passes.
- The UXOSO will determine when weather conditions will safely allow diving/snorkeling operations to re-commence.

3.1.4.6 Internal Safety Inspections

The assigned UXOSO will conduct daily safety inspections of site operations, equipment condition, and personnel adherence to safety standards.

3.1.4.7 Injury/Illness of Boat Crew While Snorkelers are in the Water

Emergencies involving the safety of the vessel and crew are under the authority of the vessel's Captain but at no time should the Captain's actions increase risk or put crew or passengers safety in question. When an injury happens to crew or passengers on the vessel, the emergency assignments to respond to an injured boat crew member resides with the Captain. CPR training will be required for Parsons Personnel and subcontractors that are participating in field operations. The Captain may designate any personnel not inflicted with an injury to provide assistance. The Diving Supervisor will stand in for the vessel's Captain should the Captain be incapacitated. The severity of the injury or illness will be evaluated by the assigned person to provide first aid and the Vessel's Captain will determine to abort operations or not and transit back to the closest safe harbor or to the vessel's home port. Emergency notifications will be made per this document and the Accident Prevention Plan (APP). If divers or snorkelers are in the water they will be recalled back to the vessel. The pickup of the divers/snorkelers should follow normal practices.

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4.0 GENERAL REFERENCES

The following are references applicable to diving operation conducted in support of the RI/FS. USA will comply with applicable Federal, State, and local requirements. Following all applicable requirements and regulations listed in the following publications will ensure the safety and health of on-site personnel and the local community.

4.1 US ARMY CORPS OF ENGINEERS

- US Army Corps of Engineers, Safety and Health Requirements Manual, EM-385-1-1, 15 September 2008

4.2 U.S. NAVY

- U.S. Navy Diving Manual, Revision 6, 15 April 2008

4.3 OSHA

- OSHA 29 CFR 1910, Subpart T- Commercial Diving Operations

4.4 DoD

- DoD 6055.9-STD, Ammunition and Explosive Safety Standards
- DDESB TP-18, Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel

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ATTACHMENT 1.

USA ENVIRONMENTAL, INC.
DIVING SAFE PRACTICES MANUAL

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DIVING SAFE PRACTICES MANUAL
Table of Contents

Attachments

1.1) OSHA, 29 CFR 1910, Subpart T

1.2) U.S. Navy Table of No-Decompression Limits and Repetitive Group Designation for No-Decompression Air Dives

1.3) U.S. Navy Residual Nitrogen Timetables for Repetitive Air Dives

1.4) U.S. Navy Standard Air Decompression Table

1.5) Sample Forms (Pre-dive briefs, diving log sheets, and checklists)

AIR SCUBA DIVING OPERATIONS

1 INTRODUCTION

1.1 Purpose

The purpose of this Diving Safe Practices Manual is to provide divers with standard requirements and procedures to conduct safe and effective diving operations.

USA Environmental, Inc. (USA) has developed this manual to only cover diving operation performed with standard Air Self Contained Underwater Breathing Apparatus (SCUBA) systems. Diving operations conducted with any other diver system or breathing medium (surface supplied, mixed gas, etc) will not be performed unless addressed through an expanded version of this manual.

A Dive Operations Work Plan will be developed for each project requiring diving activities. This work plan will address site specific diving conditions, and reflect required diving actions, Standard Operating Procedures, and safety and health guidance.

1.2 Scope

Air SCUBA diving operations will be conducted in accordance with all applicable regulations and governing documents, including the following:

- U.S. Navy Diving Manual, Revision 6, 15 April 2008
- US Army Corps of Engineers, Safety and Health Requirements Manual, EM-385-1-1, 15 September 2008
- OSHA 29 CFR 1910, Subpart T- Commercial Diving Operations

Changes and additions to the rules and regulations governing diving operations occur periodically. As these changes to existing rules occur, or as proposed standards are finalized, areas which are in conflict with this manual will be brought to the attention of the users and, as required, changes will be issued.

2 ASSIGNMENTS AND RESPONSIBILITIES

This section details the responsibilities of USA personnel directly involved with diving operations, as related to those operations. It does not cover general responsibilities of all USA employees, such as a safety-conscious attitude. All diving personnel should read and completely understand the duties, responsibilities and standards of their particular job.

2.1 Diving Manager

The USA Diving Manager shall have overall responsibility for the safe conduct of all diving and diving-related evolutions that are being performed. The Diving Manger will ensure that the applicable Dive Operations Work Plan and Safe Practices Manual are updated, and will verify that only qualified personal are assigned to duties involving diving operations.

2.2 Diving Supervisor

A USA Dive Supervisor (DS) will be appointed for each dive operation. An employee designated as a DS shall be identified in writing and approved by the Diving Manager. Qualifications for the DS will be at the discretion of the Dive Manager, and will be based upon demonstrated knowledge, formal training, and ability to effectively supervise the intended operation.

The DS will have sufficient knowledge and experience to supervise the operation, and will ensure that divers assigned to the job are physically and mentally capable of performing designated tasks.

The DS will be responsible to the Dive Manager for ensuring strict compliance with applicable safety parameters and policies, and will promptly report any accident, injury, or variation of policies to the Dive Manager. If assigned personnel are unable to perform an assignment for medical or other reasons, the Dive Manager will be immediately informed.

The Dive Manager may, if necessary, relieve the DS at any time if conditions exists which would impact the safety of the diving operation.

The DS will have complete authority to conduct those tasks as may be assigned. If there are any pre-existing unsafe conditions, or if unsafe conditions develop during the operation, the DS will postpone or abort the dive. Any condition which might cause postponement or cessation of a dive will be resolved prior to resumption of dive operations.

Additional requirements for individual Diving Supervisors will consist of the following:

- Have thorough knowledge in all aspects of the dive operation
- Have a complete knowledge of diving related medical procedures
- Be familiar with all regulations governing diving operations, as well as with the contents of the Dive Safe Practices Manual and site specific Dive Operations Work Plan
- Maintain a complete record of each dive and generate required reports relating to the overall operation
- Establish and maintain effective communication with the Dive Manager, local agencies, and government representatives as directed.

2.3 Divers

All Divers employed by USA will meet the following meet the following criteria:

- Have training and experience working at depths up to 100 Feet of Salt Water (FSW)
- Be trained and proficient in commercial diving operations and medical procedures, and the use of industry standard diving equipment and tools
- Have a thorough understanding of the specific Dive Operations Work Plan for the intended project site.

Diver training documentation shall be in compliance with the OSHA Diving Standards 29 CFR 1910.410 and shall show that the dive team members have successfully completed training to the appropriate level (e.g., SSA diver's certificate, surface supplied mixed-gas diver certificate).

All divers will also function as safety observers during all activities, and will maintain the authorization to direct the cessation of site operations if a safety concern is identified.

2.4 Standby Diver

Personnel fulfilling the standby diver positions will be fully qualified divers in accordance with applicable regulations. The standby diver's SCUBA equipment configuration will be the same as the in-water divers, which will enable the standby diver to descend to the equivalent diving depth.

The standby diver will remain attentive to the status of the working diver to reduce emergency reaction time, and will only be deployed after being briefed by the Diving Supervisor. The brief will include specific guidance from the DS relating to the situation being encountered.

2.5 Operational and Medical Qualifications

All diving personnel will meet the experience and qualification requirements outlined in the following guidance documents:

- US Army Corps of Engineers, Safety and Health Requirements Manual, EM-385-1-1
- OSHA 29 CFR 1910, Subpart T- Commercial Diving Operations

All diving personnel will also be medically qualified to perform diving operations, and received training/certification in CPR, first aid, and the use of any auxiliary emergency medical equipment that is present at the dive site to include, but not limited to, first aid kits, oxygen systems, and Automated External Defibrillators (if provided at the dive side).

The Diving Manager and USA Human Resource Department will ensure that all diving personnel fulfill the required qualifications, and the DS will maintain records of the applicable certifications on the dive site.

3 OPERATIONAL PLANNING

The initial phase of all diving operation is Operational Planning. Proper planning will eliminate unnecessary delays and contribute to the overall success and safety of the task. The planning can be broken down into the following components:

- Definition of task
- Collection and evaluation of data
- Establishment of requirements
- Preparation for the operation.

3.1 Definition of the Task

The initial step in the planning of any operation is the definition of the task to be accomplished. This includes an in-depth breakdown of all elements required to complete the task, the location, and the time frame in which it is to be accomplished. Once these requirements have been established, planning for their accomplishment can begin.

3.2 Collection and Evaluation of Data

Once the specific tasks are established, data regarding the project site can be collected. The extent and type of information required will be influenced by such factors as the size of the operation, location of the dive site, and the time of year dive operations will be executed.

Areas to be considered when planning an operation include government regulations affecting diving, and resources (logistical and emergency) available to support the operation. Several elements will have a continuous affect on the conduct of operations, and include meteorological conditions, oceanographic conditions, and bottom conditions.

3.2.1 Meteorological Conditions

Past meteorological conditions and long-range forecasts should be evaluated to determine the probable effect that local weather will have on diving operations. This information will allow recognition of special equipment requirements and the optimal seasonal period for diving operations.

Preparations will be made to ensure that equipment and personnel are properly prepared for anticipated weather conditions. Extremes of both cold and hot temperatures require special consideration, and personnel exposed must be provided with adequate protection from the environment.

3.2.2 Oceanographic Conditions

Oceanographic conditions should be examined in order to facilitate effective operational planning. Both standard conditions, and the extent of adverse conditions due to storms or seasonal weather patterns, should be assessed.

3.2.2.1 Sea State

Sea states at a specific dive site can be consistent in nature, or fluctuate greatly depending on the related weather conditions.

Heavy seas can result in numerous conditions that make diving hazardous, both for divers and topside personnel functioning from afloat dive platforms. While divers on the bottom are not usually affected by wave action, surge can be extremely noticeable and uncomfortable to divers entering or leaving the water.

Planned equipment and dive platforms should be capable of operating in the anticipated conditions, and allow for protection of personnel during adverse weather conditions (storms, etc).

Diving operations will be terminated when, in the opinion of the Diving Supervisor, weather conditions make diving hazardous.

3.2.2.2 Water Temperature

Water temperatures will determine the duration of dive profiles, and the associated protective clothing/thermal protection that divers will require. Few factors will more rapidly fatigue a diver than continued exposure to cold water. Even in moderately warm water (60-70 °F) heat loss to the water can bring on excessive fatigue. If the diver becomes cold, the ability to concentrate and work efficiency will be reduced.

3.2.2.3 Explosive Safety

The majority of diving operations conducted by USA will involve Munitions and Explosives of Concern (MEC) and Unexploded Ordnance (UXO) items. These items present may present an explosive hazard, and will be treated in accordance with standard safety practices and procedures reflected in the specific Diver Operations Work Plan, overall project Work Plan, and project Site Safety and Health Plan.

Unless authorized and planned, divers will not make contact with MEC/UXO items, and will be aware of the effects that currents and visibility may have in safely diving in proximity of these items.

3.2.2.4 Tides and Currents

Tidal conditions generally have little effect on diving operations except when they result in a strong current. A strong current can severely limit diving and make conditions extremely hazardous for a diver. Currents can be especially dangerous to untethered divers, or divers working around structures, MEC, or UXO items.

SCUBA dives will not be conducted in currents of 1 knot or more. If currents at the dive site are questionable or unknown, the conditions will be checked to determine if they are sufficient to affect operations.

3.2.2.5 Visibility

Visibility at the dive site should be assessed, as reduced visibility conditions can reduce the diver's effectiveness and increase the time required to accomplish a task.

If the lack of visibility is due to an absence of light (such as when diving inside structures), some visibility can be restored by the use of an underwater light. The use of a light will be determined by its overall contribution to the task and the diver's ability to handle it while working underwater.

3.2.2.6 Bottom Conditions

The bottom conditions which the diver will be working in can affect selection of procedures and equipment, and can also restrict available visibility and the diver's ability to work effectively.

Obstructions such as a wreck or large amounts of debris can cause an increased potential of a diver to become entrapped or limit the visibility of the bottom surface.

Other hazards that the diver might encounter in and around the work site must also be considered and planned for. This includes isolation of impressed current cathodic protection systems on structures or moored vessels in proximity of the diver.

3.3 Diving Asset Requirements

Once the tasks and site related data is established, the assets required to ensure a safe and effective dive operation can be determined. Major areas of consideration are types of diving and support equipment, logistical demands, and personnel requirements.

3.3.1 Diving Equipment

The water depth, in-water conditions, and tasks to be accomplished are critical factors when selecting the SCUBA diving equipment that will be utilized. The diver must be able to safely and efficiently perform the required work in the equipment selected.

3.3.2 Support Equipment

Two primary factors influencing the type of required support equipment are the diving system being used and the tasks to be accomplished. The requirements for power, water, and fuel will vary between diving systems, and provisions must be made for an adequate supply of each. The tools and equipment that allow the diver to accomplish the task will also vary, and must be planned for and supplied.

The surface support and diving platforms selected will be capable of providing required services and equipment, as well as adequate space and a firm mooring capability. These platforms will also provide personnel with adequate protection from sun expose and adverse weather conditions.

3.3.3 Logistics

Logistic requirements for each dive operation will vary with intended the task, location, and duration of operations. Planning will be focused on timely delivery of all equipment, supplies, and personnel to the dive site, and maintaining an adequate supply of required materials.

3.3.4 Personnel

An evaluation of the SCUBA system that will be utilized, the type and duration of the tasks, and the location of the dive site will establish the requirement for diving and support personnel. All personnel will be properly screened to ensure that each maintains the required qualifications and certifications.

3.4 Preparation

As the requirements for a diving operation are determined, preparations will begin to ensure that assets are mobilized in a timely manner to the required.

An additional component of the preparation phase will be arranging for a Project Operations and Safety Brief. The DS will conduct this brief with all diving and support personnel prior to commencement of the overall diving operation. This contents of this brief will consist of a review of the Diving Safe Practices Manual, the Dive Operations Work Plan, applicable medical procedures, and site specific SOPs .

4 REQUIRED EQUIPMENT FOR SCUBA OPERATIONS

At a minimum, each diver will be equipped with the following items to safely conduct an open-circuit SCUBA dive:

- Open-circuit SCUBA
- Bailout bottle with a minimum of 30 cubic feet (0.85 m3) of air and separate regulator
- Face mask
- Buoyancy compensator device
- Weight belt and weights as required
- Safety harness with a positive buckling device
- Knife
- Swim fins
- Submersible pressure gauge
- Submersible wrist watch
- Submersible depth gauge.

4.1 Cylinders

Scuba cylinders (tanks or bottles) are designed to hold high pressure compressed air. Because of the extreme stresses imposed on a cylinder at these pressures, all cylinders used in SCUBA diving must be inspected and tested periodically.

Seamless steel or aluminum cylinders which meet Department of Transportation (DOT) specifications (DOT 3AA, DOT 3AL, DOT SP6498, and DOT E6498) are approved for use. Each cylinder used must have identification symbols and test dates stamped into the shoulder.

4.2 Buoyancy Compensator Device

The buoyancy compensator device (BCD) shall be capable of maintaining the diver at the surface in a face-up position, having a manually activated inflation source independent of the breathing supply, an oral inflation device, and an exhaust valve.

4.3 Inspection Requirements

All SCUBA equipment should be inspected upon issue, and prior to each use in accordance with the applicable pre-dive checklist.

Open-circuit SCUBA cylinders must be visually inspected at least once every 12 months and every time water or particulate matter is suspected in the cylinder. Cylinders containing visible accumulations of corrosion must be cleaned before being placed into service. Commercially available steel and aluminum SCUBA cylinders, which meet DOT specifications, must be visually inspected at least annually and must be hydrostatically tested at least every five years.

4.4 OPTIONAL EQUIPMENT FOR SCUBA OPERATIONS

The requirements of each specific diving operation determine which items of optional diving equipment may be necessary. This section lists some of the equipment that may be used.

- Protective clothing
    - Wet suit
    - Variable volume dry suit
    - Gloves
    - Hoods
    - Boots or hard-soled shoes
- Whistle
- Slate and pencil
- Tools and light
- Tool bag
- Lines and floats
- Wrist compass
- Witness float
- Snorkel
- Chemical light and strobe light

4.4.1 Protective Clothing

Requirements for protective clothing will be assessed based on the conditions of each particular dive site. Once know, the DS will ensure that divers are outfitted with applicable protection from cold water and/or heat loss during long exposure in water of moderate temperature, from chemical or bacterial pollution in the water, and from the hazards posed by marine life and underwater obstacles. Protection can be provided by wet suits, dry suits, or coveralls.

4.4.1.1 Voice Communication System

USA will plan to utilize two-way underwater voice communication systems for all diving operations. These systems are intended to enhance the safety of diving personnel and contribute to effective communication between the diver and topside personnel.

4.4.1.2 Tending Lines and Floats

A form of lifeline will be used as required to exchange signals, keep track of the diver's location, or operate in limited visibility. There are three basic types of diving related lines: a surface tending line, a floating tending line, and the buddy line.

A surface tending line extends from the diver to the diving platform, and is managed by a designated surface tender. The hard tending line can be used when operating with a single diver, and in low visibility or high current conditions with a pair of divers.

A floating tending line extends from the diver to a suitable float on the water surface. This float can be a brightly painted piece of wood, an empty sealed plastic bottle, a life ring, or any similar visible object. A single diver may be tended with floating line, depending on the water conditions and a safety assessment made by the Diving Supervisor. USA will only utilize this method if a voice communication systems is also used to maintain communication.

A buddy line, 6 to 10 feet long, will be used to connect diver partners at night or in limited visibility conditions.

Any line used in SCUBA operations should be strong and have neutral or slightly positive buoyancy. Suitable materials include Nylon, Dacron, and manila. All lines will be attached directly to the diver, and never to a piece of SCUBA equipment that may be ripped away or removed in an emergency.

In addition, each tethered SCUBA diver shall wear a safety harness with a positive buckling device, attachment point for the safety line, and a lifting point to distribute the pull force of the line over the diver's body while maintaining the body in a heads-up vertical position when unconscious or inert.

5 AIR SUPPLY

The air supply requirement for SCUBA diving is a function of the expected duration of the dive at a specified working depth.

The duration of the air supply is dependant on a number of factors, including the depth of the dive, the work load required for the task, and the consumption rate of each individual diver.

The DS will ensure that SCUBA cylinders have adequate pressure prior to deploying a diver, and divers will regularly monitor the submersible pressure gauge, and will terminate the dive when the prescribed air pressure limits are reached.

5.1 Compressed Air from Commercial Sources

Compressed air meeting the established standards can usually be obtained from commercial sources. Air procured from commercial sources must meet the requirements of Grade A Source I or Source II air as specified by FED SPEC BB-A1034B. The following table reflects air purity standards for commercial sources:

Diver's Compressed Air Breathing Requirements if from Commercial Source

Constituent	Specification Source 1 Source II
Oxygen (percent by volume)	20-22%
Carbon dioxide (by volume)	500 ppm(max)
Carbon monoxide (by volume)	10 ppm (max)
Total hydrocarbons [as Methane (CH4) by volume]	25 ppm (max)
Odor	Not objectionable
Oil, mist, particulates	.005 mg/l (max)
Separated Water	None
Total Water	0.02 mg/1 (max)
Halogenated Compounds (by volume): Solvents	0.2 ppm (max)
Reference: FED SPEC BB-A-1034 B	

The DS will ensure that commercial sources maintain an inspection/sampling certificate for applicable air purity standards.

6 PRE-DIVE PROCEDURES

Pre-dive procedures for SCUBA operations include equipment and diver preparation, and completion of a pre-dive inspection before the divers enter the water. Checklist reflecting pre-dive procedures will be included in the site specific Dive Operations Work Plan.

6.1 Equipment Certification, Procedures, and Inspection

Prior to any dive, all divers will carefully inspect assigned equipment for signs of deterioration, damage, or corrosion. The equipment will be tested for proper operation. Pre-dive preparation procedures must be a personal concern for each diver, as verification of equipment condition and operation is a critical safety factor.

Pre-dive inspection will follow the applicable SOP included in the site specific Dive Operations Work Plan, and will include the following inspection criteria.

6.1.1 Air Cylinders

Inspection criteria includes the following:

- Inspect air cylinder exteriors and valves for rust, cracks, dents, and any evidence of weakness
- Inspect O-ring
- If equipped, verify that the reserve mechanism is closed (lever in up position) signifying a filled cylinder ready for use
- Gauge the cylinders according to the following procedure:
  - Attach pressure gauge to O-ring seal face of the on/off valve.
  - Close gauge bleed valve and open air reserve mechanism (lever in down position). Slowly open the cylinder on/off valve, keeping a cloth over the face of the gauge.

- Read pressure gauge, and remove the cylinder from use if the pressure is not sufficient to complete the planned dive
- Close the cylinder on/off valve and open the gauge bleed valve.
- When the gauge reads zero, remove the gauge from the cylinder.

6.1.1.1 Breathing Hoses

Inspection criteria includes the following:

- Check the hoses for cracks and punctures
- Test the connections of each hose at the regulator and mouthpiece assembly by tugging on the hose
- Check the clamps for corrosion and damage.

6.1.1.2 Regulator

Inspection criteria includes the following:

- Attach regulator to the cylinder manifold, ensuring that the O-ring is properly seated
- Crack the cylinder valve open and wait until the hoses and gauges have equalized
- Next open the cylinder valve completely and then close (back off) one-quartet turn
- Check for any leaks in the regulator by listening for the sound of escaping air.

6.1.1.3 Life Preserver/Buoyancy Compensator (BC)

Inspection criteria includes the following:

- Attached the auto inflation valve to an air cylinder and check for proper operation
- Inflate the preserver and check for leaks
- If equipped, inspect the carbon dioxide cartridges to ensure they have not been used (seal intact) and are the proper size for the vest being used and for the depth of dive
- Check all straps and connections for must wear and ensure secure operation.

6.1.1.4 Face Mask

Inspection criteria includes the following:

- Check the seal of the mask and the condition of the head strap
- Check for cracks in the skirt and faceplate.

6.1.1.5 Swim Fins

Inspection criteria includes the following:

- Check straps for signs of cracking
- Inspect blades for signs of cracking.

6.1.1.6 Dive Knife

Inspection criteria includes the following:

- Test the edge of the knife for sharpness
- Ensure the knife is fastened securely in the scabbard
- Verify that the knife can be removed from the scabbard without difficulty.

6.1.1.7 Depth Gauge and Compass

Inspection criteria includes the following:

- Inspect pins and straps
- If possible, check compass with another compass
- Make comparative checks on depth gauges to ensure depth gauges read zero feet of salt water (FSW) on the surface.

6.1.1.8 Miscellaneous Equipment

Inspect any other equipment that will be used on the dive, as well as any spare equipment that may be needed during the dive, including spare regulators cylinders, and gauges.

6.1.2 Predive Brief

The DS will conduct a predive brief prior to the commencement of each diving evolution in accordance with the applicable SOP contained in the site specific Dive Operations Work Plan.

6.1.3 Predive Inspection

Each diver will report for a final inspection prior to entering the water.

The DS will conduct the inspection, and ensure that the divers are physically and mentally ready to enter the water, verify the operation and configuration of all required equipment, and conduct a brief final review of the dive plan.

6.2 WATER ENTRY AND DESCENT

Once divers are ready for deployment, divers will follow procedures to ensure safe entry into the water and descent through the water column.

6.2.1 Water Entry

Water entry techniques will be determined by the nature of the diving platform. Several basic rules applicable to all methods of entry consist of the following:

- Look before jumping or pushing off from the platform or ladder
- Tuck chin into chest and hold the cylinders with one hand to prevent the manifold from hitting the back of the head
- Hold the mask in place with the fingers and the mouthpiece in place with the heel of the hand.

6.2.2 Pre-descent Surface Check

Once in the water, and before descending to operating depth, the diver will complete a final equipment check:

- Make a breathing check of the SCUBA system
- Visually check dive partner's equipment for leaks, especially at all connection points (i.e., cylinder valve, hoses at regulator and mouthpiece)
- Check partner for loose or entangled straps
- Check buoyancy and the ability to descend with the amount of weight carried on the diver.

When satisfied that all equipment is operating and functional, the divers will report readiness to the Diving Supervisor. The Diving Supervisor will direct the diver to descend and commence the dive.

6.2.3 Descent

The rate of descent will generally be governed by the ease with which the divers will be able to equalize the pressure of the inner ear and sinuses. However, the rate of descent should never exceed 75 feet per minute.

If a diver experiences difficulty in clearing, the diver must stop and ascend until the situation is resolved. If the problem persists after several attempts to equalize, the dive shall be aborted and the diver will return to the surface.

Upon reaching the operating depth, the diver will orient themselves to the surroundings, verify the site, and check the underwater conditions. If conditions appear to be radically different from those anticipated and seem to pose a hazard, the dive should be aborted and the conditions reported to the Diving Supervisor.

6.3 UNDERWATER PROCEDURES

For each SCUBA dive, bottom time is at a premium because of a limited supply of air. Divers must pace their work, conserve their energy, and address each task or issue in an effective manner.

At the same time, divers must be flexible to contend with unanticipated underwater conditions and events. Divers will terminate a dive at any time they feel that they can no longer progress toward the completion of their mission, or when conditions are judged unsafe. Divers must be alert for trouble at all times and monitor the condition of the dive partner regularly.

6.3.1 Breathing Technique

Some divers may attempt to conserve air by conducting irregular breathing patterns. One common technique is to skip-breathe, a process where a diver will insert an unnatural, long pause between each breath.

WARNING: Skip-breathing may lead to hypercapnia and shall not be practiced at any time by USA divers.

When equipped with a submersible bottle gauge, the diver shall monitor the air supply pressure and will terminate the dive whenever bottle pressure is reduced to 500 psi for a single bottle, or 250 psi for a set of double bottles.

6.3.2 Diver Communication

Diver communication is essential for conducting effective and safe diving operations.

Each diving operation will utilize some means of communication, which can range from voice communication systems, hand signals, slate boards, and line-pull signals.

6.3.2.1 Hand and Line-Pull Signals

Divers shall use hand signals shown in the applicable SOP contained in the Dive Operations Work Plan. Under certain conditions, special signals applicable to a specific mission may be devised and approved by the Diving Supervisor. Dive partners may need to communicate with line-pull signals on a buddy line if visibility restricts identifying hand signals.

Hand signals and line-pull signals should be delivered in a forceful, exaggerated manner so that there is no ambiguity and no doubt that a signal is being given. Every signal will be acknowledged by the individual receiving the signal (tender or dive partner).

6.3.3 Tending with a Surface or Buddy Line

When a diver is being tended by a line from the surface or a buddy line, several basic considerations apply.

- Lines should be kept free of slack
- Any signals via the line must be acknowledged immediately by returning the same signal.
- The tender should signal the diver with a single pull every 2 -3 minutes to determine that the diver is all right, with the diver returning the signal if no problems are encountered
- When utilizing a floating tending line, the diver will indicate that no problems are being encountered by executing a single pull of the tending line every 2-3 minutes
- The diver will maintain an awareness of the direction and attitude of the tending line to minimize the possibility of entanglement with an obstruction.

6.3.4 Tending with No Surface Line

If a tending is not used, a topside tender will keep track of the general location of the divers by observing the diver's air bubbles on the water surface. When tending a single diver with a floating tending line, the tender shall continually monitor the diver float to track the location of the diver and recognize line pull signals.

6.3.5 Working with Tools

Prior to use, divers will review applicable operating procedures and safety precautions related to underwater tools.

The dive and support team will also be aware of specific requirements associated with fuel or electrically powered tools. Precautions relating to spill containment and electrical safety will be taken.

NOTE When using externally powered tools with SCUBA, the diver must have voice communications with the Diving Supervisor.

The DS will ensure that tools will not adversely affect safety, and the diver will carry as few tools as possible. If a collection of tools are required, a holding bag should be used to lower the tools to the diver as needed.

6.3.6 Adapting to Underwater Conditions

Divers should be briefed on anticipated underwater conditions. However, the diver may have to employ techniques to offset the effects of certain underwater conditions.

General guidelines include the following:

- Stay 2 or 3 feet above a muddy or sediment bottom to avoid creating a cloud that will reduce visibility
- Be positioned so that the current will carry away any debris/sediment clouds
- Avoid coral or rocky bottoms which may cause cuts and abrasions
- Avoid abrupt changes of depth
- Do not make excursions away from the dive site unless the excursions have been included in the dive plan
- Be aware of unusually strong currents, particularly rip currents near a shoreline
- Swim against a current to approach a job site, which will result in a return swim with the current
- Stay clear of lines or wires that are under stress.

6.4 ASCENT PROCEDURES

Divers will communicate the intent to ascend to topside through the method of communication being utilized. The diver will then commence a controlled ascent to the surface, and will not exceed an ascent rate of 30 feet per minute.

The diver will breathe steadily and naturally, and must never hold their breath during ascent which can create the potential of developing an air embolism. While ascending, divers will keep an arm extended overhead to protect from contact with any obstructions.

Once on the surface, the diver will signal the DS that the diver is either “OK” or is experiencing problems and requires assistance. The diver will also report the maximum depth achieved and bottom time.

6.4.1 Emergency Free-Ascent Procedures

In the event where a diver is required to perform an emergency free ascent to the surface, the procedures listed under the General Safety section of this manual will be followed.

6.5 POSTDIVE PROCEDURES

The diver will be removed from the water as soon as possible and situated in a secure location on the dive platform or land based dive side. The DS will assess the physical condition of each diver, and conduct a debrief while the experience of the dive is still recent.

The debrief will determine if the assigned tasks were completed, if any problems were encountered, if any changes to the overall dive plan are indicated, and if the diver has any suggestions to improve the next evolution.

Each diver is responsible for the immediate post-dive maintenance and proper disposition of the equipment used during the dive.

6.6 Administrative Record Keeping

A profile of every dive will be maintained at the dive site, and dive records will contain the following information:

- Purpose of the dive
- Date, time, and location of the dive
- Name of the DS, divers, and standby divers
- Breathing media an equipment used
- Time left surface
- Time reached bottom
- Time left bottom
- Time reached surface
- Total bottom time
- Total decompression time
- Total time of dive
- Maximum depth
- Surface interval between dives
- Divers' condition
- Underwater and surface conditions
- Repetitive dive group
- General description of work performed and other remarks

Samples of the administrative record documents that will be utilized for diving operations are attached to this manual.

All diving records will be organized and maintained by the DS, and forwarded to the USA Corporate Office at the conclusion of diving operations for submission to the USACE DDC, incorporation into operational reports, and long term storage.

7 GENERAL DIVING SAFETY

Safety of all diving and support personnel is essential to the achievement of project related objectives, and will be a priority during the planning and operational phases of the overall diving program.

Safety equipment will be maintained at each dive side, and will include the following minimum equipment:

- First-aid kit meeting the requirements of Section 3, OSHA 29 CFR
- Oxygen resuscitation system capable of delivering oxygen for a minimum of 30 minutes or until emergency medical assistance can be administered
- Stokes litter or backboard, with flotation capability.

Each project dive site will present unique diving related safety concerns that must be addressed in the site specific Dive Operations Work Plan and the associated Activity Hazard Analysis (AHA) documents. However, the following is a listing of general diving emergency situations, and the corresponding actions required for an effective and timely response.

7.1 Entrapped Diver

- Diver should not panic
- Diver will evaluate the situation and determine what actions are required to gain freedom of movement
- Diver will Notify topside of the situation through available means of communication (line pull signals or voice communication).
- The diver will attempt to free himself/herself. This includes, if necessary, temporarily removing your tanks to free them. Do not immediately ditch equipment and ascend to the surface.
- If the diver is unable to become free, obtain assistance from the buddy diver, or signal the surface using line-pull signals indicating that assistance is required
- Standby diver will be deployed after being briefed by the Diving Supervisor. The standby diver will descend to the location of the entrapped diver, note the entrapped diver's air supply level, and assess the situation to determine what actions are required to free the diver.
- Once free, continue the dive or return to the surface, as appropriate
- If SCUBA equipment cannot be freed after all reasonable efforts have been made, the diver will remove the fouled equipment, ensure he/she is clear of all equipment, and execute an emergency ascent to the surface.

7.2 Actions Upon Loss of Vital Support Equipment

- DS will assess the impact of the equipment loss in regards to conduct of safe diving operations
- Topside will communicate the loss to any in water divers regarding impact to operations. Communication will be achieved through use of voice activated systems or deployment of standby diver.
- As required, abort diving operations and ensure the safety of surfacing divers is not adversely affected by equipment loss.

7.3 Actions Upon Loss of Gas Supply

- Diver should not panic
- Transition to breathing from the diver bailout bottle and immediately terminate dive with a controlled ascent to the surface
- If bailout bottle can not be reached due to entanglement, and a buddy diver is available, commence buddy-breathing. Immediately terminate dive and commence a controlled ascent to the surface.
- If no buddy diver is available, and bailout bottle can not be reached, diver will drop weight belt and commence an emergency ascent to the surface. Diver will not ditch SCUBA gear unless it is fouled.

- If necessary, the diver will inflate his/her flotation device/BC. Once inflated, a controlled emergency ascent might become an uncontrolled emergency ascent due to the added buoyancy
- Diver will ascend to the surface, exhaling continuously during the ascent
- Upon reaching the surface, inform the Diving Supervisor of the situation

7.4 Action Upon Loss of Communication

- Diver should not panic
- Transition to breathing from the diver bailout bottle, and immediately terminate dive with a controlled ascent to the surface
- If bailout bottle can not be reached due to entanglement, and a buddy diver is available, commence buddy-breathing. Immediately terminate dive and perform a controlled ascent to the surface.
- If no buddy diver is available, and bailout bottle can not be reached, diver will drop weight belt and commence an emergency ascent to the surface. Diver will not ditch SCUBA gear unless it is fouled.
- If necessary, the diver will inflate his/her flotation device/BC. Once inflated, a controlled emergency ascent might become an uncontrolled emergency ascent due to the added buoyancy
- Diver will ascend to the surface, exhaling continuously during the ascent

7.5 Lost Diver Plan

Procedures for Dive Pair

- Diver should not panic
- Complete a 360 degree search for lost diver
- If voice communication with topside is available, communicate the situation to the DS
- Note depth, time, and general location of lost diver situation
- Terminate dive and perform a controlled ascent to the surface
- During ascent, complete 360 degree searches throughout the water column
- Upon reaching the surface, inform the DS of the situation and relay information regarding depth and time of lost diver event.

Procedures for Topside Personnel

- DS will direct that a lost diver buoy is deployed overboard, and that the latitude and longitude coordinates of the site is recorded

- The DS will direct that all means to communicate with the diver are attempted (voice, line pull, and "revving" of the dive platforms engines in order to indicate that the dive is terminated and the diver should surface
- The DS will brief and deploy the standby diver to commence a search for the lost diver
- If required, additional divers will be deployed and systematic search patters will be established to extend the search area
- As required, the DS will request additional support from local agencies and the U.S. Coast Guard

7.6 Injured Diver Plan

- If diving in pairs, injured diver will be assisted in ascending to the surface. If a single diver is injured, diver will ascend to the surface or be assisted by the standby diver
- Injured diver will be removed from the water by the safest means available, and placed in a secure location on the dive platform or on land
- DS will assess the injury, and direct other personnel to perform immediate medical response actions
- As required, local medical responders will be requested at the site, or actions for evacuation of the diver will be enacted
- Dive team will refer to the site specific Dive Operations Work Plan for medical response and evacuation actions for the local area and intended diving operation

7.7 Discovery of Fire

- Personnel will immediately enact fire fighting actions
- If divers are in the water, DS will assess if directing the divers to the surface will place them in danger, or if it is safer for divers to remain in the water during fire fighting actions
- If operating from waterborne dive platform, Boat Captain will direct fire fighting effort and commence emergency communication procedures as required
- Once fire fighting efforts are complete, all dive operations will be terminated until the proper operations of all associated equipment can be verified, and confirmation is achieved that a re-flash of the fire will not occur.

7.8 Diver Blow Up/Over Rapid Ascent to Surface

- Diver will ascend to the surface, exhaling continuously during the ascent
- Upon reaching the surface, the diver will inflate his/her flotation device/BC and inform the DS of the situation
- Diver will be removed from the water and placed in a secure location on the dive platform or land

- A neurological exam will be administered to establish a baseline condition, and the diver will be and observed for a minimum of one hour to detect any developing neurological deficiencies
- Diving operations will be aborted until the DS determines that the diver did not sustain any injuries.

7.9 Diver Loss of Consciousness

Procedures for Dive Pair

- Divers should not panic
- Unaffected diver will provide immediate aid to unconscious diver, and place the mouthpiece back into the divers mouth if it has fallen out
- If voice communication with topside is available, the situation will be communicated to the DS
- The unaffected diver will take position behind the unconscious diver and establish positive control of the divers body
- The unconscious diver will be placed in an upright position, and the unaffected diver will prepare to leave the bottom
- The unaffected diver will terminate the dive and perform a controlled ascent to the surface. Positive pressure will be applied to the unconscious divers abdomen during ascent
- Upon reaching the surface, the unaffected diver will inflate the unconscious divers BC, and assist in removing the diver from the water

Procedures for Topside Personnel

- The DS will brief and deploy the standby diver to retrieve the unconscious diver
- Once located, the standby diver will perform the procedures indicated in the previous section to bring the unconscious diver to the surface and assist in removing the diver from the water
- The injured diver will be removed from the water by the safest means available, and placed in a secure location on the dive platform or on land
- DS will assess the injury, and direct other personnel to perform immediate medical response actions
- As required, local medical responders will be requested at the site, or actions for evacuation of the diver will be enacted
- The diver's SCUBA equipment will be segregated from all other equipment
- Dive team will refer to the site specific Dive Operations Work Plan for medical response and evacuation actions for the local area and intended diving operation
- Diving operations will be secured until the cause of the unconscious diver can be determined, or until the quality of the divers air supply can be ruled out as the cause of the casualty.

7.10 Injury/illness of Member of Surface Crew with Diver in the Water

- DS will assess the injury, and direct other personnel to perform immediate medical response actions
- Dive operations will be terminated and divers will be directed to surface
- As required, local medical responders will be requested at the site, or actions for evacuation of the injured personnel will be enacted
- Dive team will refer to the site specific Dive Operations Work Plan for medical response and evacuation actions for the local area and intended diving operation
- The DS will determine when diving operations can re-commence

7.11 Adverse Weather Conditions

- DS will terminate dive operations as required
- If conducting diving operations from a waterborne platform, the DS and Boat Captain will assess weather the dive platform should return to the originating port, or if temporary shelter should be sought at a location in close proximity to the dive site
- For lightening conditions, all personnel will seek as much shelter as possible within the dive platform or land based vehicles/structures
- The DS will determine when weather conditions will safely allow diving operations to re-commence.

8 Internal Safety Inspections

The DS or assigned UXO Safety Specialist will conduct daily safety inspections of site operations, equipment condition, and personnel adherence to safety standards.

Results of the inspection will be recorded on the attached form, and maintained in the project file.

DIVING SAFE PRACTICES MANUAL

ATTACHMENT 1.1

OSHA, 29 CFR 1910, SUBPART T

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OSHA 29 CFR 1910, Subpart T—Commercial Diving Operations

Authority: Sections 4, 6, and 8 of the Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, and 657); Sec. 107, Contract Work Hours and Safety Standards Act (the Construction Safety Act) (40 U.S.C. 333); Sec. 41, Longshore and Harbor Workers' Compensation Act (33 U.S.C. 941); Secretary of Labor's Order No. 8-76 (41 FR 25059), 9-83 (48 FR 35736), 1-90 (55 FR 9033), 3-2000 (65 FR 50017), or 5-2002 (67 FR 65008) as applicable; 29 CFR part 1911.

Source: 42 FR 37668, July 22, 1977, unless otherwise noted.

General

§ 1910.401 Scope and application.

(a) *Scope.* (1) This subpart (standard) applies to every place of employment within the waters of the United States, or within any State, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, American Samoa, Guam, the Trust Territory of the Pacific Islands, Wake Island, Johnston Island, the Canal Zone, or within the Outer Continental Shelf lands as defined in the Outer Continental Shelf Lands Act (67 Stat. 462, 43 U.S.C. 1331), where diving and related support operations are performed.

(2) This standard applies to diving and related support operations conducted in connection with all types of work and employments, including general industry, construction, ship repairing, shipbuilding, shipbreaking and longshoring. However, this standard does not apply to any diving operation:

(i) Performed solely for instructional purposes, using open-circuit, compressed-air SCUBA and conducted within the no-decompression limits;

(ii) Performed solely for search, rescue, or related public safety purposes by or under the control of a governmental agency; or

(iii) Governed by 45 CFR part 46 (Protection of Human Subjects, U.S. Department of Health and Human Services) or equivalent rules or regulations established by another

federal agency, which regulate research, development, or related purposes involving human subjects.

(iv) Defined as scientific diving and which is under the direction and control of a diving program containing at least the following elements:

(A) Diving safety manual which includes at a minimum: Procedures covering all diving operations specific to the program; procedures for emergency care, including recompression and evacuation; and criteria for diver training and certification.

(B) Diving control (safety) board, with the majority of its members being active divers, which shall at a minimum have the authority to: Approve and monitor diving projects; review and revise the diving safety manual; assure compliance with the manual; certify the depths to which a diver has been trained; take disciplinary action for unsafe practices; and, assure adherence to the buddy system (a diver is accompanied by and is in continuous contact with another diver in the water) for SCUBA diving.

(3) *Alternative requirements for recreational diving instructors and diving guides.* Employers of recreational diving instructors and diving guides are not required to comply with the decompression-chamber requirements specified by paragraphs (b)(2) and (c)(3)(iii) of §1910.423 and paragraph (b)(1) of §1910.426 when they meet all of the following conditions:

(i) The instructor or guide is engaging solely in recreational diving instruction or dive-guiding operations;

(ii) The instructor or guide is diving within the no-decompression limits in these operations;

(iii) The instructor or guide is using a nitrox breathing-gas mixture consisting of a high percentage of oxygen (more than 22% by volume) mixed with nitrogen;

(iv) The instructor or guide is using an open-circuit, semi-closed-circuit, or closed-circuit self-contained underwater breathing apparatus (SCUBA); and

(v) The employer of the instructor or guide is complying with all requirements of Appendix C of this subpart.

(b) *Application in emergencies.* An employer may deviate from the requirements of this standard to the extent necessary to prevent or minimize a situation which is likely to cause death, serious physical harm, or major environmental damage, provided that the employer:

(1) Notifies the Area Director, Occupational Safety and Health Administration within 48 hours of the onset of the emergency situation indicating the nature of the emergency and extent of the deviation from the prescribed regulations; and

(2) Upon request from the Area Director, submits such information in writing.

(c) *Employer obligation.* The employer shall be responsible for compliance with:

(1) All provisions of this standard of general applicability; and

(2) All requirements pertaining to specific diving modes to the extent diving operations in such modes are conducted.
[42 FR 37668, July 22, 1977, as amended at 47 FR 53365, Nov. 26, 1982; 58 FR 35310, June 30, 1993; 69 FR 7363, Feb. 17, 2004]

§ 1910.402 Definitions.

As used in this standard, the listed terms are defined as follows:

Acfm: Actual cubic feet per minute.

ASME Code or equivalent:
ASME (American Society of Mechanical Engineers) Boiler and Pressure Vessel Code, Section VIII, or an equivalent code which the employer can demonstrate to be equally effective.

ATA: Atmosphere absolute.

Bell: An enclosed compartment, pressurized (closed bell) or unpressurized (open bell), which allows the diver to be transported to and from the underwater work area and which may be used as a temporary refuge during diving operations.

Bottom time: The total elasped time measured in minutes from the time when the diver leaves the surface in descent to the time that the diver begins ascent.

Bursting pressure: The pressure at which a pressure containment device would fail structurally.
Cylinder: A pressure vessel for the storage of gases.

Decompression chamber: A pressure vessel for human occupancy such as a surface decompression chamber, closed bell, or deep diving system used to decompress divers and to treat decompression sickness.

Decompression sickness: A condition with a variety of symptoms which may result from gas or bubbles in the tissues of divers after pressure reduction.

Decompression table: A profile or set of profiles of depth-time relationships for ascent rates and breathing mixtures to be followed after a specific depth-time exposure or exposures.

Dive-guiding operations means leading groups of sports divers, who use an open-circuit, semi-closed-circuit, or closed-circuit self-contained underwater breathing apparatus, to local undersea diving locations for recreational purposes.

Dive location: A surface or vessel from which a diving operation is conducted.

Dive-location reserve breathing gas: A supply system of air or mixed-gas (as appropriate) at the dive location which is independent of the primary supply system and sufficient to support divers during the planned decompression.

Dive team: Divers and support employees involved in a diving operation, including the designated person-in-charge.

Diver: An employee working in water using underwater apparatus which supplies compressed breathing gas at the ambient pressure.

Diver-carried reserve breathing gas: A diver-carried supply of air or mixed gas (as appropriate) sufficient under standard operating conditions to allow the diver to reach

the surface, or another source of breathing gas, or to be reached by a standby diver.
Diving mode: A type of diving requiring specific equipment, procedures and techniques (SCUBA, surface-supplied air, or mixed gas).

Fsw: Feet of seawater (or equivalent static pressure head).
Heavy gear: Diver-worn deep-sea dress including helmet, breastplate, dry suit, and weighted shoes.
Hyperbaric conditions: Pressure conditions in excess of surface pressure.

Inwater stage: A suspended underwater platform which supports a diver in the water.

Liveboating: The practice of supporting a surfaced-supplied air or mixed gas diver from a vessel which is underway.

Mixed-gas diving: A diving mode in which the diver is supplied in the water with a breathing gas other than air.

No-decompression limits: The depth-time limits of the "no-decompression limits and repetitive dive group designation table for no-decompression air dives", U.S. Navy Diving Manual or equivalent limits which the employer can demonstrate to be equally effective.

Psi(g): Pounds per square inch (gauge).

Recreational diving instruction means training diving students in the use of recreational diving procedures and the safe operation of diving equipment, including an open-circuit, semi-closed-circuit, or closed-circuit self-contained underwater breathing apparatus, during dives.

Scientific diving means diving performed solely as a necessary part of a scientific, research, or educational activity by employees whose sole purpose for diving is to perform scientific research tasks. Scientific diving does not include performing any tasks usually associated with commercial diving such as: Placing or removing heavy objects underwater; inspection of pipelines and similar objects; construction; demolition; cutting or welding; or the use of explosives.

SCUBA diving: A diving mode independent of surface supply in which the diver uses open circuit self-contained underwater breathing apparatus.

Standby diver: A diver at the dive location available to assist a diver in the water.

Surface-supplied air diving: A diving mode in which the diver in the water is supplied from the dive location with compressed air for breathing.

Treatment table: A depth-time and breathing gas profile designed to treat decompression sickness.

Umbilical: The composite hose bundle between a dive location and a diver or bell, or between a diver and a bell, which supplies the diver or bell with breathing gas, communications, power, or heat as appropriate to the diving mode or conditions, and includes a safety line between the diver and the dive location.

Volume tank: A pressure vessel connected to the outlet of a compressor and used as an air reservoir.

Working pressure: The maximum pressure to which a pressure containment device may be exposed under standard operating conditions.

[42 FR 37668, July 22, 1977, as amended at 47 FR 53365, Nov. 26, 1982; 69 FR 7363, Feb. 17, 2004]

Personnel Requirements
§ 1910.410 Qualifications of dive team.

(a) *General.*

(1) Each dive team member shall have the experience or training necessary to perform assigned tasks in a safe and healthful manner.

(2) Each dive team member shall have experience or training in the following:

(i) The use of tools, equipment and systems relevant to assigned tasks;

(ii) Techniques of the assigned diving mode: and

(iii) Diving operations and emergency procedures.

(3) All dive team members shall be trained in cardiopulmonary resuscitation and first aid (American Red Cross standard course or equivalent).

(4) Dive team members who are exposed to or control the exposure of others to hyperbaric conditions shall be trained in diving-related physics and physiology.

(b) *Assignments.* (1) Each dive team member shall be assigned tasks in accordance with the employee's experience or training, except that limited additional tasks may be assigned to an employee undergoing training provided that these tasks are performed under the direct supervision of an experienced dive team member.

(2) The employer shall not require a dive team member to be exposed to hyperbaric conditions against the employee's will, except when necessary to complete decompression or treatment procedures.

(3) The employer shall not permit a dive team member to dive or be otherwise exposed to hyperbaric conditions for the duration of any temporary physical impairment or condition which is known to the employer and is likely to affect adversely the safety or health of a dive team member.

(c) *Designated person-in-charge.* (1) The employer or an employee designated by the employer shall be at the dive location in charge of all aspects of the diving operation affecting the safety and health of dive team members.

(2) The designated person-in-charge shall have experience and training in the conduct of the assigned diving operation.

General Operations Procedures
§ 1910.420 Safe practices manual.

(a) *General.* The employer shall develop and maintain a safe practices manual which shall be made available at the dive location to each dive team member.

(b) *Contents.*

(1) The safe practices manual shall contain a copy of this standard and the employer's policies for implementing the requirements of this standard.

(2) For each diving mode engaged in, the safe practices manual shall include:

(i) Safety procedures and checklists for diving operations;

(ii) Assignments and responsibilities of the dive team members;

(iii) Equipment procedures and checklists; and

(iv) Emergency procedures for fire, equipment failure, adverse environmental conditions, and medical illness and injury.
[42 FR 37668, July 22, 1977, as amended at 49 FR 18295, Apr. 30, 1984]

§ 1910.421 Pre-dive procedures.

(a) *General.* The employer shall comply with the following requirements prior to each diving operation, unless otherwise specified.

(b) *Emergency aid.* A list shall be kept at the dive location of the telephone or call numbers of the following:

(1) An operational decompression chamber (if not at the dive location);

(2) Accessible hospitals;

(3) Available physicians;

(4) Available means of transportation; and

(5) The nearest U.S. Coast Guard Rescue Coordination Center.

(c) *First aid supplies.* (1) A first aid kit appropriate for the diving operation and approved by a physician shall be available at the dive location.

(2) When used in a decompression chamber or bell, the first aid kit shall be suitable for use under hyperbaric conditions.

(3) In addition to any other first aid supplies, an American Red Cross standard first aid handbook or equivalent, and a bag-type manual resuscitator with transparent mask and tubing shall be available at the dive location.

(d) *Planning and assessment.* Planning of a diving operation shall include an assessment of the safety and health aspects of the following:

(1) Diving mode;
(2) Surface and underwater conditions and hazards;
(3) Breathing gas supply (including reserves);
(4) Thermal protection;
(5) Diving equipment and systems;
(6) Dive team assignments and physical fitness of dive team members (including any impairment known to the employer);
(7) Repetitive dive designation or residual inert gas status of dive team members;
(8) Decompression and treatment procedures (including altitude corrections); and
(9) Emergency procedures.

(e) *Hazardous activities.* To minimize hazards to the dive team, diving operations shall be coordinated with other activities in the vicinity which are likely to interfere with the diving operation.

(f) *Employee briefing.* (1) Dive team members shall be briefed on:

(i) The tasks to be undertaken;

(ii) Safety procedures for the diving mode;

(iii) Any unusual hazards or environmental conditions likely to affect the safety of the diving operation; and

(iv) Any modifications to operating procedures necessitated by the specific diving operation.

(2) Prior to making individual dive team member assignments, the employer shall inquire into the dive team

member's current state of physical fitness, and indicate to the dive team member the procedure for reporting physical problems or adverse physiological effects during and after the dive.

(g) *Equipment inspection.* The breathing gas supply system including reserve breathing gas supplies, masks, helmets, thermal protection, and bell handling mechanism (when appropriate) shall be inspected prior to each dive.

(h) *Warning signal.* When diving from surfaces other than vessels in areas capable of supporting marine traffic, a rigid replica of the international code flag "A" at least one meter in height shall be displayed at the dive location in a manner which allows all-round visibility, and shall be illuminated during night diving operations.
[42 FR 37668, July 22, 1977, as amended at 47 FR 14706, Apr. 6, 1982; 54 FR 24334, June 7, 1989]

§ 1910.422 Procedures during dive.

(a) *General.* The employer shall comply with the following requirements which are applicable to each diving operation unless otherwise specified.

(b) *Water entry and exit.* (1) A means capable of supporting the diver shall be provided for entering and exiting the water.

(2) The means provided for exiting the water shall extend below the water surface.

(3) A means shall be provided to assist an injured diver from the water or into a bell.

(c) *Communications.* (1) An operational two-way voice communication system shall be used between:

(i) Each surface-supplied air or mixed-gas diver and a dive team member at the dive location or bell (when provided or required); and

(ii) The bell and the dive location.

(2) An operational, two-way communication system shall be available at the dive location to obtain emergency assistance.

(d) *Decompression tables.* Decompression, repetitive, and no-decompression tables (as appropriate) shall be at the dive location.

(e) *Dive profiles.* A depth-time profile, including when appropriate any breathing gas changes, shall be maintained for each diver during the dive including decompression.

(f) *Hand-held power tools and equipment.* (1) Hand-held electrical tools and equipment shall be de-energized before being placed into or retrieved from the water.

(2) Hand-held power tools shall not be supplied with power from the dive location until requested by the diver.

(g) *Welding and burning.* (1) A current supply switch to interrupt the current flow to the welding or burning electrode shall be:

(i) Tended by a dive team member in voice communication with the diver performing the welding or burning; and

(ii) Kept in the open position except when the diver is welding or burning.

(2) The welding machine frame shall be grounded.

(3) Welding and burning cables, electrode holders, and connections shall be capable of carrying the maximum current required by the work, and shall be properly insulated.

(4) Insulated gloves shall be provided to divers performing welding and burning operations.

(5) Prior to welding or burning on closed compartments, structures or pipes, which contain a flammable vapor or in which a flammable vapor may be generated by the work, they shall be vented, flooded, or purged with a mixture of gases which will not support combustion.

(h) *Explosives.* (1) Employers shall transport, store, and use explosives in accordance with this section and the applicable provisions of §1910.109 and §1926.912 of Title 29 of the Code of Federal Regulations.

(2) Electrical continuity of explosive circuits shall not be tested until the diver is out of the water.

(3) Explosives shall not be detonated while the diver is in the water.

(i) *Termination of dive.* The working interval of a dive shall be terminated when:

(1) A diver requests termination;

(2) A diver fails to respond correctly to communications or signals from a dive team member;

(3) Communications are lost and can not be quickly re-established between the diver and a dive team member at the dive location, and between the designated person-in-charge and the person controlling the vessel in liveboating operations; or

(4) A diver begins to use diver-carried reserve breathing gas or the dive-location reserve breathing gas.

§ 1910.423 Post-dive procedures.

(a) *General.* The employer shall comply with the following requirements which are applicable after each diving operation, unless otherwise specified.

(b) *Precautions.* (1) After the completion of any dive, the employer shall:

(i) Check the physical condition of the diver;

(ii) Instruct the diver to report any physical problems or adverse physiological effects including symptoms of decompression sickness;

(iii) Advise the diver of the location of a decompression chamber which is ready for use; and

(iv) Alert the diver to the potential hazards of flying after diving.

(2) For any dive outside the no-decompression limits, deeper than 100 fsw or using mixed gas as a breathing mixture, the employer shall instruct the diver to remain

awake and in the vicinity of the decompression chamber which is at the dive location for at least one hour after the dive (including decompression or treatment as appropriate).

(c) *Recompression capability.* (1) A decompression chamber capable of recompressing the diver at the surface to a minimum of 165 fsw (6 ATA) shall be available at the dive location for:

(i) Surface-supplied air diving to depths deeper than 100 fsw and shallower than 220 fsw;

(ii) Mixed gas diving shallower than 300 fsw; or

(iii) Diving outside the no-decompression limits shallower than 300 fsw.

(2) A decompression chamber capable of recompressing the diver at the surface to the maximum depth of the dive shall be available at the dive location for dives deeper than 300 fsw.

(3) The decompression chamber shall be:

(i) Dual-lock;

(ii) Multiplace; and

(iii) Located within 5 minutes of the dive location.

(4) The decompression chamber shall be equipped with:

(i) A pressure gauge for each pressurized compartment designed for human occupancy;

(ii) A built-in-breathing-system with a minimum of one mask per occupant;

(iii) A two-way voice communication system between occupants and a dive team member at the dive location;

(iv) A viewport; and

(v) Illumination capability to light the interior.

(5) Treatment tables, treatment gas appropriate to the diving mode, and sufficient gas to conduct treatment shall be available at the dive location.

(6) A dive team member shall be available at the dive location during and for at least one hour after the dive to operate the decompression chamber (when required or provided).

(d) *Record of dive.* (1) The following information shall be recorded and maintained for each diving operation:

(i) Names of dive team members including designated person-in-charge;

(ii) Date, time, and location;

(iii) Diving modes used;

(iv) General nature of work performed;

(v) Approximate underwater and surface conditions (visibility, water temperature and current); and
(vi) Maximum depth and bottom time for each diver.

(2) For each dive outside the no-decompression limits, deeper than 100 fsw or using mixed gas, the following additional information shall be recorded and maintained:

(i) Depth-time and breathing gas profiles;

(ii) Decompression table designation (including modification); and

(iii) Elapsed time since last pressure exposure if less than 24 hours or repetitive dive designation for each diver.

(3) For each dive in which decompression sickness is suspected or symptoms are evident, the following additional information shall be recorded and maintained:

(i) Description of decompression sickness symptoms (including depth and time of onset); and

(ii) Description and results of treatment.

(e) *Decompression procedure assessment.* The employer shall:

(1) Investigate and evaluate each incident of decompression sickness based on the recorded information, consideration of the past performance of decompression table used, and individual susceptibility;

(2) Take appropriate corrective action to reduce the probability of recurrence of decompression sickness; and

(3) Prepare a written evaluation of the decompression procedure assessment, including any corrective action taken, within 45 days of the incident of decompression sickness.
[42 FR 37668, July 22, 1977, as amended at 49 FR 18295, Apr. 30, 1984]

Specific Operations Procedures
§ 1910.424 SCUBA diving.

(a) *General.* Employers engaged in SCUBA diving shall comply with the following requirements, unless otherwise specified.

(b) *Limits.* SCUBA diving shall not be conducted:

(1) At depths deeper than 130 fsw;

(2) At depths deeper than 100 fsw or outside the no-decompression limits unless a decompression chamber is ready for use;

(3) Against currents exceeding one (1) knot unless line-tended; or

(4) In enclosed or physically confining spaces unless line-tended.

(c) *Procedures.* (1) A standby diver shall be available while a diver is in the water.

(2) A diver shall be line-tended from the surface, or accompanied by another diver in the water in continuous visual contact during the diving operations.

(3) A diver shall be stationed at the underwater point of entry when diving is conducted in enclosed or physically confining spaces.

(4) A diver-carried reserve breathing gas supply shall be provided for each diver consisting of:

(i) A manual reserve (J valve); or

(ii) An independent reserve cylinder with a separate regulator or connected to the underwater breathing apparatus.

(5) The valve of the reserve breathing gas supply shall be in the closed position prior to the dive.

§ 1910.425 Surface-supplied air diving.

(a) *General.* Employers engaged in surface-supplied air diving shall comply with the following requirements, unless otherwise specified.

(b) *Limits.* (1) Surface-supplied air diving shall not be conducted at depths deeper than 190 fsw, except that dives with bottom times of 30 minutes or less may be conducted to depths of 220 fsw.

(2) A decompression chamber shall be ready for use at the dive location for any dive outside the no-decompression limits or deeper than 100 fsw.

(3) A bell shall be used for dives with an inwater decompression time greater than 120 minutes, except when heavy gear is worn or diving is conducted in physically confining spaces.

(c) *Procedures.* (1) Each diver shall be continuously tended while in the water.

(2) A diver shall be stationed at the underwater point of entry when diving is conducted in enclosed or physically confining spaces.

(3) Each diving operation shall have a primary breathing gas supply sufficient to support divers for the duration of the planned dive including decompression.

(4) For dives deeper than 100 fsw or outside the no-decompression limits:

(i) A separate dive team member shall tend each diver in the water;

(ii) A standby diver shall be available while a diver is in the water;

(iii) A diver-carried reserve breathing gas supply shall be provided for each diver except when heavy gear is worn; and

(iv) A dive-location reserve breathing gas supply shall be provided.

(5) For heavy-gear diving deeper than 100 fsw or outside the no-decompression limits:

(i) An extra breathing gas hose capable of supplying breathing gas to the diver in the water shall be available to the standby diver.

(ii) An inwater stage shall be provided to divers in the water.

(6) Except when heavy gear is worn or where physical space does not permit, a diver-carried reserve breathing gas supply shall be provided whenever the diver is prevented by the configuration of the dive area from ascending directly to the surface.

§ 1910.426 Mixed-gas diving.

(a) *General.* Employers engaged in mixed-gas diving shall comply with the following requirements, unless otherwise specified.

(b) *Limits.* Mixed-gas diving shall be conducted only when:

(1) A decompression chamber is ready for use at the dive location; and

(i) A bell is used at depths greater than 220 fsw or when the dive involves inwater decompression time of greater than 120 minutes, except when heavy gear is worn or when diving in physically confining spaces; or

(ii) A closed bell is used at depths greater than 300 fsw, except when diving is conducted in physically confining spaces.

(c) *Procedures.*
(1) A separate dive team member shall tend each diver in the water.

(2) A standby diver shall be available while a diver is in the water.

(3) A diver shall be stationed at the underwater point of entry when diving is conducted in enclosed or physically confining spaces.

(4) Each diving operation shall have a primary breathing gas supply sufficient to support divers for the duration of the planned dive including decompression.

(5) Each diving operation shall have a dive-location reserve breathing gas supply.

(6) When heavy gear is worn:

(i) An extra breathing gas hose capable of supplying breathing gas to the diver in the water shall be available to the standby diver; and

(ii) An inwater stage shall be provided to divers in the water.

(7) An inwater stage shall be provided for divers without access to a bell for dives deeper than 100 fsw or outside the no-decompression limits.

(8) When a closed bell is used, one dive team member in the bell shall be available and tend the diver in the water.

(9) Except when heavy gear is worn or where physical space does not permit, a diver-carried reserve breathing gas supply shall be provided for each diver:

(i) Diving deeper than 100 fsw or outside the no-decompression limits; or

(ii) Prevented by the configuration of the dive area from directly ascending to the surface.

§ 1910.427 Liveboating.

(a) *General.* Employers engaged in diving operations involving liveboating shall comply with the following requirements.

(b) *Limits.* Diving operations involving liveboating shall not be conducted:

(1) With an inwater decompression time of greater than 120 minutes;

(2) Using surface-supplied air at depths deeper than 190 fsw, except that dives with bottom times of 30 minutes or less may be conducted to depths of 220 fsw;

(3) Using mixed gas at depths greater than 220 fsw;

(4) In rough seas which significantly inpede diver mobility or work function; or

(5) In other than daylight hours.

(c) *Procedures.* (1) The propeller of the vessel shall be stopped before the diver enters or exits the water.

(2) A device shall be used which minimizes the possibility of entanglement of the diver's hose in the propeller of the vessel.

(3) Two-way voice communication between the designated person-in-charge and the person controlling the vessel shall be available while the diver is in the water.

(4) A standby diver shall be available while a diver is in the water.

(5) A diver-carried reserve breathing gas supply shall be carried by each diver engaged in liveboating operations.
Equipment Procedures and Requirements

§ 1910.430 Equipment.

(a) *General.* (1) All employers shall comply with the following requirements, unless otherwise specified.

(2) Each equipment modification, repair, test, calibration or maintenance service shall be recorded by means of a tagging or logging system, and include the date and nature of work performed, and the name or initials of the person performing the work.

(b) *Air compressor system.* (1) Compressors used to supply air to the diver shall be equipped with a volume tank with a check valve on the inlet side, a pressure gauge, a relief valve, and a drain valve.

(2) Air compressor intakes shall be located away from areas containing exhaust or other contaminants.

(3) Respirable air supplied to a diver shall not contain:

(i) A level of carbon monoxide (CO) greater than 20 p/m;

(ii) A level of carbon dioxide (CO_2) greater than 1,000 p/m;

(iii) A level of oil mist greater than 5 milligrams per cubic meter; or

(iv) A noxious or pronounced odor.

(4) The output of air compressor systems shall be tested for air purity every 6 months by means of samples taken at the connection to the distribution system, except that non-oil lubricated compressors need not be tested for oil mist.

(c) *Breathing gas supply hoses.* (1) Breathing gas supply hoses shall:

(i) Have a working pressure at least equal to the working pressure of the total breathing gas system;

(ii) Have a rated bursting pressure at least equal to 4 times the working pressure;

(iii) Be tested at least annually to 1.5 times their working pressure; and

(iv) Have their open ends taped, capped or plugged when not in use.

(2) Breathing gas supply hose connectors shall:

(i) Be made of corrosion-resistant materials;

(ii) Have a working pressure at least equal to the working pressure of the hose to which they are attached; and

(iii) Be resistant to accidental disengagement.

(3) Umbilicals shall:

(i) Be marked in 10-ft. increments to 100 feet beginning at the diver's end, and in 50 ft. increments thereafter;

(ii) Be made of kink-resistant materials; and

(iii) Have a working pressure greater than the pressure equivalent to the maximum depth of the dive (relative to the supply source) plus 100 psi.

(d) *Buoyancy control.* (1) Helmets or masks connected directly to the dry suit or other buoyancy-changing equipment shall be equipped with an exhaust valve.

(2) A dry suit or other buoyancy-changing equipment not directly connected to the helmet or mask shall be equipped with an exhaust valve.

(3) When used for SCUBA diving, a buoyancy compensator shall have an inflation source separate from the breathing gas supply.

(4) An inflatable flotation device capable of maintaining the diver at the surface in a face-up position, having a manually activated inflation source independent of the breathing supply, an oral inflation device, and an exhaust valve shall be used for SCUBA diving.

(e) *Compressed gas cylinders.* Compressed gas cylinders shall:

(1) Be designed, constructed and maintained in accordance with the applicable provisions of 29 CFR 1910.101 and 1910.169 through 1910.171.

(2) Be stored in a ventilated area and protected from excessive heat;

(3) Be secured from falling; and

(4) Have shut-off valves recessed into the cylinder or protected by a cap, except when in use or manifolded, or when used for SCUBA diving.

(f) *Decompression chambers.* (1) Each decompression chamber manufactured after the effective date of this standard, shall be built and maintained in accordance with the ASME Code or equivalent.

(2) Each decompression chamber manufactured prior to the effective date of this standard shall be maintained in conformity with the code requirements to which it was built, or equivalent.

(3) Each decompression chamber shall be equipped with:

(i) Means to maintain the atmosphere below a level of 25 percent oxygen by volume;

(ii) Mufflers on intake and exhaust lines, which shall be regularly inspected and maintained;

(iii) Suction guards on exhaust line openings; and

(iv) A means for extinguishing fire, and shall be maintained to minimize sources of ignition and combustible material.

(g) *Gauges and timekeeping devices.* (1) Gauges indicating diver depth which can be read at the dive location shall be used for all dives except SCUBA.

(2) Each depth gauge shall be deadweight tested or calibrated against a master reference gauge every 6 months, and when there is a discrepancy greater than two percent (2 percent) of full scale between any two equivalent gauges.

(3) A cylinder pressure gauge capable of being monitored by the diver during the dive shall be worn by each SCUBA diver.

(4) A timekeeping device shall be available at each dive location.

(h) *Masks and helmets.* (1) Surface-supplied air and mixed-gas masks and helmets shall have:

(i) A non-return valve at the attachment point between helmet or mask and hose which shall close readily and positively; and

(ii) An exhaust valve.

(2) Surface-supplied air masks and helmets shall have a minimum ventilation rate capability of 4.5 acfm at any depth at which they are operated or the capability of maintaining the diver's inspired carbon dioxide partial pressure below 0.02 ATA when the diver is producing carbon dioxide at the rate of 1.6 standard liters per minute.

(i) *Oxygen safety.* (1) Equipment used with oxygen or mixtures containing over forty percent (40%) by volume oxygen shall be designed for oxygen service.

(2) Components (except umbilicals) exposed to oxygen or mixtures containing over forty percent (40%) by volume oxygen shall be cleaned of flammable materials before use.

(3) Oxygen systems over 125 psig and compressed air systems over 500 psig shall have slow-opening shut-off valves.

(j) *Weights and harnesses.* (1) Except when heavy gear is worn, divers shall be equipped with a weight belt or assembly capable of quick release.

(2) Except when heavy gear is worn or in SCUBA diving, each diver shall wear a safety harness with:

(i) A positive buckling device;

(ii) An attachment point for the umbilical to prevent strain on the mask or helmet; and

(iii) A lifting point to distribute the pull force of the line over the diver's body.

[39 FR 23502, June 27, 1974, as amended at 49 FR 18295, Apr. 30, 1984; 51 FR 33033, Sept. 18, 1986]

Recordkeeping

§ 1910.440 Recordkeeping requirements.

(a)(1) [Reserved]

(2) The employer shall record the occurrence of any diving-related injury or illness which requires any dive team member to be hospitalized for 24 hours or more, specifying the circumstances of the incident and the extent of any injuries or illnesses.

(b) *Availability of records.* (1) Upon the request of the Assistant Secretary of Labor for Occupational Safety and Health, or the Director, National Institute for Occupational Safety and Health, Department of Health and Human Services of their designees, the employer shall make available for inspection and copying any record or document required by this standard.

(2) Records and documents required by this standard shall be provided upon request to employees, designated representatives, and the Assistant Secretary in accordance with 29 CFR 1910.1020 (a)-(e) and (g)-(i). Safe practices manuals (§1910.420), depth-time profiles (§1910.422), recordings of dives (§1910.423), decompression procedure assessment evaluations (§1910.423), and records of hospitalizations (§1910.440) shall be provided in the same manner as employee exposure records or analyses using exposure or medical records. Equipment inspections and testing records which pertain to employees (§1910.430) shall also be provided upon request to employees and their designated representatives.

(3) Records and documents required by this standard shall be retained by the employer for the following period:

(i) Dive team member medical records (physician's reports) (§1910.411)—5 years;

(ii) Safe practices manual (§1910.420)—current document only;

(iii) Depth-time profile (§1910.422)—until completion of the recording of dive, or until completion of decompression procedure assessment where there has been an incident of decompression sickness;

(iv) Recording of dive (§1910.423)—1 year, except 5 years where there has been an incident of decompression sickness;
(v) Decompression procedure assessment evaluations (§1910.423)—5 years;

(vi) Equipment inspections and testing records (§1910.430)—current entry or tag, or until equipment is withdrawn from service;

(vii) Records of hospitalizations (§1910.440)—5 years.

(4) After the expiration of the retention period of any record required to be kept for five (5) years, the employer shall forward such records to the National Institute for Occupational Safety and Health, Department of Health and Human Services. The employer shall also comply with any additional requirements set forth at 29 CFR 1910.20(h).

(5) In the event the employer ceases to do business:

(i) The successor employer shall receive and retain all dive and employee medical records required by this standard; or

(ii) If there is no successor employer, dive and employee medical records shall be forwarded to the National Institute for Occupational Safety and Health, Department of Health and Human Services.
[42 FR 37668, July 22, 1977, as amended at 45 FR 35281, May 23, 1980; 47 FR 14706, Apr. 6, 1982; 51 FR 34562, Sept. 29, 1986; 61 FR 9242, Mar. 7, 1996; 71 FR 16672, Apr. 3, 2006]

Appendix A to Subpart T to Part 1910—Examples of Conditions Which May Restrict or Limit Exposure to Hyperbaric Conditions

The following disorders may restrict or limit occupational exposure to hyperbaric conditions depending on severity, presence of residual effects, response to therapy, number of occurrences, diving mode, or degree and duration of isolation.

History of seizure disorder other than early febrile convulsions.

Malignancies (active) unless treated and without recurrence for 5 yrs.

Chronic inability to equalize sinus and/or middle ear pressure.

Cystic or cavitary disease of the lungs.

Impaired organ function caused by alcohol or drug use.

Conditions requiring continuous medication for control (e.g., antihistamines, steroids, barbiturates, moodaltering drugs, or insulin).

Meniere's disease.

Hemoglobinopathies.

Obstructive or restrictive lung disease.

Vestibular end organ destruction.

Pneumothorax.

Cardiac abnormalities (e.g., pathological heart block, valvular disease, intraventricular conduction defects other than isolated right bundle branch block, angina pectoris, arrhythmia, coronary artery disease).

Juxta-articular osteonecrosis.

Appendix B to Subpart T to Part 1910—Guidelines for Scientific Diving

This appendix contains guidelines that will be used in conjunction with §1910.401(a)(2)(iv) to determine those scientific diving programs which are exempt from the requirements for commercial diving. The guidelines are as follows:

1. The Diving Control Board consists of a majority of active scientific divers and has autonomous and absolute authority over the scientific diving program's operations.

2. The purpose of the project using scientific diving is the advancement of science; therefore, information and data resulting from the project are non-proprietary.

3. The tasks of a scientific diver are those of an observer and data gatherer. Construction and trouble-shooting tasks

traditionally associated with commercial diving are not included within scientific diving.

4. Scientific divers, based on the nature of their activities, must use scientific expertise in studying the underwater environment and, therefore, are scientists or scientists in training.
[50 FR 1050, Jan. 9, 1985]

Appendix C to Subpart T to Part 1910—Alternative Conditions Under §1910.401(a)(3) for Recreational Diving Instructors and Diving Guides (Mandatory)

Paragraph (a)(3) of §1910.401 specifies that an employer of recreational diving instructors and diving guides (hereafter, "divers" or "employees") who complies with all of the conditions of this appendix need not provide a decompression chamber for these divers as required under §§1910.423(b)(2) or (c)(3) or 1910.426(b)(1).

1. Equipment Requirements for Rebreathers

(a) The employer must ensure that each employee operates the rebreather (*i.e.,* semi-closed-circuit and closed-circuit self-contained underwater breathing apparatuses (hereafter, "SCUBAs")) according to the rebreather manufacturer's instructions.

(b) The employer must ensure that each rebreather has a counterlung that supplies a sufficient volume of breathing gas to their divers to sustain the divers' respiration rates, and contains a baffle system and/or other moisture separating system that keeps moisture from entering the scrubber.

(c) The employer must place a moisture trap in the breathing loop of the rebreather, and ensure that:

(i) The rebreather manufacturer approves both the moisture trap and its location in the breathing loop; and

(ii) Each employee uses the moisture trap according to the rebreather manufacturer's instructions.

(d) The employer must ensure that each rebreather has a continuously functioning moisture sensor, and that:

(i) The moisture sensor connects to a visual (*e.g.,* digital, graphic, analog) or auditory (*e.g.,* voice, pure tone) alarm that is readily detectable by the diver under the diving conditions in which the diver operates, and warns the diver of moisture in the breathing loop in sufficient time to terminate the dive and return safely to the surface; and

(ii) Each diver uses the moisture sensor according to the rebreather manufacturer's instructions.

(e) The employer must ensure that each rebreather contains a continuously functioning CO_2sensor in the breathing loop, and that:

(i) The rebreather manufacturer approves the location of the CO_2sensor in the breathing loop;

(ii) The CO_2sensor is integrated with an alarm that operates in a visual (*e.g.,* digital, graphic, analog) or auditory (*e.g.,* voice, pure tone) mode that is readily detectable by each diver under the diving conditions in which the diver operates; and

(iii) The CO_2alarm remains continuously activated when the inhaled CO_2level reaches and exceeds 0.005 atmospheres absolute (ATA).

(f) Before each day's diving operations, and more often when necessary, the employer must calibrate the CO_2sensor according to the sensor manufacturer's instructions, and ensure that:

(i) The equipment and procedures used to perform this calibration are accurate to within 10% of a CO_2concentration of 0.005 ATA or less;

(ii) The equipment and procedures maintain this accuracy as required by the sensor manufacturer's instructions; and

(iii) The calibration of the CO_2sensor is accurate to within 10% of a CO_2concentration of 0.005 ATA or less.

(g) The employer must replace the CO_2sensor when it fails to meet the accuracy requirements specified in paragraph 1 (f)(iii) of this appendix, and ensure that the replacement CO_2sensor meets the accuracy requirements specified in

paragraph 1(f)(iii) of this appendix before placing the rebreather in operation.

(h) As an alternative to using a continuously functioning CO_2sensor, the employer may use a schedule for replacing CO_2-sorbent material provided by the rebreather manufacturer. The employer may use such a schedule only when the rebreather manufacturer has developed it according to the canister-testing protocol specified below in Condition 11, and must use the canister within the temperature range for which the manufacturer conducted its scrubber canister tests following that protocol. Variations above or below the range are acceptable only after the manufacturer adds that lower or higher temperature to the protocol.

(i) When using CO_2-sorbent replacement schedules, the employer must ensure that each rebreather uses a manufactured (*i.e.,* commercially pre-packed), disposable scrubber cartridge containing a CO_2-sorbent material that:

(i) Is approved by the rebreather manufacturer;

(ii) Removes $CO_2$from the diver's exhaled gas; and

(iii) Maintains the CO_2level in the breathable gas (*i.e.,* the gas that a diver inhales directly from the regulator) below a partial pressure of 0.01 ATA.

(j) As an alternative to manufactured, disposable scrubber cartridges, the employer may fill CO_2scrubber cartridges manually with CO_2-sorbent material when:

(i) The rebreather manufacturer permits manual filling of scrubber cartridges;

(ii) The employer fills the scrubber cartridges according to the rebreather manufacturer's instructions;

(iii) The employer replaces the CO_2-sorbent material using a replacement schedule developed under paragraph 1(h) of this appendix; and

(iv) The employer demonstrates that manual filling meets the requirements specified in paragraph 1(i) of this appendix.

(k) The employer must ensure that each rebreather has an information module that provides:

(i) A visual (*e.g.,* digital, graphic, analog) or auditory (*e.g.,* voice, pure tone) display that effectively warns the diver of solenoid failure (when the rebreather uses solenoids) and other electrical weaknesses or failures (*e.g.,* low battery voltage);

(ii) For a semi-closed circuit rebreather, a visual display for the partial pressure of CO_2, or deviations above and below a preset CO_2partial pressure of 0.005 ATA; and

(iii) For a closed-circuit rebreather, a visual display for: partial pressures of $O_2$and CO_2, or deviations above and below a preset CO_2partial pressure of 0.005 ATA and a preset O_2partial pressure of 1.40 ATA or lower; gas temperature in the breathing loop; and water temperature.

(l) Before each day's diving operations, and more often when necessary, the employer must ensure that the electrical power supply and electrical and electronic circuits in each rebreather are operating as required by the rebreather manufacturer's instructions.

2. Special Requirements for Closed-Circuit Rebreathers

(a) The employer must ensure that each closed-circuit rebreather uses supply-pressure sensors for the $O_2$and diluent (*i.e.,* air or nitrogen) gases and continuously functioning sensors for detecting temperature in the inhalation side of the gas-loop and the ambient water.

(b) The employer must ensure that:

(i) At least two O_2sensors are located in the inhalation side of the breathing loop; and

(ii) The O_2sensors are: functioning continuously; temperature compensated; and approved by the rebreather manufacturer.

(c) Before each day's diving operations, and more often when necessary, the employer must calibrate O_2sensors as required by the sensor manufacturer's instructions. In doing so, the employer must:

(i) Ensure that the equipment and procedures used to perform the calibration are accurate to within 1% of the O_2fraction by volume;

(ii) Maintain this accuracy as required by the manufacturer of the calibration equipment;

(iii) Ensure that the sensors are accurate to within 1% of the O_2fraction by volume;

(iv) Replace O_2sensors when they fail to meet the accuracy requirements specified in paragraph 2(c)(iii) of this appendix; and

(v) Ensure that the replacement O_2sensors meet the accuracy requirements specified in paragraph 2(c)(iii) of this appendix before placing a rebreather in operation.

(d) The employer must ensure that each closed-circuit rebreather has:

(i) A gas-controller package with electrically operated solenoid O_2-supply valves;

(ii) A pressure-activated regulator with a second-stage diluent-gas addition valve;

(iii) A manually operated gas-supply bypass valve to add O_2or diluent gas to the breathing loop; and

(iv) Separate $O_2$and diluent-gas cylinders to supply the breathing-gas mixture.

3. O_2Concentration in the Breathing Gas
The employer must ensure that the fraction of O_2in the nitrox breathing-gas mixture:

(a) Is greater than the fraction of O_2in compressed air (*i.e.*, exceeds 22% by volume);

(b) For open-circuit SCUBA, never exceeds a maximum fraction of breathable $O_2$of 40% by volume or a maximum O_2partial pressure of 1.40 ATA, whichever exposes divers to less O_2; and

(c) For a rebreather, never exceeds a maximum O_2partial pressure of 1.40 ATA.

4. Regulating O_2Exposures and Diving Depth

(a) Regarding O_2exposure, the employer must:

(i) Ensure that the exposure of each diver to partial pressures of O_2between 0.60 and 1.40 ATA does not exceed the 24-hour single-exposure time limits specified either by the 2001 National Oceanic and Atmospheric Administration Diving Manual (the "2001 NOAA Diving Manual"), or by the report entitled "Enriched Air Operations and Resource Guide" published in 1995 by the Professional Association of Diving Instructors (known commonly as the "1995 DSAT Oxygen Exposure Table"); and

(ii) Determine a diver's O_2-exposure duration using the diver's maximum O_2exposure (partial pressure of O_2) during the dive and the total dive time (*i.e.*, from the time the diver leaves the surface until the diver returns to the surface).

(b) Regardless of the diving equipment used, the employer must ensure that no diver exceeds a depth of 130 feet of sea water ("fsw") or a maximum O_2partial pressure of 1.40 ATA, whichever exposes the diver to less O_2.

5. Use of No-Decompression Limits

(a) For diving conducted while using nitrox breathing-gas mixtures, the employer must ensure that each diver remains within the no-decompression limits specified for single and repetitive air diving and published in the 2001 NOAA Diving Manual or the report entitled "Development and Validation of No-Stop Decompression Procedures for Recreational Diving: The DSAT Recreational Dive Planner," published in 1994 by Hamilton Research Ltd. (known commonly as the "1994 DSAT No-Decompression Tables").

(b) An employer may permit a diver to use a dive-decompression computer designed to regulate decompression when the dive-decompression computer uses the no-decompression limits specified in paragraph 5(a) of this appendix, and provides output that reliably represents those limits.

6. Mixing and Analyzing the Breathing Gas
(a) The employer must ensure that:

(i) Properly trained personnel mix nitrox-breathing gases, and that nitrogen is the only inert gas used in the breathing-gas mixture; and

(ii) When mixing nitrox-breathing gases, they mix the appropriate breathing gas before delivering the mixture to the breathing-gas cylinders, using the continuous-flow or partial-pressure mixing techniques specified in the 2001 NOAA Diving Manual, or using a filter-membrane system.

(b) Before the start of each day's diving operations, the employer must determine the O_2fraction of the breathing-gas mixture using an O_2analyzer. In doing so, the employer must:

(i) Ensure that the O_2analyzer is accurate to within 1% of the O_2fraction by volume.

(ii) Maintain this accuracy as required by the manufacturer of the analyzer.

(c) When the breathing gas is a commercially supplied nitrox breathing-gas mixture, the employer must ensure that the O_2meets the medical USP specifications (Type I, Quality Verification Level A) or aviator's breathing-oxygen specifications (Type I, Quality Verification Level E) of CGA G–4.3–2000 (“Commodity Specification for Oxygen”). In addition, the commercial supplier must:

(i) Determine the O_2fraction in the breathing-gas mixture using an analytic method that is accurate to within 1% of the O_2fraction by volume;

(ii) Make this determination when the mixture is in the charged tank and after disconnecting the charged tank from the charging apparatus;

(iii) Include documentation of the O_2-analysis procedures and the O_2fraction when delivering the charged tanks to the employer.

(d) Before producing nitrox breathing-gas mixtures using a compressor in which the gas pressure in any system component exceeds 125 pounds per square inch (psi), the:

(i) Compressor manufacturer must provide the employer with documentation that the compressor is suitable for mixing high-pressure air with the highest O_2fraction used in the

nitrox breathing-gas mixture when operated according to the manufacturer's operating and maintenance specifications;

(ii) Employer must comply with paragraph 6(e) of this appendix, unless the compressor is rated for O_2service and is oil-less or oil-free; and

(iii) Employer must ensure that the compressor meets the requirements specified in paragraphs (i)(1) and (i)(2) of §1910.430 whenever the highest O_2fraction used in the mixing process exceeds 40%.

(e) Before producing nitrox breathing-gas mixtures using an oil-lubricated compressor to mix high-pressure air with O_2, and regardless of the gas pressure in any system component, the:

(i) Employer must use only uncontaminated air (*i.e.,* air containing no hydrocarbon particulates) for the nitrox breathing-gas mixture;

(ii) Compressor manufacturer must provide the employer with documentation that the compressor is suitable for mixing the high-pressure air with the highest O_2fraction used in the nitrox breathing-gas mixture when operated according to the manufacturer's operating and maintenance specifications;

(iii) Employer must filter the high-pressure air to produce O_2-compatible air;

(iv) The filter-system manufacturer must provide the employer with documentation that the filter system used for this purpose is suitable for producing O_2-compatible air when operated according to the manufacturer's operating and maintenance specifications; and

(v) Employer must continuously monitor the air downstream from the filter for hydrocarbon contamination.

(f) The employer must ensure that diving equipment using nitrox breathing-gas mixtures or pure O_2under high pressure (*i.e.,* exceeding 125 psi) conforms to the O_2-service requirements specified in paragraphs (i)(1) and (i)(2) of §1910.430.

7. Emergency Egress

(a) Regardless of the type of diving equipment used by a diver (*i.e.,* open-circuit SCUBA or rebreathers), the employer must ensure that the equipment contains (or incorporates) an open-circuit emergency-egress system (a "bail-out" system) in which the second stage of the regulator connects to a separate supply of emergency breathing gas, and the emergency breathing gas consists of air or the same nitrox breathing-gas mixture used during the dive.

(b) As an alternative to the "bail-out" system specified in paragraph 7(a) of this appendix, the employer may use:

(i) For open-circuit SCUBA, an emergency-egress system as specified in §1910.424(c)(4); or

(ii) For a semi-closed-circuit and closed-circuit rebreather, a system configured so that the second stage of the regulator connects to a reserve supply of emergency breathing gas.

(c) The employer must obtain from the rebreather manufacturer sufficient information to ensure that the bail-out system performs reliably and has sufficient capacity to enable the diver to terminate the dive and return safely to the surface.

8. Treating Diving-Related Medical Emergencies

(a) Before each day's diving operations, the employer must:

(i) Verify that a hospital, qualified health-care professionals, and the nearest Coast Guard Coordination Center (or an equivalent rescue service operated by a state, county, or municipal agency) are available to treat diving-related medical emergencies;

(ii) Ensure that each dive site has a means to alert these treatment resources in a timely manner when a diving-related medical emergency occurs; and

(iii) Ensure that transportation to a suitable decompression chamber is readily available when no decompression chamber is at the dive site, and that this transportation can deliver the injured diver to the

decompression chamber within four (4) hours travel time from the dive site.

(b) The employer must ensure that portable O_2equipment is available at the dive site to treat injured divers. In doing so, the employer must ensure that:

(i) The equipment delivers medical-grade O_2that meets the requirements for medical USP oxygen (Type I, Quality Verification Level A) of CGA G-4.3-2000 (“Commodity Specification for Oxygen”);

(ii) The equipment delivers this $O_2$to a transparent mask that covers the injured diver's nose and mouth; and

(iii) Sufficient $O_2$is available for administration to the injured diver from the time the employer recognizes the symptoms of a diving-related medical emergency until the injured diver reaches a decompression chamber for treatment.

(c) Before each day's diving operations, the employer must:

(i) Ensure that at least two attendants, either employees or non-employees, qualified in first-aid and administering O_2treatment, are available at the dive site to treat diving-related medical emergencies; and

(ii) Verify their qualifications for this task.

9. Diving Logs and No-Decompression Tables

(a) Before starting each day's diving operations, the employer must:

(i) Designate an employee or a non-employee to make entries in a diving log; and

(ii) Verify that this designee understands the diving and medical terminology, and proper procedures, for making correct entries in the diving log.

(b) The employer must:

(i) Ensure that the diving log conforms to the requirements specified by paragraph (d) (“Record of dive”) of §1910.423; and

(ii) Maintain a record of the dive according to §1910.440 (“Recordkeeping requirements”).

(c) The employer must ensure that a hard-copy of the no-decompression tables used for the dives (as specified in paragraph 6(a) of this appendix) is readily available at the dive site, whether or not the divers use dive-decompression computers.

10. Diver Training

The employer must ensure that each diver receives training that enables the diver to perform work safely and effectively while using open-circuit SCUBAs or rebreathers supplied with nitrox breathing-gas mixtures. Accordingly, each diver must be able to demonstrate the ability to perform critical tasks safely and effectively, including, but not limited to: recognizing the effects of breathing excessive $CO_2$and O_2; taking appropriate action after detecting excessive levels of $CO_2$and O_2; and properly evaluating, operating, and maintaining their diving equipment under the diving conditions they encounter.

11. Testing Protocol for Determining the CO_2Limits of Rebreather Canisters

(a) The employer must ensure that the rebreather manufacturer has used the following procedures for determining that the CO_2-sorbent material meets the specifications of the sorbent material's manufacturer:

(i) The North Atlantic Treating Organization CO_2absorbent-activity test;

(ii) The RoTap shaker and nested-sieves test;

(iii) The Navy Experimental Diving Unit (“NEDU”)-derived Schlegel test; and

(iv) The NEDU MeshFit software.

(b) The employer must ensure that the rebreather manufacturer has applied the following canister-testing materials, methods, procedures, and statistical analyses:

(i) Use of a nitrox breathing-gas mixture that has an O_2fraction maintained at 0.28 (equivalent to 1.4 ATA of O_2at

130 fsw, the maximum O_2concentration permitted at this depth);

(ii) While operating the rebreather at a maximum depth of 130 fsw, use of a breathing machine to continuously ventilate the rebreather with breathing gas that is at 100% humidity and warmed to a temperature of 98.6 degrees F (37 degrees C) in the heating-humidification chamber;

(iii) Measurement of the O_2concentration of the inhalation breathing gas delivered to the mouthpiece;

(iv) Testing of the canisters using the three ventilation rates listed in Table I below (with the required breathing-machine tidal volumes and frequencies, and CO_2-injection rates, provided for each ventilation rate):

Table I—Canister Testing Parameters

Ventilation rates (Lpm, ATPS[1])	**Breathing machine tidal volumes (L)**	**Breathing machine frequencies (breaths per min.)**	**CO_2injection rates (Lpm, STPD[2])**
22.5	1.5	15	0.90
40.0	2.0	20	1.35
62.5	2.5	25	2.25

[1]ATPS means ambient temperature and pressure, saturated with water.
[2]STPD means standard temperature and pressure, dry; the standard temperature is 32 degrees F (0 degrees C).

(v) When using a work rate (*i.e.*, breathing-machine tidal volume and frequency) other than the work rates listed in the table above, addition of the appropriate combinations of ventilation rates and CO_2-injection rates;

(vi) Performance of the CO_2injection at a constant (steady) and continuous rate during each testing trial;

(vii) Determination of canister duration using a minimum of four (4) water temperatures, including 40, 50, 70, and 90 degrees F (4.4, 10.0, 21.1, and 32.2 degrees C, respectively);

(viii) Monitoring of the breathing-gas temperature at the rebreather mouthpiece (at the “chrome T” connector), and ensuring that this temperature conforms to the temperature of a diver's exhaled breath at the water temperature and ventilation rate used during the testing trial;[1]

[1] NEDU can provide the manufacturer with information on the temperature of a diver's exhaled breath at various water temperatures and ventilation rates, as well as techniques and procedures used to maintain these temperatures during the testing trials.

(ix) Implementation of at least eight (8) testing trials for each combination of temperature and ventilation-CO_2-injection rates (for example, eight testing trials at 40 degrees F using a ventilation rate of 22.5 Lpm at a CO_2-injection rate of 0.90 Lpm);

(x) Allowing the water temperature to vary no more than ± 2.0 degrees F (± 1.0 degree C) *between* each of the eight testing trials, and no more than ± 1.0 degree F (± 0.5 degree C) *within* each testing trial;
(xi) Use of the average temperature for each set of eight testing trials in the statistical analysis of the testing-trial results, with the testing-trial results being the time taken for the inhaled breathing gas to reach 0.005 ATA of CO_2(*i.e.,* the canister-duration results);

(xii) Analysis of the canister-duration results using the repeated-measures statistics described in NEDU Report 2–99;

(xiii) Specification of the replacement schedule for the CO_2-sorbent materials in terms of the lower prediction line (or limit) of the 95% confidence interval; and

(xiv) Derivation of replacement schedules only by interpolating among, but not by extrapolating beyond, the depth, water temperatures, and exercise levels used during canister testing.
[69 FR 7363, Feb. 17, 2004]

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DIVING SAFE PRACTICES MANUAL

ATTACHMENT 1.2

U.S. NAVY TABLE OF NO-DECOMPRESSION LIMITS AND REPETITIVE GROUP DESIGNATION FOR NO-DECOMPRESSION AIR DIVES

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Table 9-7. *No-Decompression Limits and Repetitive Group Designators for No-Decompression Air Dives.*

Depth (fsw)	No-Stop Limit	Repetitive Group Designation															
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Z
10	Unlimited	57	101	158	245	426	*										
15	Unlimited	36	60	88	121	163	217	297	449	*							
20	Unlimited	26	43	61	82	106	133	165	205	256	330	461	*				
25	595	20	33	47	62	78	97	117	140	166	198	236	285	354	469	595	
30	371	17	27	38	50	62	76	91	107	125	145	167	193	223	260	307	371
35	232	14	23	32	42	52	63	74	87	100	115	131	148	168	190	215	232
40	163	12	20	27	36	44	53	63	73	84	95	108	121	135	151	163	
45	125	11	17	24	31	39	46	55	63	72	82	92	102	114	125		
50	92	9	15	21	28	34	41	48	56	63	71	80	89	92			
55	74	8	14	19	25	31	37	43	50	56	63	71	74				
60	60	7	12	17	22	28	33	39	45	51	57	60					
70	48	6	10	14	19	23	28	32	37	42	47	48					
80	39	5	9	12	16	20	24	28	32	36	39						
90	30	4	7	11	14	17	21	24	28	30							
100	25	4	6	9	12	15	18	21	25								
110	20	3	6	8	11	14	16	19	20								
120	15	3	5	7	10	12	15										
130	10	2	4	6	9	10											
140	10	2	4	6	8	10											
150	5	2	3	5													
160	5		3	5													
170	5			4	5												
180	5			4	5												
190	5			3	5												

* Highest repetitive group that can be achieved at this depth regardless of bottom time.

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ATTACHMENT 2
PERSONNEL SCUBA AND SNORKELING CERTIFICATIONS (NOTE: THIS ATTACHMENT WILL BE COMPLETE ONCE THE DIVE TEAM HAS BEEN IDENTIFIED).

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ATTACHMENT 3
AIR SOURCE CERTIFICATION

This attachment contains the SCUBA Air Source Clean Air Certification

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TRI Air Testing, Inc.
A Texas Research International Company
1607 N. Cuernavaca Drive, Suite 500
Austin, Texas 78733-1600
(512)263-2101 (800)880-8378 FAX:(512)263-7039
http://www.airtesting.com

Laboratory Report
Compressed Air/Gas Quality Testing

CULEBRA DIVERS
ATTN WALTER RIEDER
P.O. BOX 474
CULEBRA, PR 00775

ANALYSIS RESULTS

Report Number: 225014 - 0 **Report Date:** 06/04/14 **Customer No:** A010323 - 1
Air/Gas Source: BAUER DMT08 E123060 **Order Number:** 67378
Air/Gas Sampled From: COMPRESSED AIR SYSTEM **Sample Date:** 05/29/14
Compared to Air/Gas Specification: CGA G-7.1 GRADE E 2011 EDITION **Date Received:** 06/03/14
Date Analyzed: 06/03/14

ANALYTE	SOURCE AIR/GAS	ANALYTE RESULTS	SPECIFICATION LIMITS	AMBIENT AIR/GAS	REPORTING LIMITS*
Oxygen (Volume %)	**20.5**	**PASS**	**20-22**	N/A	0.5
Carbon Monoxide (ppmv)	**< 1**	**PASS**	**10**	N/A	1
Total Gaseous Hydrocarbons including Methane (ppmv)	**7.7**	**PASS**	**25**	N/A	1
Methane (ppmv)	**1.8**	**N/A**	**N/A**	N/A	1
Total Gaseous Hydrocarbons excluding Methane (ppmv)	**5.9**	**N/A**	**N/A**	N/A	1
Carbon Dioxide (ppmv)	**394**	**PASS**	**1000**	N/A	25
Oil Mist & Particulate [COM:133] (mg/m3)	**1.4**	**N/A**	**N/A**	N/A	0.1
Oil Mist (mg/m3)	**COM:133**	**PASS**	**5**	N/A	N/A
Particulate (mg/m3)	**COM:133**	**N/A**	**N/A**	N/A	N/A
Odor (Pronounced)	**NO**	**PASS**	**NO**	N/A	N/A

N/A = Not Applicable
COM:133 Oil Mist and Particulate quantitative results are reported as a combined amount until the value approaches the Specification Limits.

>>> YOUR SAMPLE IS WITHIN SPECIFICATIONS <<<

Analyzed By: ROBERT HOOK LYLA HOLLOWAY
Using: 70SOP-41 REV14 GC: 70-09, 70SOP-36 REV8 BALANCE: 70-03 (TRI AC: 06)
Sample Media: S B: 30007 A B: Filter: X13704
* Reporting Limit is the lowest concentration at which an analyte can be detected in a sample and its concentration can be reported with a reasonable degree of accuracy and precision.

OSHA1910.134 requires a dew point: 1)lower than -50 degrees F (67ppm) in purchased cylinders of breathing air or 2)for compressor supplied breathing air at least 10 degrees F below the ambient temperature. Although the presence of particulate matter is not applicable to this air specification the user should determine if particulate matter could cause problems.

AIHA LAP, LLC ACCREDITED LABORATORY INDUSTRIAL HYGIENE ISO/IEC 17025:2005 www.aihaaccreditedlabs.org LAB #101505

Ed Golla, Ph.D., Laboratory Director

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APPENDIX M. VSP CALCULATIONS

This appendix contains a copy of the VSP calculations for MRS 07.

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Transect Sampling for Unexploded Ordnance (UXO) Target Detection

Summary

This report summarizes the probability of traversing and detecting a target area of specific size and shape for different transect spacings. Simulation details and a power curve estimate how well the specified design would detect the target. The selected design statement is:

If 1 meter wide transects with a parallel pattern are spaced 50 meters between transects (51 meters on centers) over the entire site, these transects have an approximately 90% chance of traversing and detecting any 300 foot diameter (150 foot radius) circular target area having a bivariate normal distribution with an average density of 200 anomalies per acre above the background density of 25 anomalies per acre. This assumes the instrument false negative rate is 0% and flagged windows have at least 95% confidence they have density greater than background.

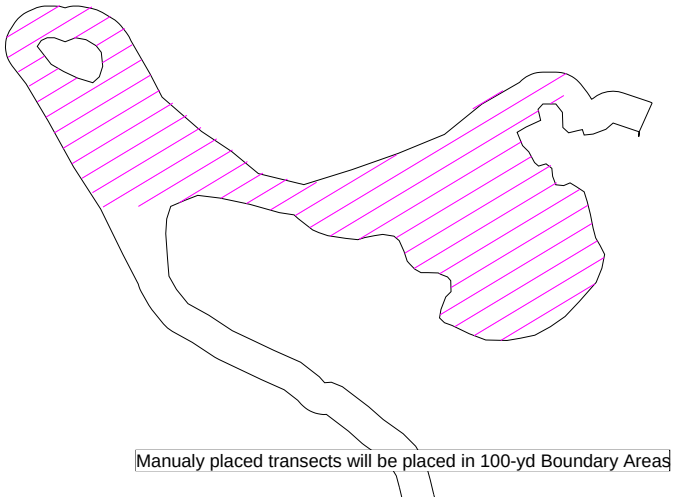
The following table summarizes the sampling design developed. A figure that shows the transect placement in the field and a table that lists the transect placement coordinates are also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Ensure high probability of traversing and detecting a target area that has a specified size and shape
Required Probability of Traversing the Target	100%
TARGET AREA AND TRANSECT INPUTS	
Type of Sampling Design	**Transects**
Transect Pattern	**Parallel**
Transect Width	**1 meters**
Target Area Definition	**User Specified**
Area of target area	**70685.83 ft^2**
Shape of target area of concern	**Circular**
Radius of target area of concern	**150 feet**
SIMULATION PARAMETERS FOR PROBABILITY OF DETECTION	
Formula for calculating the probability of traversing and detecting target area	Monte Carlo Simulation (method described below)
Decision Rule	Flag if at least 95% confident an area has density greater than background density
Background Density of the Site	25 anomalies / acre
Expected Target Area Density Above Background	200 anomalies / acre Target average
Distribution of target area density above background	Bivariate Normal
Transect spacing evaluation range	25 to 50 meters
Instrument false negative rate	0%
Minimum precision	0.1
Maximum error	0.05
Search Window Diameter	58 meters
PROPOSED TRANSECT DESIGN AND COST INFORMATION	
Number of selected sample areas [a]	1
Specified sampling area [b]	141.75 acres
Computed spacing between transects	50 meters
Computed spacing between	51 meters

transect centers	
Number of transects to be surveyed	35
Transect Coverage	1.95% of total site area
Linear transect coverage	11.17 km
Area of transect coverage	2.7608 acres
Total cost of sampling [c]	$15,672.69

[a] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[b] The sampling area is the total surface area of the selected colored sample areas on the map of the site.
[c] See the Cost of Sampling section for an explanation of the costs presented here.

Site Map With Proposed Transect Design



Summary of Transect Survey Design for Area: Culibrita Modified								
(All measurements are in meters)								
Start Coordinate		End Coordinate		Transect				
X	Y	X	Y	Width	Length	ID	Seq	Label
264410.6538	2026792.1101	264681.4456	2026954.8182	1.0000	315.9147	0	0	
264334.0492	2026805.5797	264707.5416	2027029.9965	1.0000	435.7287	0	0	
264277.9632	2026831.3781	264688.7649	2027078.2127	1.0000	479.2550	0	0	
264235.8856	2026865.5936	264673.4891	2027128.5323	1.0000	510.5229	0	0	
264267.2212	2026943.9202	264662.0213	2027181.1401	1.0000	460.5870	0	0	
264234.5846	2026983.8085	264637.7439	2027226.0510	1.0000	470.3390	0	0	
264161.1121	2026999.1601	264571.3242	2027245.6404	1.0000	478.5671	0	0	
264134.2312	2027042.5067	264554.9518	2027295.3012	1.0000	490.8267	0	0	

264108.9224	2027086.7979	264498.8398	2027321.0840	1.0000	454.8907	0	0	
264002.8975	2027082.5901	264471.4971	2027364.1531	1.0000	546.6840	0	0	
263919.5462	2027092.0059	264520.2881	2027452.9680	1.0000	700.8456	0	0	
264553.5741	2027472.9683	264592.1278	2027496.1337	1.0000	44.9780	0	0	
263860.9259	2027116.2815	264598.9857	2027559.7526	1.0000	861.0452	0	0	
263818.7077	2027150.4126	264111.8652	2027326.5594	1.0000	342.0073	0	0	
264330.3897	2027457.8622	264417.0567	2027509.9370	1.0000	101.1086	0	0	
263747.1254	2027166.8999	263880.6001	2027247.0996	1.0000	155.7160	0	0	
263679.0873	2027185.5168	263796.7179	2027256.1964	1.0000	137.2318	0	0	
263605.6159	2027200.8690	263726.1216	2027273.2762	1.0000	140.5860	0	0	
263486.2414	2027188.6399	263681.7252	2027306.0984	1.0000	228.0579	0	0	
263368.2795	2027177.2596	263638.5679	2027339.6652	1.0000	315.3275	0	0	
263266.3062	2027175.4861	263592.9467	2027371.7515	1.0000	381.0697	0	0	
263235.9607	2027216.7510	263547.7907	2027404.1173	1.0000	363.7913	0	0	
263205.9939	2027258.2434	263507.3786	2027439.3336	1.0000	351.6054	0	0	
263176.2521	2027299.8710	263466.9664	2027474.5499	1.0000	339.1571	0	0	
263151.2092	2027344.3221	263429.7685	2027511.6974	1.0000	324.9766	0	0	
263126.1664	2027388.7731	263403.5292	2027555.4295	1.0000	323.5808	0	0	
263101.4928	2027433.4460	263376.7875	2027598.8598	1.0000	321.1680	0	0	
263077.5650	2027478.5671	263191.5249	2027547.0411	1.0000	132.9495	0	0	
263264.3198	2027590.7807	263349.9684	2027642.2436	1.0000	99.9205	0	0	
263053.6372	2027523.6881	263137.7446	2027574.2249	1.0000	98.1226	0	0	
263246.3280	2027639.4684	263328.5429	2027688.8681	1.0000	95.9147	0	0	
263022.7628	2027564.6352	263098.4064	2027610.0864	1.0000	88.2484	0	0	
263182.2809	2027660.4833	263287.3557	2027723.6187	1.0000	122.5838	0	0	
262993.4862	2027606.5424	263234.2314	2027751.1966	1.0000	280.8613	0	0	
262988.7523	2027663.1962	263141.7733	2027755.1405	1.0000	178.5194	0	0	

Primary Sampling Objective
The primary purpose of sampling at this site is to traverse and detect target areas of a given size and shape with required high probability. The transect design tools provide a statistically defensible method to use transect survey data that covers only a small proportion of the total study area.

Selected Sampling Approach
The specified sampling approach was random parallel transect sampling. If parameters change from those specified in the table above, then the probability of detecting the target area will be different from those computed by VSP and reported here.

Simulation Details
To generate an estimated probability on a graph, VSP runs a Monte Carlo simulation based on the entered parameters. For each iteration, VSP creates a square site with the target area centered at the origin and rotated at a random angle. A parallel transect pattern is placed randomly so that 1 meters wide transects are parallel to the x axis.

VSP calculates the total area of the site traversed by transects, A_b, which can vary for each iteration. The expected number of detected background anomalies, λ_b, is calculated as $\lambda_b = D_b A_b (1 - P_{fn})$ where D_b is the background density of 25 anomalies / acres and P_{fn} is the instrument false negative rate of 0. A random number of detected background anomalies is generated using a Poisson distribution with parameter λ_b. VSP randomly places these anomalies within the traversed areas of the site.

To simulate the number of additional anomalies in the target area, VSP uses an approximation technique to randomly place additional detected anomalies in the traversed areas of the target area. Portions of transects overlapping the target area are divided into small sections. For each section, the quantile of the target area in which it lies is determined, the expected number of additional anomalies is determined, and a random number of detected anomalies is determined using a Poisson distribution and placed within the section.

VSP uses a moving window along each transect to determine which areas have density significantly greater than background density. The window moves 1/6 of the search window diameter for each iteration. Where D_a is the actual density for the current window, the null and alternative hypotheses for determining if the area inside the window has density significantly greater than background density, D_b, are as follows:

Null Hypothesis: $H_o : D_a \leq D_b$

Alternative Hypothesis: $H_a : D_a > D_b$

VSP checks each window to see if the actual number of detected anomalies is significantly greater than the expected number of anomalies for a Poisson distribution. If any windows intersecting the target area are flagged as significant, then we determine the target area has been detected.

250 iterations are run to begin the simulation to estimate a probability of detection. If the specified Maximum Error has not been achieved, additional iterations are run until the Maximum Error is met. If the total number of iterations is *n* and the proportion of target areas detected is *p*, then another iteration is run if

Maximum Error < $1.96 * \sqrt{\frac{p(1-p)}{n}}$

The quantity $1.96 * \sqrt{\frac{p(1-p)}{n}}$ is the 95th percentile of the standard error of the mean for a binomial distribution. We are 95% certain that the estimated probability is close to the true probability (within the maximum error). When all iterations are completed, VSP tabulates the estimated probability the target area has been detected, *p* / *n*. VSP repeats this process for a number of transect spacings determined by simulation results and the minimum precision specified.

APPENDIX N. CORALS LISTING

This appendix contains a copy of the NOAA Fisheries' Corals Listing press release dated August 27, 2014 and the NOAA Fisheries' Fact Sheet.

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NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
UNITED STATES DEPARTMENT OF COMMERCE

Contact: Connie Barclay/Jennie Lyons
301-427-8029/8013
Kim Amendola, SE Region
727-403-6533
Wende Goo, Pacific Islands Region
808-725-5020

FOR IMMEDIATE RELEASE
August 27, 2014

NOAA lists 20 coral species as threatened under the Endangered Species Act

NOAA announced today it will afford Endangered Species Act protections to 20 coral species. All 20 species will be listed as threatened, none as endangered. Fifteen of the newly listed species occur in the Indo-Pacific and five in the Caribbean.

“Coral reefs are one of the most biologically diverse ecosystems on earth, providing habitat for many marine species. Protecting and conserving these biologically rich ecosystems is essential, and the Endangered Species Act gives us the tools to conserve and recover those corals most in need of protection,” commented Eileen Sobeck, assistant administrator for NOAA Fisheries. “The final decision is a result of the most extensive rulemaking ever undertaken by NOAA. The amount of scientific information sought, obtained and analyzed was unprecedented.”

Today’s announcement is a significant change from the proposed rule in November 2012. Since that time, many new scientific papers on climate change and coral habitat, distribution and abundance were published so that NOAA was able to consider and incorporate new information into the final decision. NOAA also considered extensive public comments as part of the final rule making. The new information provided after the proposed rule was published strengthened the body of species-specific information available to NOAA for its final determination. The new information also improved the agency’s understanding of coral habitat diversity, abundance, distribution and species-specific exposure to threats and their relative vulnerability or resilience.

“We want to thank our stakeholders and partners for their strong participation at each step of this process, and we look forward to working with the states, territories, commonwealths, local governments and all our stakeholders and partners to conserve these coral species and ensure they remain for future generations to enjoy,” said Sobeck.

NOAA will continue to work with communities to help them understand how the agency’s decision may or may not affect them. The tools available under the Endangered Species Act are sufficiently flexible so that they can be used for partnerships with coastal jurisdictions, in a manner that will allow activity to move forward in a way that does not jeopardize listed coral. Currently no prohibitions exist relating to the newly listed species.

Coral reefs are critical to the health of marine ecosystems, and they face severe threats. Coral reefs world-wide have declined significantly—some individual species have declined by at least 90 percent. Healthy coral reefs provide shoreline protection for coastal communities and habitat for a variety of species, including commercially important fish. These benefits are lost when corals are degraded.

As part of this rule-making process, NOAA identified a number of threats to coral ecosystems. Some of the most serious threats include: impacts related to climate change (rising ocean temperatures, ocean acidification and disease), ecological effects of fishing, and poor land-use practices.

NOAA will work with partners on mitigation measures and recovery plans for the newly listed corals. These will likely include approaches that have shown success elsewhere, such as watershed management, to address land-based sediment pollution in the U.S. Virgin Islands and Hawaii, and restoration efforts in the Southeast where NOAA and partners are transplanting corals grown in nurseries to help recover degraded reefs.

More information about the final rule and rule-making process can be found here: www.fisheries.noaa.gov/stories/2014/08/corals_listing.html

NOAA's mission is to understand and predict changes in the Earth's environment, from the depths of the ocean to the surface of the sun, and to conserve and manage our coastal and marine resources. Join us on Facebook: https://www.facebook.com/NOAA , Twitter and our other social media channels.

-30-

NOAA FISHERIES

NOAA Lists 20 New Corals as Threatened Under the Endangered Species Act

Orbicella faveolata

In total, 22 species of coral are now protected under the Endangered Species Act, including the two corals (elkhorn and staghorn) listed as threatened in 2006. Fifteen of the newly listed species occur in the Indo-Pacific and five in the Caribbean (see table on reverse for details). None are found in Hawaii.

Protecting and conserving biologically diverse coral reefs is essential. The Endangered Species Act gives us some important tools to conserve and recover those corals most in need of protection. The final decision to list these 20 corals is a result of the most extensive rulemaking ever undertaken by NOAA. The amount of scientific information sought, obtained, and analyzed was unprecedented. This information included general reef-building coral biology, habitat characteristics and threats, as well as species-specific spatial, demographic, and other information for the individual coral species in the final rule.

The final decision is a significant change from the proposed rule in November 2012, which proposed listing 66 species (a mix of threatened and endangered). We changed our determinations for many of the species for two general reasons:

- We received and gathered new general and species specific information.
- Public comments helped us refine the way we apply all the available information to determine vulnerability to extinction of each species considered.

Acropora globiceps

What happens next?

- There are currently no prohibitions relating to individual conduct, except for those related to the two previously listed elkhorn and staghorn corals in the Caribbean.
- We will consult with federal agencies on actions that they execute, fund, or authorize that "may affect" listed corals to ensure the action does not jeopardize the continued existence of these corals.
- In the future, we may also identify specific regulations for the conservation of these *threatened* species, because ESA prohibitions against "take" are not automatically applied as they are for species listed as *endangered*.
- We will continue to work with communities to help them understand how the agency's decision may or may not affect them. The tools available under the Endangered Species Act are sufficiently flexible so that they can be used partnership with coastal jurisdictions, in a manner that will allow activity to move forward in a way that does not jeopardize listed coral.
- We will now work with partners on mitigation measures and recovery strategies for the newly listed corals, building from approaches that have shown success elsewhere.

For more information—www.fisheries.noaa.gov/stories/2014/08/corals_listing.html

Threatened Corals	Currently Known in These U.S. Geographic Areas			
Caribbean Waters	**Florida - Atlantic**	**Puerto Rico**	**U.S. Virgin Islands**	**Gulf of Mexico**
*Acropora cervicornis (Staghorn)**	X	X	X	
*Acropora palmata (Elkhorn)**	X	X	X	X
Mycetophyllia ferox	X	X	X	X
Dendrogyra cylindrus	X	X	X	
Orbicella annularis	X	X	X	X
Orbicella faveolata	X	X	X	X
Orbicella franksi	X	X	X	X
Pacific Waters	**Guam**	**Commonwealth of Northern Mariana Islands**	**Pacific Remote Island Areas**	**American Samoa**
Acropora globiceps	X	X	X	X
Acropora jacquelineae				X
Acropora lokani				
Acropora pharaonis				
Acropora retusa	X		X	X
Acropora rudis				X
Acropora speciosa			X	X
Acropora tenella				
Anacropora spinosa				
Euphyllia paradivisa				X
Isopora crateriformis				X
Montipora australiensis				
Pavona diffluens	X	X		X
Porites napopora				
Seriatopora aculeata	X			

* Listed as threatened in 2006

About Coral Reefs

Coral reefs are critical to the health of marine ecosystems and they face severe threats. Coral reefs world-wide have declined significantly—some individual species have declined by up to 90 percent. Healthy coral reefs provide shoreline protection for coastal communities and habitat for a variety of species, including commercially important fish. These benefits are lost when corals are degraded.

As part of this rule-making process, NOAA identified a number of threats to coral ecosystems, some of the most serious of which are: impacts related to climate change (rising ocean temperatures, ocean acidification, and disease), ecological effects of fishing, and poor land-use practices.

For more information—www.fisheries.noaa.gov/stories/2014/08/corals_listing.html