Munitions Response Work Plan

Environmental Baseline Study

Culebra Island Site, Puerto Rico

Contract No. W912DY-04-D-0006
Task Order No. 0022

Prepared For
U.S. Army Engineering & Support Center, Huntsville

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

Prepared By
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Final

12 October 2012

USA Environmental, Inc.

FINAL WORK PLAN
Environmental Baseline Survey
Culebra Island, Puerto Rico
Contract No. W912DY-04-D-0006; Task Order No. 0022
12 October 2012

U.S. Army Corps of Engineers,
Jacksonville

The following table lists the Environmental Baseline Study, Culebra Island Site, PR Work Plan change pages that have been incorporated per Regulator Review Comments.

REVISION HISTORY

Page	Action (Replace, Remove, Insert)	Date
Cover Sheet	Replace	12 October 2012
Page viii	Replace	12 October 2012
Page 1-1	Replace	12 October 2012
Page 1-7 through 1-8	Replace	12 October 2012
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Page 4-15	Replace	12 October 2012
Page 7-1 through 7-8	Replace	12 October 2012
Page F-1	Replace	12 October 2012
Appendix F: Accident Investigation Instruction (ENG Form 3394)	Insert (8 pages)	12 October 2012
Appendix N: Page 1 through 3	Replace	12 October 2012
Appendix N: Page 9 through 10	Replace	12 October 2012

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12 October 2012

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ACRONYMS AND ABBREVIATIONS

AHA	Activity Hazard Plan
APP	Accident Prevention Plan
ASI	Aqua Survey Inc.
ASR	Archives Search Report
BSI	Blind Seed Item
EBSR	Environmental Baseline Survey Report
CDSQ	Corporate Director of Safety and Quality
CESAJ	USACE Jacksonville District
CFR	Code of Federal Regulation
DID	Data Item Description
DDESB	Department of Defense Explosives Safety Board
DFW	Definable Feature of Work
DGPS	Differential GPS
DMM	Discarded Military Munitions
DN	Deficiency Notice
DNER	Department of Natural and Environmental Resources
DA	Department of the Army
DoD	Department of Defense
DQO	Data Quality Objective
EE/CA	Engineering Evaluation/Cost Analysis
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
EPP	Environmental Protection Plan
EQB	Environmental Quality Board
ESA	Endangered Species Act
ESCA	Endangered Species Conservation Act
EZ	Exclusion Zone
FSW	Feet of Salt Water
FUDS	Formerly Used Defense Site
GIS	Geographical Information System
GPS	Global Positioning System
GSA	General Services Administration
HE	High Explosive
HTRW	Hazardous, Toxic, and Radioactive Waste
IAW	In Accordance With
IHO	International Hydrographic Organization
ISO	Industry Standard Object
LLP	Lessons Learned Program
MBS	Multibeam Bathometry Survey
MC	Munitions Constituents
MEC	Munitions and Explosives of Concern

MRS	Munitions Response Site
NATO	North Atlantic Treaty Organization
NAUI	National Association of Underwater Instructors
NOAA	National Oceanic and Atmospheric Administration
NWRS	National Wildlife Refuge System
OSHA	Occupational Safety and Health Administration
PADI	Professional Association of Diving Instructors
PDA	Personal Digital Assistant
PLS	Professional Licensed Surveyor
PM	Project Manager
POC	Point of Contact
PPE	Personal Protective Equipment
PR	Puerto Rico
QC	Quality Control
QCP	Quality Control Plan
RAB	Restoration Advisory Board
RI/FS	Remedial Investigation/Feasibility Study
ROV	Remotely Operated Vehicle
RTK-DGPS	real-time kinematic differential GPS
SI	Site Inspection
SS	Snorkeling Supervisor
SSHP	Site Health and Safety Plan
SP	Snorkeling Plan
SOP	Standard Operating Procedure
SSS	Side Scan Sonar
Team Leader	Senior UXO Supervisor
TIFF	Tagged Image File Format
TM	Technical Manager
TP	Technical Paper
TPP	Technical Project Planning
USACE	U.S. Army Corps of Engineers
USAESCH	U.S. Army Engineering and Support Center, Huntsville
USA	USA Environmental, Incorporated
USCG	United States Coast Guard
USFWS	U.S. Fish and Wildlife Service
UXO	Unexploded Ordnance
UXOQCS	Unexploded Ordnance Quality Control Specialist
UXOSO	Unexploded Ordnance Safety Officer
UXOTIII	Unexploded Ordnance Technician III
WP	Work Plan

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1.0 INTRODUCTION

1.1 PROJECT AUTHORIZATION

USA Environmental (USA) has prepared this Environmental Baseline Survey Work Plan (WP) for Culebra Island, Puerto Rico (PR) (Formerly Used Defense Site [FUDS] Project Number I02PR0068) under Contract No: W912DY-04-D-0006 Task Order No. 0022, from the U.S. Army Corps of Engineers, Engineering and Support Center, Huntsville (USAESCH).

1.2 PURPOSE AND SCOPE

The primary purpose and scope is to perform an in-depth study designed to gather the data necessary to determine the underwater (U/W) habitat within the Culebra Island Munitions Response Sites (MRSs) 09 and 13 (water areas). This WP has been prepared to address the water portions of MRSs 09 and 13.

This WP outlines the following field activities:

1. Phase IA: Hydrographic Surveys (Deployment of Multi-beam Bathymetry and Side Scan Sonar systems)
2. Phase IB: Underwater Visual Survey (U/W Video/still camera systems and snorkeling)

All activities involving work in areas potentially containing Munitions and Explosives of Concern (MEC) hazards will be conducted in full compliance with U.S. Army Engineering and Support Center, Huntsville (USAESCH), U.S. Army Corps of Engineers (USACE), Department of the Army (DA), and Department of Defense (DoD) requirements regarding personnel, equipment, and procedures, and with Occupational Safety and Health Administration (OSHA) Standard 29 Code of Federal Regulation (CFR) Part 1910.

1.3 WORK PLAN ORGANIZATION

1.3.1 GUIDANCE DOCUMENTS

This Work Plan (WP) follows the directions of Data Item Description (DID) MMRP-09-001, Work Plans. DIDs followed in the preparation of the WP and sub plans are listed in Table 1-1.

Table 1-1: Data Item Descriptions

DID	DID Title
MMRP-09-001	Work Plans
MMRP-09-004	Geophysics
MMRP-09-005	Accident Prevention Plan
MMRP-09-007	Geospatial Information and Electronic Submittals
MMRP-09-011	Accident / Incident Reports
MMRP-09-012	Personnel Qualifications Certification Letter
MMRP-09-014	Reports / Minutes, Record of Meeting
MMRP-09-015	Telephone Conversations / Correspondence Records
MMRP-09-016	Project Status Report

1.3.2 WP ORGANIZATION

This Work Plan has been divided into Chapters 1 through 11 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 1-2: 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 hydrographic, underwater visual surveys, 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	An Explosives Management Plan is not required for the Environmental Baseline Survey field work.
6	Explosives Siting Plan	This reference document is not required for this project.
7	Environmental Protection Plan	Describes the approach, methods and operational procedures that will be employed during onsite activities to protect the natural environment.
8	Property Management Plan	This chapter is not used. The Property Management Plan is not required for this Task Order.
9	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.
10	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.
11	References	Citation of documents referenced within this Work Plan

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The following appendices are included in this WP:

APPENDIX A	Task Order Performance Work Statement
APPENDIX B	Site Maps
APPENDIX C	Local Points of Contact
APPENDIX D	Accident Prevention Plan
APPENDIX E	Reserved
APPENDIX F	USA Forms
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1.4 PROJECT LOCATION

Project location is Culebra Island, Munition Response Sites (MRS) 09 and 13, approximately 17 miles east of the main island of Puerto Rico and also includes surrounding islands Cayo Luis Peña (MRS 13), located approximately three-quarter mile off the western coast of Culebra Island and Soldado Point (MRS 09), located on the southern peninsula of Culebra Island.

1.5 SITE DESCRIPTION

1.5.1 LOCATION

Site location is described in section 1.4 and shown in Figure 1-1.

1.5.2 TOPOGRAPHY

Culebra Island and the surrounding cays are comprised of sandy beaches, irregular rugged coastlines, lagoons, coastal wetlands, steep mountains, and narrow valleys. Ninety percent of the island is mountainous. The highest point on Culebra is Mount Resaca at approximately 630 feet above sea level.

Culebra Island is 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 Luis Peña (MRS 13) is comprised of sandy beaches, irregular rugged coastlines and steep mountains. A peak of 476 feet above sea level is located in the center of the Cayo and a smaller peak of 171 feet above sea level exists on the northern peninsular of the Cayo.

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 inches. The months of August through November are considered the

wet season, and the driest months are January through April. Yearly average daily temperatures average 80°F year round with an average maximum of 86°F and 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 from June through November, and severe hurricanes hit Culebra every 10 to 20 years. The yearly average rainfall for Culebra is provided in Table 1-3.

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

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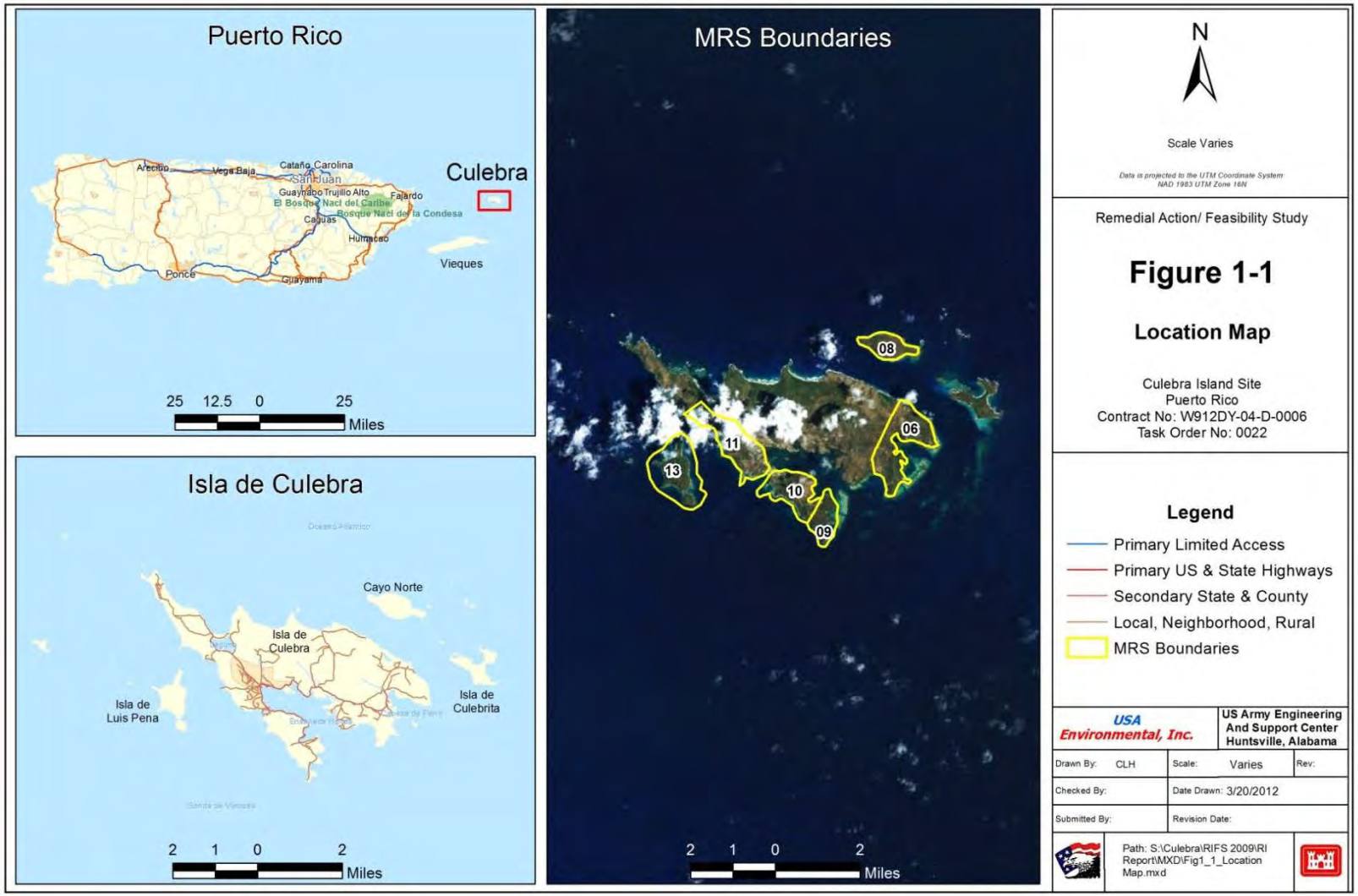

Figure 1-1: Location Map of Culebra, PR and MRS Boundaries

1.5.4 SENSITIVE ENVIRONMENTS

The main island of Puerto Rico and its associated islands support 75 federally listed threatened and endangered species consisting of 26 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, such as migratory birds. Of the 75 federally listed species, nine are known or are suspected to occupy Culebra Island and/or the associated cays. In addition to the federally listed species, 13 state-listed species are known to occupy Culebra Island and/or the associated cays. The federally and state-listed species includes both terrestrial and marine life. The federally listed species of most concern for the wildlife refuge are the, brown pelican, green sea turtle, hawksbill sea turtle, leatherback sea turtle, and loggerhead sea turtle. Due to declining populations, the elkhorn and staghorn corals in the surrounding waters are proposed to be federally listed threatened and endangered species.

According to the National Wildlife Refuge System (NWRS), portions of Culebra Island and 22 of the associated cays are considered National Wildlife Refuge area. The three largest cayos are Culebrita, Cayo Norte, and 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 cays are primarily solid rock with sparse or no vegetation. A few of the smaller cays have small beaches; however, most are rugged rock all around.

According to the Department of Natural and Environmental Resources (DNER), the conservation priority areas for Culebra and associated cays are as follows:

- All of the lagoons on Culebra
- Monte Resaca
- All beaches around Culebra
- The designated critical habitat area for the Virgin Islands Boa
- Flemenco Peninsula
- Puerto del Manglar
- Los Canos
- Punta Soldado
- Bahia (also called “Ensenada”) Cementerio
- All cayos and cays around Culebra
- The Culebra National Wildlife Refuge
- The Canal Luis Peña Natural Reserve
- The Canal Luis Pena Natural Reserve

1.6 SITE HISTORY

Spain ceded all of Puerto Rico 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 (NATO). 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 Viet Nam operations, the Navy acquired additional training areas on cays 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 Viet Nam. 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 (GSA).

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 cays are managed by the U.S. Fish and Wildlife Service (USFWS). The Puerto Rico DNER also manages land and adjacent water areas on Culebra.

1.7 LAND USE

1.7.1 MRS 13 CAYO LUIS PENA IMPACT AREAS

MRS 13 covers all of Cayo Luis Pena. The Cayo is managed by the USFWS (land portion) and DNER (shoreline areas that are within maritime terrestrial zone). Water areas are DNER jurisdiction and USFWS and national Marine Fisheries Service (NMFS) only have jurisdiction in the water as it relates to Endangered Species Act (ESA) resources. Residential areas do not exist on Cayo Luis Pena but have been developed on the main island immediately across the channel. The site has no barriers to access; however access is prohibited without USFWS authorization. Site conditions could change in the future with potential impact on land use. Examples might include excessive soil erosion on beaches or streams, or the increase in land development that could reduce distances from the site to inhabited areas or otherwise increase accessibility.

1.7.2 MRS 09 SOLDADO POINT MORTAR AND BOMBING AREA

MRS 09 is managed by the DNER and residential development is not allowed on the site. Public area structures could be developed at some point in the future. There are no restrictions for using the beach areas or entering the surrounding waters for recreation activities. Site conditions could change in the future with potential impact on land use. Examples might include excessive soil erosion on beaches or streams, or the increase in land development that could reduce distances from the site to inhabited areas or otherwise increase accessibility. Seasonal surf action could cause changes in the bottoms of the surrounding waters.

1.8 PREVIOUS UNDERWATER VISUAL SURVEY DATA

Underwater visual data (for sea floor surface MEC) was previously collected within MRSs 09 and 13. These surveys were conducted as part of the Remedial Investigation/Feasibility Study (RI/FS) field work conducted with the terrestrial portions of the MRSs during 2011. However, data collection was limited to 100-yard seaward to the mean-high tide level. Data was collected using a combination of fixed video (from the vessel) and ROV camera systems and includes GPS positioning data and video/still media files of suspected MEC items on the surface. Information regarding benthic habitats can be retrieved from these media files and used to supplement the MRS benthic mapping efforts as required. This data will be appended into the proposed data collection activities outlined in this WP as the data collection methodology are the same.

1.9 INITIAL SUMMARY OF RISK FROM MEC

1.9.1 MRS 13 CAYO LUIS PENA IMPACT AREAS

Cayo de Luis Pena, with 380 acres of water area and 864 total MRS acres, is about one quarter mile off the western coast of Culebra. The northern tip of this island was used as a firing target during Marine exercises conducted between 1924 and 1941. Records show that 75mm projectiles were fired at the Cayo in 1924 and that 155mm, 37mm, 8-inch, and 6-inch rounds may have also been used. In the 1960s, an observation point was erected on the hill top on Luis Pena, including a run-in line, helipad, and living quarters. Cayo de Luis Pena is managed by the USFWS as part of the Culebra National Wildlife Refuge.

1.9.2 MRS 09 SOLDADO POINT MORTAR AND BOMBING AREA

This area consists of 328 acres on the very southern tip of the southwestern peninsula of Culebra. In 1914, a 5-inch battery was established on Soldado Point. Several training exercises including mortar firing, aerial bombing, and strafing were conducted on Soldado Point and the bay northwest of Soldado point during the 1930s and 40s. The Supplemental Archives Search Report (ASR) mentions that 30- and 1,000-pound bombs were dropped in this area (USACE 2005c). Munitions used in the bay included 30-pound fragmentation bombs, 100-pound demolition bombs, 81mm mortars, and small arms. This piece of property was accepted in a quitclaim deed from the Secretary of the Interior by the Governor of Puerto Rico in 1982. This property is managed by the DNER.

2.0 TECHNICAL MANAGEMENT PLAN

2.1 PROJECT OBJECTIVES

The objective of this project is to document, in the form of an Environmental Baseline Survey Report (EBSR), the various underwater biological habitats that reside within the water portions of MRSs 09 and 13. The EBSR will be utilized by project stakeholders to establish the parameters for conducting subsequent RI/FS field activities (Underwater Surveys and Intrusive Investigations) within MRSs 09 and 13.

2.2 PROJECT ORGANIZATION

For this project to be successful, close coordination and cooperation between the stakeholders, community, regulators, and technical support personnel must occur. Figure 2-1 depicts the organizational structure of the USA project team with respect to the USACE. Other team members include the Culebra site stakeholders. The roles of these team members are described below.

2.2.1 PROJECT STAKEHOLDERS

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

- Puerto Rico Department of Natural and Environmental Resources (PR DNER)
- Puerto Rico Environmental Quality Board (EQB)
- United States Environmental Protection Agency (EPA)
- Culebra National Wildlife Refuge
- US Fish and Wildlife Service (USFWS)
- National Oceanic and Atmospheric Administration (NOAA)
- Restoration Advisory Board (RAB)

The stakeholders listed above participate in the Technical Project Planning (TPP) process.

2.2.2 U.S. ARMY CORPS OF ENGINEERS (USACE), JACKSONVILLE DISTRICT

USACE Jacksonville District is the project management and funding agency for this project. USACE Jacksonville District responsibilities include review of project plans and documents, coordinating with the news media and the public, and coordinating with national, state and local regulatory agencies on issues pertaining to protection of ecological and cultural resources

2.2.3 U.S. ARMY ENGINEERING AND SUPPORT CENTER, HUNTSVILLE (USAESCH)

USAESCH is the lead technical agency for this project. USAESCH responsibilities include procurement of contract services, review and coordination of project plans and documents, and supporting USACE Jacksonville District in working with the news media, the public, and the regulators. USAESCH provides technical expertise for Munitions and Explosives of Concern (MEC) activities. As the technical Project Manager, USAESCH is responsible for controlling the budget and schedule. As the contracting agency, USAESCH is responsible for directing the contractor.

2.2.4 USA ENVIRONMENTAL, INC.

USA is the prime contractor to USAESCH for this project. USA will provide staff to perform all aspects of field work and provide oversight of field sampling activities. USA will assign project personnel based on management and technical experience and abilities. USA will subcontract Aqua Survey Inc. (ASI) for conduct hydrographic surveys. USA will prepare and submit data reports in accordance with (IAW)

relevant USACE guidance and applicable DIDs. The USA Project Manager (PM) is Mr. Matt Tucker. The USA Project Engineer is Mr. Brian Skubin.

2.2.5 AQUA SURVEY INC.

ASI is the hydrographic subcontractor for this project. ASI will provide personnel and equipment to perform all hydrographic surveys to include side scan sonar, multi-beam bathymetry surveys. ASI will conduct all work under USA PM oversight. The ASI PM is responsible for the coordination of the overall field work with USA. The ASI PM is Mr. William Rottner. The ASI Technical Manager (TM) is Mr. Mark Padover. The ASI TM oversees work conducted by ASI marine technicians and is responsible for data processing Quality Control (QC), and performance system audits. Mr. Padover is also a qualified Marine Biologist and will be supporting underwater habitat identification in support of the Environmental Baseline Survey activities. The TM will coordinate all data submittals with USA PM and Project Engineer.

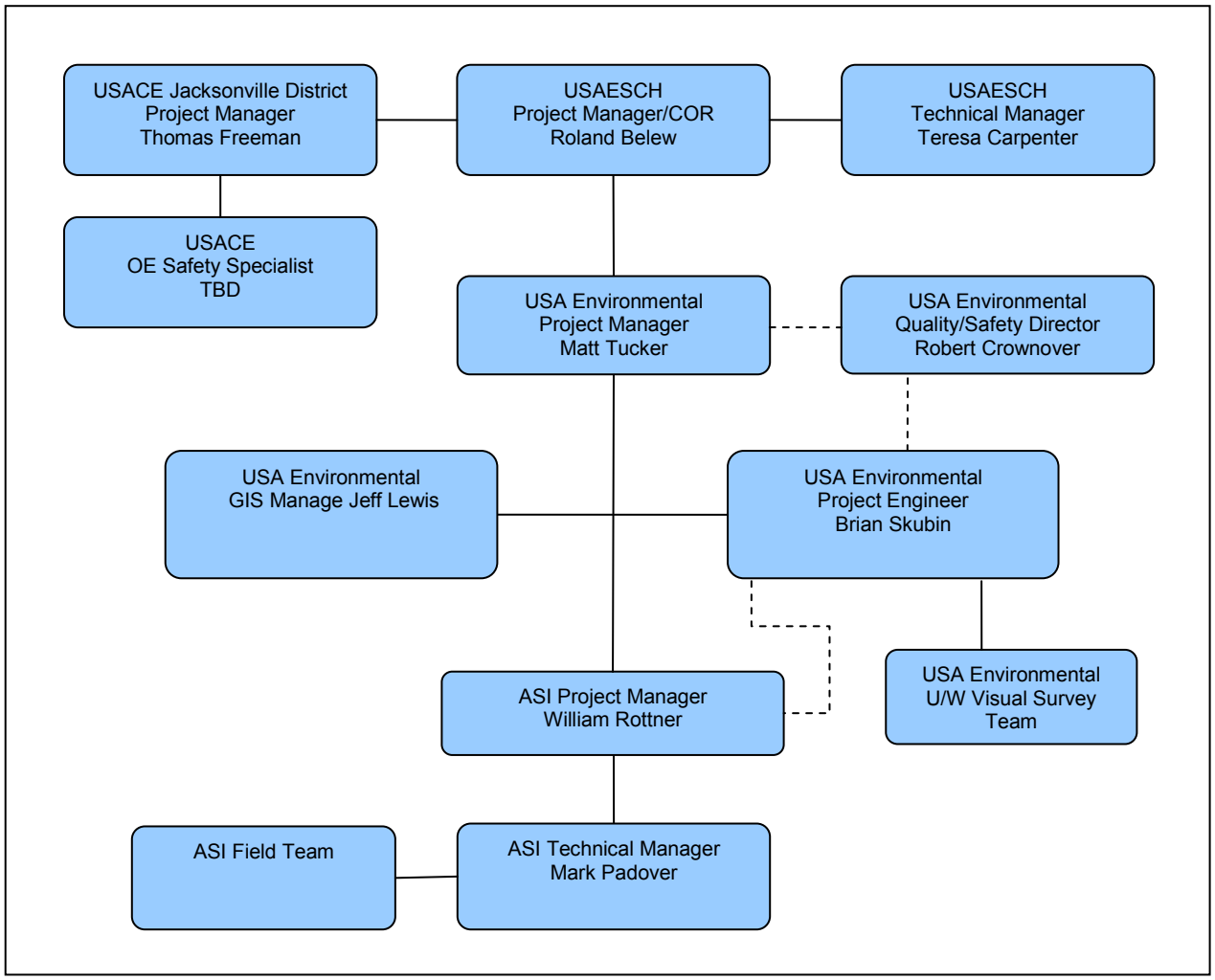

Figure 2-1: Project Management Organization

2.3 PROJECT PERSONNEL

2.3.1 USA PROJECT MANAGER

The Project Manager (Mr. Matt Tucker) is responsible for monitoring overall progress of the Task Order, reviewing monthly progress reports, and ensuring that resources are available. The Project Manager maintains close communication with USAESCH to assess client satisfaction with USA performance on this Task Order.

2.3.2 USA CORPORATE DIRECTOR OF SAFETY AND QUALITY

The Corporate Director of Safety and Quality (Mr. Robert Crownover) is responsible for reviewing and updating the Quality Control Plan and verifying compliance with the plan. The Corporate Director of Safety and Quality verifies compliance with the Quality Control Plan by auditing project activities and instituting corrective actions; and develops and coordinates the Accident Prevention Plan (APP). The Corporate Director of Safety and Quality is the contact for regulatory agencies on matters of health and safety. For this project, the Quality Manager also serves as the Safety Manager.

2.3.3 USA 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. The Project Engineer coordinates filed activities with the USA Underwater Visual Survey Team and subcontractors.

2.3.4 USA GEOGRAPHICAL INFORMATION SYSTEMS (GIS) MANAGER

The 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.

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

The UXOSO/UXOQCS is responsible for overseeing the site QC plan in all field operations. The UXOSO/UXOQCS will be trained in QC techniques methodology and be qualified as a Unexploded Ordnance 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 Leader. The UXOSO/UXOQCS reports directly to the CDSQ

2.3.6 USA UNDERWATER VISUAL SURVEY TEAM

The USA Underwater Visual Survey Team consists of a Remotely Operated Vehicle (ROV) Operator and a UXO Technician III. The ROV Operator will be qualified to operate the ROV (VideoRay Pro-3), underwater digital video camera, and positioning equipment. The UXO Technician III will provide munitions identification support as well as aiding with equipment logistics. The Underwater Visual Survey Team will undergo site-specific training prior to underwater investigation activities.

2.3.6.1 Underwater Visual Survey Team Boat Support Personnel

Personnel assigned to support operations consist of the following positions:

- Boat captain and crew

The boat captain and crew personnel will be provided by a local subcontractor to provide water transportation services.

2.3.7 USA SNORKELING TEAM

USA provides a 4 person snorkeling team to conduct supplemental surveys within shallow water environments where vessels pose a risk to safety and endangered species. The snorkeling team composition is as follows:

- Snorkeling Supervisor (1)
- UXO Technician/Survey Snorkeler (1)
- Marine Biologist/Survey Snorkeler (1)
- Support/Safety Vessel Operator (1).

2.3.8 USA SNORKELING SUPERVISOR

The USA Snorkeling Supervisor (SS) will report directly to the Project Manager on issues pertaining to the field operations. The USA SS will have the following operations and safety/health related responsibilities:

- Reviewing and becoming familiar with the site Snorkeling Plan (SP) and the overall Site Inspection (SI) Site Safety and Health Plan (SSHP) included in Appendix D of the Environmental Baseline Survey Work Plan.
- Ensuring that all snorkeling and support personnel review and are aware of the guidelines and procedures reflected in the SP and the overall SI SSHP
- Coordinating and overseeing all snorkeling operations
- Coordinating the assignment of personnel during snorkeling operations
- Ensuring implementation of project quality and safety and health procedures
- Assessing weather and site conditions to ensure that safe and effective snorkeling can be accomplished
- Identify potential problem areas, including safety and health matters, and instituting corrective measures.

2.3.8.1 Underwater Visual Survey Team Boat Support Personnel

Personnel assigned to support operations consist of the following positions:

- Boat captain and crew

The boat captain and crew personnel will be provided by a local subcontractor to provide water transportation services.

2.3.9 SUBCONTRACTORS

2.3.9.1 Sea Ventures

USA will subcontract with Sea Ventures to provide water transportation support. Sea Ventures operates out of Marina Puerto Del Rey, Fajardo, Puerto Rico and operates boats that are inspected and licensed by the United States Coast Guard and the Puerto Rico Public Service Commission. USA will rely on Sea Ventures to provide rubber dinghies for access into shallow water areas.

2.3.9.2 Aqua Survey, Incorporated (ASI)

ASI is the hydrographic subcontractor for this project. ASI will provide personnel and equipment to perform all hydrographic surveys to include side scan sonar, multi-beam bathymetry surveys. ASI will conduct all work under USA PM oversight. The ASI PM is responsible for the coordination of the overall field work with USA. The ASI PM is Mr. William Rottner. The ASI Technical Manager (TM) is Mr. Mark

Padover. The ASI TM oversees work conducted by ASI marine technicians and is responsible for data processing QC, and performance system audits. Mr. Padover is also a qualified Marine Biologist and will be supporting underwater habitat identification in support of the Environmental Baseline Survey activities. Mr. Padover is also a qualified sea turtle/marine mammal observer.

2.4 PROJECT COMMUNICATION AND REPORTING

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

2.5 PROJECT DELIVERABLES

This section provides a brief description of the required deliverables for this Phase of the RI/FS. A detailed description of project deliverables is provided in the current version of the PWS (Appendix A). Deliverable data will be submitted to USAESCH and USACE Jacksonville District (CESAJ) no later than the close of the business day indicated in the project schedule. Electronic data will be submitted in formats consistent with USAESCH software and systems, as defined in the PWS.

2.5.1 ENVIRONMENTAL BASELINE SURVEY WORK PLAN

A Draft, Draft Final, and Final Environmental Baseline Survey Work Plan will be prepared using DID MMRP-09-001 as guidance. USA team members will perform a peer review of each section of the WP followed by an overall review by the USA QC Manager prior to submittal to confirm the overall quality and completeness of each document. Review comments received on the Draft and Draft Final versions will be incorporated and formal, annotated responses will be provided for each comment. USA will submit the Draft Final and Final versions no later than 14 days following receipt of comments. USA will include a CD with each hard copy document submitted.

2.5.2 PHASE 1A INTERIM DATA DELIVERABLE (HYDROGRAPHIC DATA AND REALIGNED VISUAL SURVEY TRANSECTS)

Upon completion of the hydrographic survey field work (Phase 1a), USA will prepare and submit for review, an interim field data deliverable consisting of the raw hydrographic data and proposed transect realignment analysis maps for utilization in the underwater visual survey field work (Phase 1b). As a part of the EBS effort, hydrographic data will be used to identify sea floor conditions and benthic habitats along the proposed visual survey transects. Ultimately this data will be used to screen the appropriate deployment platforms for geophysical instruments in subsequent phases of the project. This deliverable will be reviewed by the TPP members in accordance with the Project DQOs (Table 3-1) prior to being utilized in Phase 1b field operations.

2.5.3 ENVIRONMENTAL BASELINE SURVEY REPORT

USA will prepare and submit a EBSR to the USACE for review and approval. The EBSR documents the various underwater biological habitats (including critical habitat and identified endangered species) that reside within the water portions of MRSs 09 and 13. In anticipation of the inclusion of the 7 coral species being added to the ESA this year (2012), the EBSR will include identification of areas containing these species. The EBSR will be utilized by project stakeholders to establish the parameters for conducting subsequent RI/FS field activities (Underwater geophysical surveys and intrusive investigations) within MRSs 09 and 13. The EBSR will include an International Hydrographic Organization (IHO), Order 1, hydrographic survey that covers 100% of the water portions of MRSs 09 and 13. Hydrographic surveys will consist of multi-beam bathymetry and sides scan sonar data (maps). In addition hydrographic data, the EBSR will include documentation and analysis of the underwater habitats located within the proposed MEC and munitions constituents (MC) investigation areas of each MRS. Comparative analysis will be

conducted by a qualified marine biologist who will evaluate visual survey data collected from underwater cameras and ROV. Visual data will be compared to documented underwater benthic habitat descriptions for Puerto Rico (Kendall, et al, 2001). The EBSR will included a recommended RI transect design for conducting subsequent underwater geophysical surveys and intrusive investigations within the documented underwater habitat. The recommend RI transect design will take into consideration the locations of critical habitat and endangered species. All efforts will be made to locate investigation transects away from these critical areas. Concurrence of the EBSR by project stakeholders will be achieved prior to conducting follow on RI investigations within MRSs 09 and 13.

2.6 PROJECT SCHEDULE

The project schedule 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 included in the Monthly Progress Status reports prepared and submitted IAW DID MMRP-09-016. The schedule is included in Appendix J.

2.7 PERIODIC REPORTING

Project Status Reports will be prepared IAW MMRP-09-016. This report will be submitted monthly when fieldwork is not being performed, and weekly when fieldwork is underway.

2.8 COSTING AND BILLING

The budget for the project was negotiated with the USAESCH pursuant to contract number W912DY-04-D-0006 Task Order No. 0022. USA will submit a monthly invoice to the USAESCH. The USA Project Manager is responsible for submitting monthly reports to the USAESCH Project Manager 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.

2.9 PROJECT PUBLIC RELATIONS SUPPORT

Public relations support will include participation in up to three public meetings to be held on the Isla Culebra. These meetings are in addition to the TPP meetings. The third meeting will be held specifically for the Proposed Plan. USA will prepare and deliver briefings, graphics, maps, posters, presentations, and support of question and answer sessions. When required, USA will prepare invitation letters, fact sheets, and meeting notices. USA will obtain the meeting sites, perform public notification and prepare any correspondence necessary to meeting the objectives of this task. USA will also maintain a project website for viewing by the public and PDT members. To ensure the quality of public meetings, USA will coordinate with the USACE public relations officer or other appropriate USACE representative on all matters of public relations.

2.10 SUBCONTRACT MANAGEMENT

Before subcontract work is performed at the site, USA will negotiate and prepare subcontracts that will detail all necessary and appropriate terms and conditions, including the statement of work (SOW). Once the subcontract is executed, USA 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. USA technical staff will review data generated by the subcontractor as part of subcontract deliverables.

USA will maintain overall supervisory responsibility for all operations. Subcontractors will work under the direction and oversight of USA's Site Project Manager/Team Leader (Senior UXO Supervisor) and will be monitored by USA's UXOSO/UXOQCS. The Team Leader 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 USA's Team Leader, and strictly adhere to this Work Plan and associated APP.

2.11 MANAGEMENT OF FIELD OPERATIONS

USA Project Manager and Project Engineer will coordinate field operations with survey teams. The USA Safety Manager and Quality Manager will remain off site but will be available by telephone for consultation on issues of safety or quality. The USA 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.

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3.0 FIELD INVESTIGATION PLAN

3.1 OVERALL APPROACH TO BASELINE SURVEY ACTIVITIES

3.1.1 PRELIMINARY PROJECT GOALS

The preliminary project goal is to document the various underwater biological habitats that reside within the water portions of MRSs 09 and 13 in order to establish the parameters for conducting subsequent RI/FS field activities (Underwater Surveys and Intrusive Investigations) within MRSs 09 and 13. Based on this preliminary project goal, site characterization goals are as stated in Step 2 for the DQO process in Table 3-1

3.1.2 DATA QUALITY OBJECTIVES

Data Quality Objectives (DQO) 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 Environmental Baseline Survey activities meet the U.S. Environmental Protection Agency (EPA) *QA/G-4HW* Guidance's 7 step DQO criteria. Table 3-1 presents the Project DQOs for the Environmental Baseline Survey activities.

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Table 3-1: Project Data Quality Objectives for the Environmental Baseline Survey Report

DQO STEPS	Water Acreage of MRS 09 and MRS 13
1. State Problem	The overarching problem is determining the nature and extent of MEC/MC within the accessible areas[1] of the underwater portions of MRSs 09 and 13 while minimizing disturbance to endangered and threatened species and sensitive underwater environments within the investigation footprint. An initial Baseline Survey effort (Phase I) will be required in order to establish the parameters for conducting subsequent RI/FS field activities (Underwater Electromagnetic (EM) Surveys and Intrusive Investigations) within MRSs 09 and 13.
2. Identify the Goal of the Study	• Document the bathymetry within the water portions of the MRSs; • Document and verify the types of benthic habitats that are located within the proposed MEC and MC investigation areas of each MRS; • Identify and locate (map) coral, sea grass, sandy areas, essential fish habitats, and endangered and threatened species within the underwater portions of the MRSs; • Investigate and document suspected MEC items that may be located on the surface of the seafloor within the MRSs; • Develop appropriate mapping unit considering comparable existing maps; and • Establish a Remedial Investigation transect design for conducting subsequent underwater geophysical surveys and intrusive investigations that considers the locations of sensitive habitat and endangered and threatened species.
3. Identify Information Inputs	• Collection of multi-beam bathymetry and side scan sonar data (International Hydrographic Organization (IHO) Order I Hydrographic Survey); • Collection and analysis of underwater visual survey data (Underwater camera systems deployed by vessels or snorkelers with integrating positioning using GPS systems); • Analysis of documented Puerto Rico/Caribbean benthic habitats and endangered/ threatened species and their locations within the investigation footprints; • Locations of suspected surface MEC items within accessible water areas, of the MRS boundary.
4. Define the Boundaries of the Study	The MRS boundary defines the population to be sampled and the decision units to which the data will be applied. Step-out visual investigations may be required to modify/expand MRS boundary in areas where MEC has been identified on the seafloor. The population for this project consists of the underwater (benthic) areas of MRSs 09 and 13. The boundary may be reconfigured to relocate inaccessible[1] acreage to investigate the underwater areas of eastern Culebrita.
5. Develop a Decision Rule	Data gathering requirements for completing a Baseline Survey Report will be considered met after the following items have been achieved: • A hydrographic survey within the accessible[1] water areas for MRSs 09 and

DQO STEPS	Water Acreage of MRS 09 and MRS 13
	13 is completed. Hydrographic surveys will be conducted from a vessel in waters no less than 4-ft depth. Depths less than 4-ft will be surveyed by a snorkeling team. • Hydrographic survey data are sufficient to plan follow on Phase II and Phase III investigations. • The benthic habitats and endangered/threatened species within the accessible[1] underwater areas of MRSs 09 and 13 have been mapped. The anticipated survey areas are established along idealized transects in the approved Baseline Survey Work Plan. • Step-out visual investigations within the MRS boundary will be conducted in a 100-ft (horizontal) radius around MEC items located along the idealized visual transects (spaced at 250-ft). If additional MEC are located within the first step out, an additional 100-ft radius will be visually investigated. Step outs will stop when crossing overlapping step-out areas or if no additional MEC are located within a 100-ft radius. • For MEC items located within 100 horizontal feet from the MRS boundary, the initial step out will be 100-ft, the second 100-ft (if required), and the PDT will be consulted if additional step outs are needed. • If access is restricted by coral reefs or other features exposed to the water surface that do not allow for survey activities to be safely conducted, the PDT will be consulted.
6. Specify Performance or Acceptance Criteria	• Measurable decision errors are limited to the field and analytical QC processes identified in the Baseline Survey Work Plan for survey coverage. Work will be performed in accordance with established SOPs for underwater surveys. • Acceptable survey data for hydrographic surveys will be coverage of all accessible areas of the water portions of each MRS. • The completed hydrographic survey meets IHO Order I parameters as defined in the yellow column of the attached table and meets the quality standards outlined in the Quality Control Plan (Chapter 4 of the Baseline Survey Work Plan). TPP approval of Phase 1a data will be sought. • Acceptable underwater visual survey coverage will be stationed on idealized geophysical transects at 250-ft (RI design) based on the hydrographic survey data. Width of visual coverage (corridor along transects) will vary depending on conditions.
7. Develop the Detailed Plan for Obtaining Data	Data collection procedures and associated QC measurements are included in the Baseline Survey Work Plan. A combination of Visual Sample Plan and visual analysis of accessible[1] areas within the investigation footprints were used to develop the transect design reflected in the Baseline Survey Work Plan. Hydrographic data collected during Phase 1a will be utilized to refine the transect locations for the visual survey conducted in Phase 1b.

Footnotes:

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

- *For Vessels: That access to the water portions of the MRS are <u>not</u> hindered by water depth, shallow rock or coral formations, or unsafe sea state conditions (consistently rough seas).*
- For Snorkeling Personnel: *That access to the water portions of the MRS are <u>not</u> hindered by or unsafe sea state conditions (consistently rough seas).*

3.1.3 DATA INCORPORATION INTO THE ENVIRONMENTAL BASELINE SURVEY REPORT

Field data and GIS data will be incorporated into the EBSR in accordance with DID MMRP-09-007. Maps will be submitted which show the locations of the areas searched, the search pattern, and the significant findings, as well as significant surface features within and adjacent to each MRS. 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 ground scars, craters, vegetation, and terrain will also be recorded, and a tabulated list of MEC items located in the field will be provided.

3.2 ENVIRONMENTAL BASELINE SURVEY AREAS

The Environmental Baseline Survey field activities will be conducted within the water portions of MRSs 09 and 13. Figure 3-1 and Figure 3-2 depict the respective Environmental Baseline Survey coverage areas.

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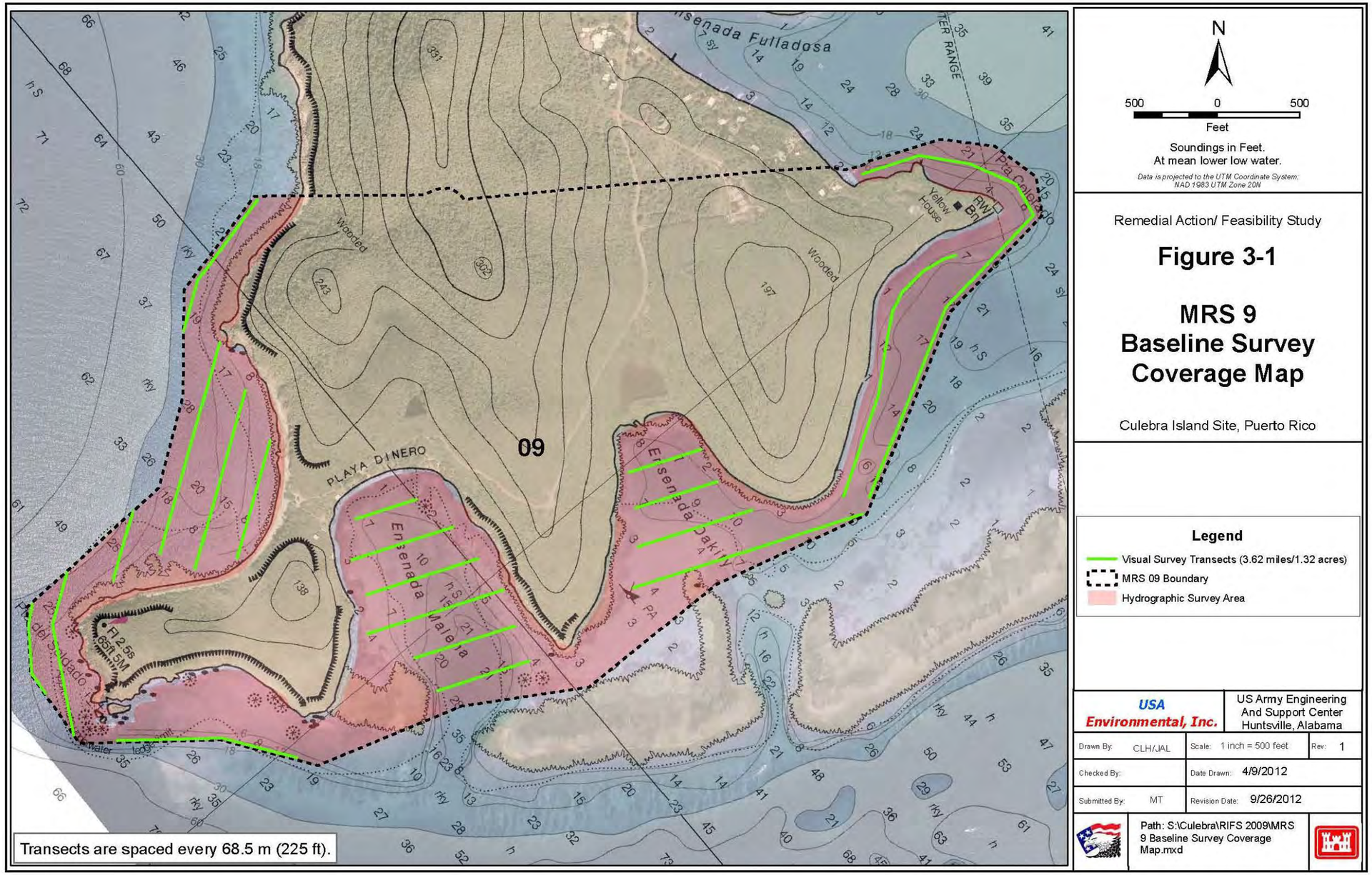

Figure 3-1: MRS 09 Environmental Baseline Survey Coverage Map

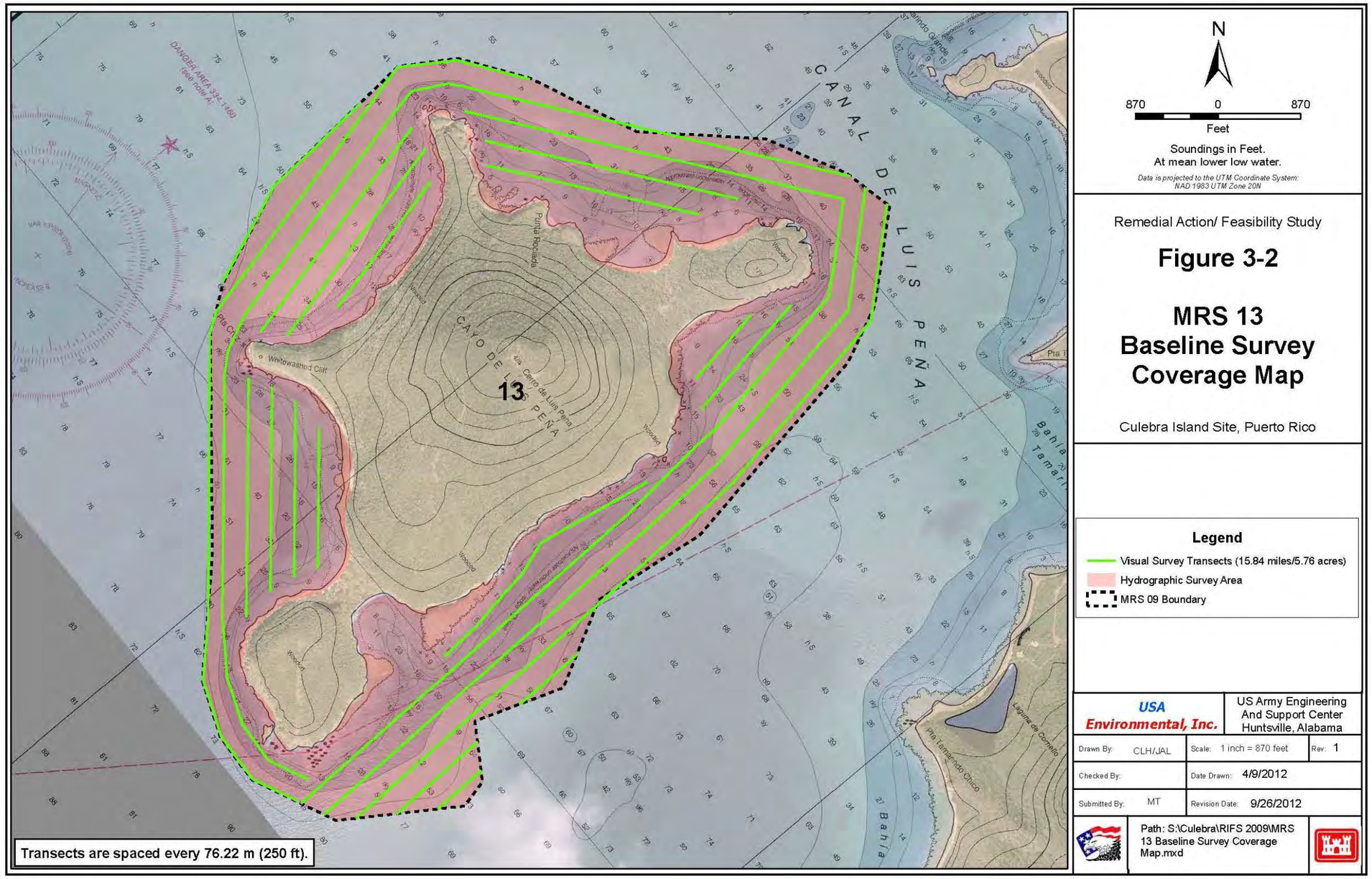

Figure 3-2: MRS 13 Environmental Baseline Survey Coverage Map

3.3 HYDROGRAPHIC SURVEY

USA subcontracts ASI to conduct hydrographic surveys including multi-beam bathymetry and side scan sonar surveys. Hydrographic surveys will meet the DQOs stated in Table 3-1. Data collection will be the primary use of hydrographic data will be to create benthic maps for referencing in subsequent project activities (underwater geophysical and intrusive investigations). Hydrographic data will help assure the appropriate geophysical survey platform that will be deployed in subsequent investigation areas. The data from the preliminary survey and previous underwater visual surveys will be used to refine geophysical survey transects to minimize environmental impact.

Hydrographic surveys conducted on survey vessesl will be limited to areas with 4 ft or greater depth and will adhere to the IHO Order 1 Standard. All shallow water depths will be collected by a snorkeling team as part of the shallow water survey activities outlined in Section 3.5 of this WP.

Hydrographic surveys will be conducted aboard a 30-ft fiberglass UNIFLITE (Parker type hull) with a 10 ft wide beam and drafts 2.5-ft. The vessel operator is a USCG licensed 100-ton Captain. All safety equipment is certified by the United States Coast Guard (USCG). The survey vessel has a forward cabin were equipment can be stored and utilized in case of rain or bad weather. An on-board 5 kW diesel generator will supply required power. The survey vessel utilizes a Garmin 3010 GPS with radar and depth finder. In addition, a 17-ft Boston Whaler center console boat will serve as a support vessel to aid with GPS survey equipment (signal repeater) and to provide exclusion zone control while conducting surveys (to protect tow fish cables from being cut by other vessels). All boats will utilize existing mooring buoys or will utilize the anchoring procedures outlined in this WP and Appendix M.

3.3.1 MULTI-BEAM BATHYMETRY AND SIDE SCAN SONAR

Multi-beam bathymetry (MBS) and side scan sonar (SSS) technologies will be utilized to collect the data necessary to produce the hydrographic survey. Surveys will be conducted from a vessel within the water areas of each MRS in order to determine the actual water depths within the survey area and detect potential hazards (coral reefs or rock outcrops) for the geophysical survey equipment (Underwater EM System). A multi-beam fathometer will be deployed to collect water depth data. A side scan sonar system will be used to acoustically image the seafloor to detect the presence of obstructions, debris, and help locate environmentally sensitive areas. Data from these surveys and previous collected underwater visual survey data will be used to refine EM survey transects to minimize environmental impact as well as to help assure the appropriate geophysical equipment is deployed during subsequent RI field work. Hydrographic data will also be used to create benthic maps for referencing in other project activities.

3.3.2 HYDROGRAPHIC SURVEY PROCEDURES

The following paragraphs present the procedures for conducting MBS and SSS activities. A review of the appropriate SOPs including operational and the endangered species mitigation procedures will be conducted prior to commencement of survey work. Appendix K contains the operational SOPs related to conducting survey activities. Appendix M contains the *SOPs for Endangered Species Conservation and their Critical Habitat during underwater investigations at DERP-FUDS property No. I02PR0068, Culebra Island, Puerto Rico (CESAJ, 2012)*. Adherence to these SOPs will be strictly enforced.

3.3.2.1 Pre-Survey Preparation

Prior to commencing MBS operations, the survey team will review applicable ESA requirements (Appendix M) related to conducting MBS and SSS collection activities. The survey team will then assemble the data acquisition computer, real-time kinematic differential global positioning system (GPS) (RTK-DGPS) positioning system, and fathometer. At dockside, the team will verify that each component is installed on the vessel correctly, is working individually and that the survey control software is receiving data from both instruments. The MBS transducer will be hard mounted using an adaptable rigid aluminum

pole with fore and aft stays. Check for offsets, if any, will be made between GPS antenna and transducer location.

The RTK-DGPS base station will be established on an established control point (certified by a PR PLS) located near the project site prior to the vessel leaving dock. All required position QC checks will be performed prior to conducting survey activities.

Prior to conducting MBS survey activities, a comprehensive MBS calibration will be carried out to calibrate the different components of the multi-beam system. The multi-beam calibration accurately measures the angular mounting components of the correction sensors (roll, pitch, and yaw) - errors in these measurements can lead to inaccurate surveys. The calibration test is a data collection and processing procedure to calibrate these angles along with position system latency. Calibrations should be done, at a minimum, at the start and finish of a survey, or whenever the sounder is turned off or conditions in the survey area change. A patch test will be conducted at the start of the survey or if a change in setup is made. A daily QC check will include cross check lines at the end of survey. A check will be conducted for both Multibeam Bathymetry Survey (MBS) and Side Scan Sonar (SSS) speed will be monitored and remain equal to or less than 4 knots 90 percent of the time.

Prior to conducting SSS survey activities, the survey team will power up the SSS software and send power to the tow fish and do a "rub" test to ensure both transducers are functioning. The survey team will run a test line and review the quality of the records. Adjustments to gain, towfish height, layback, or boat speed as necessary to obtain the best records possible. On a daily basis, the survey team will tow the sensor past a known target such as a navigational buoy, piling, or other object to ensure the target is detected. Another pass will be made on the same target in the opposite direction to ensure the position at which the target is detected is the same in order to check the layback measurements/calculations.

3.3.2.2 Data Collection Activities

MBS data collection activities will be conducted from the survey vessel within the accessible water areas of each MRS (waters no deeper that 4 ft.). SSS data will be collected concurrently with MBS along the same survey lines. Survey lines will be established by the survey team based on project maps (Figures 3-1 and 3-2) and NOAA nautical charts. Survey lines will be input into GIS and tracked with the RTK-DPS system by the survey team and vessel operator to ensure survey coverage is adequately maintained during the survey. Coverage will be determined by real-time review of data collected. Data holidays will be tracked as data is collected. Additional transects will be added at that moment to fill in the gaps. Survey lane spacing based on depth will be used as a guideline but due to the possibility of varying depths in a given transect review of data collected will dictate final transects. The target for MBS transect data overlap is a 10%. Survey coverage will meet the project DQOs for 100% coverage of the accessible water areas within the MRS. The survey team will conduct surveys in accordance with the operational SOPs located in Appendix K. For survey areas contained in waters shallower than 4 ft, depth data will be collected by a snorkeling team as described in Section 3.5 of this WP.

3.3.2.2.1 MBS Operation

During survey operations all correction sensor and multi-beam data will be time tagged and logged with the data acquisition system. At the start of the survey speed of sound in seawater will be determined by a sound velocimeter profile. Correction sensor calibration factors and sensor offsets will be applied as needed during data collection. Sound velocity profile data and tide corrections will be applied at the survey start and as needed real-time.

The survey team will ensure that the line to be surveyed is the active line. Tidal corrections will be recorded if it is not being done automatically. The Vessel operator will begin the approach to the line with sufficient space to ensure a straight entry. 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. 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 ran.

3.3.2.2.2 SSS Operation

SSS data will be collected concurrently with MBS along the same survey lines. The SSS towfish will be deployed to the appropriate altitude prior to running survey lines. The optimal altitude is based on the range to be used. The towfish should be towed at an altitude above the bottom equal to 10 percent of the range. The amount of cable fed out should be measured for layback calculations. Layback should be set either using the Hypack Towfish driver or manually calculating the layback and entering this into the survey software and side scan sonar software. At no time will the towfish be deployed within 5 vertical feet of coral or sea grass areas. The vessel operator will constantly monitor and stay clear of coral reef areas. The winch operator/cable tender will be in constant communication with the surveyors. He will also be able to see towfish altitude data from the side scan sonar unit. In shallow waters the SSS will be suspended below the bow of the vessel as near the surface as possible. This will allow it to have maximum detection range on both sides without interference from the hull of the vessel. While the SSS towfish is deployed we will collect data at all times possible.

An Edgetech 4125 dual frequency side scan sonar unit will be used with a 400/900 kHz high resolution towfish. Range scale will be initially be set to 50 meters for general surveying. In shallow water areas or areas of special interest the range will be decreased to 25 meters. Across track resolution for the unit is 2.3 cm at 400 kHz and 1.5 cm at 900 kHz. Horizontal beam width is 0.46° at 400 kHz and 0.28° at 900 kHz.

The survey team will begin logging data at the start of each the survey line. Checks will be periodically made to ensure the data is logging. 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 ran.

3.3.2.2.3 Vessel Operation Practices

Vessel operator shall carry and consult appropriate NOAA nautical charts, NOAA benthic habitat maps and aerial photographs (Figure 3-1 and Figure 3-2) to locate potential coral reefs, colonized hard bottom and sea grass areas. Combining information from aerial photographs with hydrographic data will help to ensure that nautical charts are accurate. The vessel operator and survey team will maintain a vigilant watch for coral reefs, colonized hard bottom and sea grass areas to avoid running aground or striking protected species. Real-time data (e.g. GPS with nautical chart and depth finder on boat) will be continuously observed to verify water depths and vessel location. From the water's surface, some coral areas may appear golden-brown. These areas should be avoided to keep from running aground. The vessel operator shall stay at a minimum of 4 feet from the bottom of the vessel to the top of coral areas to avoid accidental grounding, propeller wash, and propeller scarring. Vessels shall be maintained away from areas with corals and sea grasses. Operations shall 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 Appendix M, which provides further details on endangered species and critical habitat mitigation measures related to vessel and equipment operation.

3.3.2.3 Hydrographic Data Processing and Data Deliverables
3.3.2.3.1 Processing Multibeam Data:

Following the survey, the multi-beam data will be processed and X,Y,Z files and color shaded relief geotiffs will be created. Processing the multi-beam data will include applying tide corrections based on RTK-DGPS elevations or a manual tide file and sound velocity corrections to the raw data. Offsets will be adjusted if they were not accounted for in acquisition or something changed during the survey. The data will then be checked for outliers in both the multi-beam and positioning data in both profile and swath modes. These erroneous data points will be removed and all good data points will be kept. Once all

corrections have been made an appropriate cell size will be determined and data will be reduced to make file sizes manageable without compromising targets of interest This X, Y, Z file will then be used to create a TIN model and color shaded relief geotiffs for integration into GIS software and further interpretation.

3.3.2.3.2 Processing side scan sonar data:

Following the survey, the individual SSS records are played back and imported into Chesapeake Technologies Sonar Wiz Map processing software. Each individual file is bottom tracked through a combination of automated bottom tracking as well as manual inspection of the tracks to insure accurate results. Following bottom tracking a file or area of a file is found where the bottom is uniform across the swath. In this area gains are adjusted to level out the intensities of bottom response across the swath. These gain settings are applied to the rest of the file and other data collected. Results are reviewed and minor adjustments may be made to create a uniform mosaic. Layback corrections are applied to the navigation if not already accounted for during data acquisition. Layback accuracy is checked by reviewing the records for an isolated object and comparing its plotted location on overlapping survey lines acquired in opposite directions. This QC check will be conducted daily. The side scan sonar mosaic is output as a single or multiple geotiffs depending on survey area size as well desired output resolution.

The results of the multi-beam bathymetric survey and SSS survey will be combined in GIS software and analyzed to create maps showing simplified bottom type/habitat classifications. All GIS information will be transmitted to the USA GIS Manager for incorporation into the project GIS database. An additional data deliverable of a point GIS layer with targets of interest along with full-resolution images (e.g. jpgs) that go along with each point. Targets of interest might include any potential ordnance items, hazards to navigation, etc.

3.4 UNDERWATER VISUAL SURVEY

Upon completion of hydrographic filed activities and acceptance of the Phase IA deliverable (Adjusted transect map), USA will field an Underwater Visual Survey Team to conduct an underwater visual survey within the water areas of each MRS in order to collect data that satisfy the project DQOs. Visual and positional data will be collected using a combination of a GPS-integrated underwater video system and VideoRay ROV Pro-3 system. The ROV will be coupled with a GPS integrated smart tether. The underwater visual survey will be conducted in accordance with the ROV Standard Operating Procedure (SOP) contained in Appendix K and the environmental mitigation measures set for in Appendix M.

Where water depths and site conditions allow access by small boat, a pole/hull-mounted underwater video camera will be deployed and monitored as the vessel progresses down each transect. The boat will be accurately maneuvered through use of a RTK-DGPS-integrated PDA displaying the transect line, while a UXO Technician monitors the video display. Digital video footage is recorded onto a lap top computer, noting the latitude and longitude of the camera position. The ASI marine biologist will monitor the video feed to make preliminary notes of the various underwater benthic habitats. The UXO technician will note any suspected MEC items that may be encountered during the survey. In addition, a post survey review of the video footage will be conducted by the ASI marine biologist, who will compare the visual data to documented underwater benthic habitat descriptions for Puerto Rico (Kendall, et al, 2001).

Items that reflect characteristics of MEC items will be reacquired and investigated further with the ROV as required in order to capture the position, record video footage of the item, and document the surrounding underwater environment. Procedures for ROV operations are detailed in the ROV SOP located in Appendix K.

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

3.4.1 UNDERWATER STEP OUT PROCEDURE

In the event that a suspected MEC item is encountered along each transect, an expanded survey will be completed within an estimated 100-foot radius of the item (200 ft diameter; 31,415 sq ft; 0.72 acres). The expanded survey is intended to identify any additional MEC items located in close proximity, which may indicate the previous presence of a waterborne target or concentrated aiming point. USACE will be notified in the event that a MEC item is observed and further investigation may be required.

If an additional item/s is located, one additional 100-foot radius will be surveyed (from the position of the item most distant from the initial point) in order to characterize the boundary of the potential area of concentration. The step out process will continue out as far as the MRS boundary. Any step outs outside of the MRS boundary will be approved by the PDT.

3.4.2 VESSEL OPERATION PRACTICES

Vessel operator shall carry and consult appropriate NOAA nautical charts, NOAA benthic habitat maps and aerial photographs (Figure 3-1 and Figure 3-2) to locate potential coral reefs, colonized hard bottom and sea grass areas. Combining information from aerial photographs with hydrographic data will help to ensure that nautical charts are accurate. The vessel operator and survey team will maintain a vigilant watch for coral reefs, colonized hard bottom and sea grass areas to avoid running aground or striking protected species. Real-time data (e.g. GPS with nautical chart and depth finder on boat) will be continuously observed to verify water depths and vessel location. From the water's surface, some coral areas may appear golden-brown. These areas should be avoided to keep from running aground. The vessel operator shall stay at a minimum of 4 feet from the bottom of the vessel to the top of coral areas to avoid accidental grounding, propeller wash, and propeller scarring. Vessels shall be maintained away from areas with corals and sea grasses. Operations shall be conducted in such manner that bottom scour or prop dredging will be avoided when corals or sea grasses are present. The vessel operator and survey team will consult Appendix M, which provides further details on endangered species and critical habitat mitigation measures related to vessel and equipment operation.

3.5 SHALLOW WATER INVESTIGATION AREAS (SNORKELING OPERATIONS)

The primary purpose of snorkeling operations is to collect supplemental Environmental Baseline Survey data (i.e. Depth soundings and visual survey, etc.) within shallow water areas (less than 4 ft depth) of the MRSs. Snorkeling activities are to satisfy the project DQOs as established by Table 3-1. USA has prepared a Snorkeling Plan (SP) for Culebra Island, Puerto Rico (Formerly Used Defense Site [FUDS] Project Number I02PR0068) under Contract No: W912DY-04-D-0006, Task Order No. 0022, from the U.S. Army Corps of Engineers, Engineering and Support Center, Huntsville (USAESCH). The SP reflects the procedures and methods USA will utilize to safely perform snorkeling surveys of the shallow underwater environment in support of subsequent RI activities. Appendix N contains the SP. In addition to the SP, the snorkeling teams will review all ESA requirements outlined in this WP and in Appendix M. Snorkelers will be briefed on the physical hazards that may be encountered while conducting snorkeling activities such as fire corals, fire worms, etc.

The following is a listing of MRSs intended for underwater survey and investigation within Culebra Island, Puerto Rico:

- MRS 13 Cayo Luis Pena Impact Areas
- MRS 09 Soldado Point Mortar and Bombing Area

Snorkeling operation will be focused within these MRSs, and maps reflecting the location, boundaries, water depth, and specific transects are presented in Figure 3-1 and Figure 3-2. Encountered water depths are not expected to be deeper than 4 Feet of Salt Water (FSW).

Snorkeling operations will be conducted in order to complete the following tasks:

- Visual surveys of the seafloor to survey marine habitat types

- Visual survey of suspected MEC items
- Collection of related underwater data (water depth, site conditions, etc.)

Snorkelers will complete surveys of the seafloor, advancing along the required distance of idealized transect lines while visually surveying a 5-ft-wide path. Snorkelers will utilize a hand held GPS enabled PDA and handheld depth sounder to collect and record depth information along the survey transects. Snorkelers will also be equipped with underwater digital cameras to photograph the underwater habitat.

In the event that a suspected MEC item is encountered during visual target investigation along each transect, the item will be marked through use of a GPS unit, and the following procedures will be followed:

At no time will the suspected MEC item be handled by hand or with equipment. Locations of suspected MEC items will be reported to USACE. At no time will locations of items be shared outside of the USA project team.

- An expanded survey will be completed within an estimated 100-ft radius of the item (200 ft in diameter)
- If an additional item/s is located, one additional 100-ft radius will be surveyed (from the position of the item most distant from the initial point) in order to characterize the boundary of the potential area of concentration.
- No additional expansions of the area will be completed following this second survey.

The expanded survey is intended to identify any additional MEC items located in close proximity, which may indicate the previous presence of a waterborne target or concentration area.

All snorkeling will be planned and performed with the highest consideration of personnel safety, and will account for site weather conditions, surf zone elements, and sufficient support assets.

3.5.1 SAFTEY BRIEFS AND SUPERVISOR CHECKS

USA will routinely conduct four distinct team safety and operations briefs during execution of snorkeling operations as described in the SP (Appendix N):

- Pre-Snorkeling brief
- Snorkeling Supervisors Checklist
- Daily Safety Brief
- Post-Snorkeling Debrief

The Pre-Snorkeling Brief will be completed prior to each snorkeling evolution, while a Daily Safety Brief will be completed prior to commencement of each work day. The USA SS will provide these briefs, highlighting both snorkeling and MEC related safety precautions.

The briefs will focus on the specific hazards anticipated at each work site during that day's operations and the safety measures that will be used to eliminate or mitigate those hazards. Review of applicable Activity Hazard Analysis (AHA) sheets, contained in Attachment 2 of the SP, will also be conducted. The briefs will also refer to other operations within the area whose proximity may have safety ramifications.

As work progresses and the team's location changes within a site, or from site-to-site, any corresponding changes in anticipated hazards or emergency procedures will be reviewed.

In addition, the SS may hold a safety stand-down at any time a degradation of safety or a safety issue that warrants a review is noted.

3.5.2 SUPPORT/SAFETY VESSEL

A support/safety vessel will maneuver in proximity to the snorkelers, with the distance dependent on the conditions/state of snorkeling site Maneuvering of the vessel where snorkelers will be working needs to

be done in a way such that the vessel operates in adequate depths, doesn't anchor, etc. to protect natural resources while still supporting snorkelers. The vessel operator shall carry and consult appropriate NOAA nautical charts, NOAA benthic habitat maps and aerial photographs (Figure 3 1 and Figure 3 2) to locate potential coral reefs, colonized hard bottom and sea grass areas as previously described.

The support/safety vessel will be available during all snorkeling operations in order to quickly respond to any emergencies. If an injured 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 snorkeler is not capable of climbing onto the support/safety vessel, a ring buoy or throw bag will be deployed, and with the assistance of the second snorkeler/assistant, the individual will be carefully towed back to a shore-based location, as required.

3.6 GEOSPATIAL INFORMATION AND ELECTRONIC SUBMITTALS

This chapter details procedures that USA will use to perform mapping and GIS integration during the Environmental Baseline Survey field activities. USA developed this plan in accordance with DID MMRP-09-007.

3.6.1 ACCURACY

USA will establish survey control on the site using Class I, Third Order control monuments. The horizontal control will be based on either the English or the metric system and referenced to 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. USA will use a professional licensed surveyor (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).

3.6.2 GIS INCORPORATION

The GIS database will be maintained 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 MBS/SSS team. This database is the official project repository of GIS data, including unprocessed feature and attribute 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 DID MMRP-09-007, and will update the GIS as often as necessary to enable planning and coordination of daily, weekly, and monthly activities. Acreage clearance estimates will be prepared and revised based on the latest design drawings provided to USA. The ArcGIS project will be prepared in ArcGIS 9.x format and be compatible with ArcGIS 9.1.

Suspected underwater 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 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's Corporate Headquarters 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 Shapefile 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.

3.6.3 PLOTTING

All control points recovered or established will be plotted at the appropriate scale for the parcel being described. Parcels less than 10 acres will be plotted at 1:200. Parcels 10-100 acres will be plotted at 1:600 (1" = 50'). Parcels larger than 100 acres will be plotted at 1:2400 (1" = 200'). A 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.

3.6.4 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 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.

3.6.5 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.

3.6.6 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, and 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.

3.7 PERSONNEL QUALIFICATIONS

As required by the specific task, all USA and ASI personnel will complete the Occupational Safety and Health Administration (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 Hazardous, Toxic, and Radioactive Waste (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.

In addition, personnel assigned as the marine observer for sea turtles and marine mammals shall have proper ESA training as listed in Appendix M.

3.7.1 UXO PERSONNEL QUALIFICATIONS

The USA Underwater Visual Survey Team will include a UXO Technician III who will be qualified personnel approved by the USACE. UXO personnel must meet the requirements set forth in Department of Defense Explosives Safety Board (DDESB) Technical Paper (TP) 18, Personnel/Work Standards. UXO personnel will be U.S. citizens and graduates of 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.

3.7.2 SNORKELING PERSONNEL QUALIFICATIONS

All UXO technicians, marine biologists, and other personnel functioning as survey snorkelers will be qualified as open water divers by a nationally recognized organization, to include 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.

In addition, all UXO Technician/survey snorkelers will also meet the applicable requirements of DDESB TP-18 for the related position as previously described.

The USA 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.

3.8 TIME CRITICAL REMOVAL ACTIONS

The procedures outlined in this Work Plan apply to conducting field activities associated with the Environmental Baseline Survey. Should circumstances justify the need for a Time Critical Removal Action (TCRA), USA will develop procedures in accordance with USACE guidance.

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4.0 QUALITY CONTROL PLAN

4.1 INTRODUCTION

The USA QC process provides a permanent and workable system that allows each employee to understand the job performance expected within the assigned task. The USA 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 can is increased and assured throughout the project.

This Quality Control Plan (QCP) provides the procedures and methods to be used for the field activities within the selected work areas. This plan addresses organization and responsibilities, DQOs, QC test methods audit procedures and pass/fail criteria, digital geophysical operations, anomaly acquisition and reacquisition, 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.

USA will use the data collected during the overall Environmental Baseline Survey activities for inclusion in the Final Environmental Baseline Survey Report at the completion of the project.

4.2 QUALITY MANAGEMENT STRUCTURE

The following paragraphs describe the organizational structure of the 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 USA CORPORATE DIRECTOR OF SAFETY AND QUALITY

The Corporate Director of Safety and Quality (CDSQ) (Mr. Robert Crownover) is responsible for reviewing and updating the Quality Control Plan and verifying compliance with the plan. The Corporate Director of Safety and Quality verifies compliance with the Quality Control Plan by auditing project activities and instituting corrective actions; and develops and coordinates the Accident Prevention Plan (APP). The Corporate Director of Safety and Quality is the contact for regulatory agencies on matters of health and safety. For this project, the UXOSO and UXOQCS is a dual-hatted position. The CDSQ has the following responsibilities:

- Preparation of USA 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

The Project Manager (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 USA TEAM LEADER (UXO TECHNICIAN III)

The Team Leader is responsible for the day-to-day field operations at the project site. The Team Leader reports directly to the USA Project Manager (PM) and has the following responsibilities:

- Implementation of work plan and QC policies and procedures
- Reporting to the PM 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.

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

The UXOSO/UXOQCS is responsible for overseeing the site QC plan 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 PM for daily operations and maintains a direct line of communication to the PM and Field Team Leader. The UXOSO/UXOQCS reports directly to the CDSQ and has the following responsibilities:

- Reviewing, implementing, and enforcing the QC plan
- Coordinating with the USACE QA representative to ensure DQOs are appropriate for the task being performed
- Coordinating with the CDSQ to ensure QC procedures are appropriate in demonstrating validity sufficient to meet QC objectives
- Performing periodic audits of USA's performance under the contract.
- Assisting the CDSQ in Root Cause Analysis
- Recommending to the PM any actions to be taken in the event of a QC failure
- Maintaining a Lessons Learned log
- Placement and control of Coverage Seeds for QC purposes
- Has STOP WORK authority for issues regarding QC at the project site.
- Conducting QC inspections of documents, work in progress, work performed, and monitoring. Recording and reporting the results to the appropriate personnel
- Ensuring classification of MEC-related items
- Recommending to the CDSQ any actions to be taken in the event of a QC failure
- Advising the Field Team Leader and Survey Teams on all QC-related site matters
- Reporting non-compliance with QC criteria to the project personnel and the UXOSO/UXOQCS

4.3 DATA QUALITY OBJECTIVES

Data obtained during the Environmental Baseline Survey field operations must support the decision-making process. Consequently, data must be of a sufficient quantity and quality to make defensible decisions to provide an acceptable level of certainty for the decision maker(s).The project DQOs are presented in Table 3-1.

4.4 QUALITY CONTROL TEST METHODS AND AUDIT PROCEDURES

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

4.4.1 INSPECTIONS

USA will conduct inspections to verify whether quality-related activities comply with this QC Plan. A list of the audit procedures based on the DFWs 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 UXOSO/UXOQCS will implement the three-phase control process for each of the Definable Feature of Work (DFW) in Table 4-1 to audit/inspect the subtasks for compliance with the approved WP, SOPs and Geophysical 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 UXOSO/UXOQCS will review the DFW scope and applicable specifications (Geophysical DQOs) 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 UXOSO/UXOQCS performs 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, to verify through inspection and testing the acceptable level of workmanship. The UXOSO/UXOQCS will review the preparatory phase QC Surveillance Forms 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 UXOSO/UXOQCS performs 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 UXOSO/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 UXOSO/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 (Work Plan, SOPs, AHAs, etc.)
- A mechanism for verifying the implementation of 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 QC Plan, 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 Project Manager. 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 that 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.

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Table 4-1: Definable Features of Work Audit Procedures

Definable Feature of Work	Reference	Audit Procedures	QC Phase	Frequency of Audit	Pass/Fail Criteria	Action if Failure Occurs
1. Mobilization of Equipment, Supplies, and Personnel & Site Training	WP Sections 2.2.4 and 3.6.3	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 Team Leader for resolution, follow-up to verify compliance before personnel are assigned project tasks
	WP Sections 2.3 and 3.5.7	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 Team Leader 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 Personnel are added	All field personnel have reviewed the Work Plan and the Accident Prevention Plan.	Document deficiency and report to Team Leader for resolution, follow-up to verify compliance before personnel commence assigned project tasks
	APP	Document Review	PP/IP/FP	Once and Follow-up as Personnel are added	All personnel have signed the Employee Sign-off Forms for the Site Health and Safety Plan, the Certificate of PPE training and that all Activity Hazard Analyses have been completed.	Document deficiency and report to Team Leader 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 onsite for all hazardous materials used or encountered onsite	Document deficiency and report to Team Leader for resolution, follow-up to verify compliance before personnel are exposed to the hazardous material of concern
	WP Section 2.6 Project Schedule	Visual Observation and Document	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 Team Leader for resolution

Definable Feature of Work	Reference	Audit Procedures	QC Phase	Frequency of Audit	Pass/Fail Criteria	Action if Failure Occurs
		Review				
	WP Sections 3.3 and 3.4	Visual Observation and Document Review	PP/IP/FP	Once and Follow-up as Required	All required equipment is functional, properly calibrated, and complies with contract specifications.	Document deficiency, ensure any faulty equipment is pulled from service and report to Team Leader for resolution, follow-up to verify compliance
	WP Section 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 Team Leader for resolution prior to initiating project tasks
2. Preparation of the Work Areas and Staging Areas	WP Section 2.11	Document Review	PP/IP/FP	Once and Follow-up as Required	Coordination with support facilities has been conducted.	Document deficiency and report to Team Leader 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 Team Leader 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 Team Leader for resolution prior to initiating project tasks
3. Hydrographic Surveys	WP Section 3.3 and SOPs (App. K)	Visual Observation and Document Review	PP/IP/FP	Daily as Required	Pre-operations checks performed on MBS and SSS equipment and positioning equipment used to collect data	Document deficiency and report to Team Leader for resolution, follow-up to verify compliance
	WP Section 3.3 and SOPs (App. K)	Visual Observation and Document Review	PP/IP/FP	Daily as Required	Hydrographic survey data collection activities	Document deficiency and report to Team Leader for resolution, follow-up to verify compliance

Definable Feature of Work	Reference	Audit Procedures	QC Phase	Frequency of Audit	Pass/Fail Criteria	Action if Failure Occurs
	WP Section 3.3 and SOPs (App. K)	Visual Observation and Document Review	PP/IP/FP	Daily as Required	Post-operations checks of MBS/ SSS equipment and positioning equipment	Document deficiency and report to Team Leader for resolution, follow-up to verify compliance
4. Underwater Visual Investigation	WP Section 3.4 and SOPs (App K)	Visual Observation and Document Review	PP/IP/FP	Daily as Required	Pre-operations checks performed on ROV and other equipment used to collect underwater data	Document deficiency and report to Team Leader for resolution, follow-up to verify compliance
	WP Section 3.4	Visual Observation and Document Review	PP/IP/FP	Daily as Required	Expanded survey conducted on MEC like items using the ROV	Document deficiency and report to Team Leader for resolution, follow-up to verify compliance
	WP Section 3.4 and SOPs (App K)	Visual Observation and Document Review	PP/IP/FP	Daily as Required	Post-operations checks performed on ROV and other equipment used to collect underwater data	Document deficiency and report to Team Leader for resolution, follow-up to verify compliance
	WP Section 3.5 and SOPs (App N)	Visual Observation and Document Review	PP/IP/FP	Daily as Required	Pre-operations checks performed on PDA/GPS and other equipment used to collect underwater data	Document deficiency and report to SS for resolution, follow-up to verify compliance
	WP Section 3.5 and SOPs (App N)	Visual Observation and Document Review	PP/IP/FP	Daily as Required	Expanded survey conducted within identified shallow water coverage areas.	Document deficiency and report to SS for resolution, follow-up to verify compliance
	WP Section 3.5 and SOPs (App N)	Visual Observation and Document Review	PP/IP/FP	Daily as Required	Post-operations checks performed on PDA/GPS and other equipment used to collect underwater data	Document deficiency and report to SS for resolution, follow-up to verify compliance
5. Demobili-	WP Section	Visual Observation	PP/IP/FP	Prior to Demobili-	All equipment and files are packaged and shipped to	Document deficiency and report to Team Leader for

Definable Feature of Work	Reference	Audit Procedures	QC Phase	Frequency of Audit	Pass/Fail Criteria	Action if Failure Occurs
zation	2.0	and Document Review		zation	corporate headquarters, all leased/rented equipment is returned off lease/rental and all project support agreements are terminated.	resolution, follow-up to verify compliance
	WP Section 2.0	Visual Observation and Document Review	IP/FP	End of Field Tasks	A walkthrough of the project area is conducted to ensure all excavations have been backfilled and no equipment remains onsite	Document deficiency and report to Team Leader for resolution, follow-up to verify compliance
6. Project Reporting and Submittals	WP Section 2.7 and PWS	Visual Observation and Document Review	PP/IP/FP	Weekly	Project Status Reports are reviewed for accuracy and thoroughness IAW the PWS	Document deficiency and report to Team Leader for resolution, follow-up to verify compliance
	WP Section 2.7 and PWS	Visual Observation and Document Review	PP/IP/FP	Prior to submittal of report	The records of telephone conversations, written correspondence concerning this Task Order and meeting minutes are attached to the Project Status Report in accordance with DID MMRP-09-016	Document deficiency and report to Team Leader and PM for resolution, follow-up to verify compliance

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 a Deficiency Notice (DN) form. The DN will identify, at a minimum, any corrective action required, the individuals reviewing and approving the actions, and the actions taken to prevent recurrence. A Deficiency Notice Log will be maintained to document and track corrective actions to closure and be included in the Environmental Baseline Survey Report. The UXOSO/UXOQCS will be responsible for tracking deficiencies to closure and reporting their status on daily reports and log forms (see Appendix F for the DN and Deficiency Notice Log forms).

4.4.2.1 Root Cause Analysis

The UXOSO/UXOQCS will conduct a Root Cause Analysis to determine if the failure is the result of the process, procedures, equipment and/or personnel and to what extent of previously performed work may have been affected by the failure. The UXOSO/UXOQCS will provide his findings to the PM, Corporate QC Manager and 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 target reacquisition and intrusive quality control measures and metrics will be documented, with copies sent to the appropriate personnel for review and inclusion into other documents as deemed necessary. Figure 4-1 illustrates the flow of the root cause and effect process that the UXOSO/UXOQCS will use to determine failure causes.

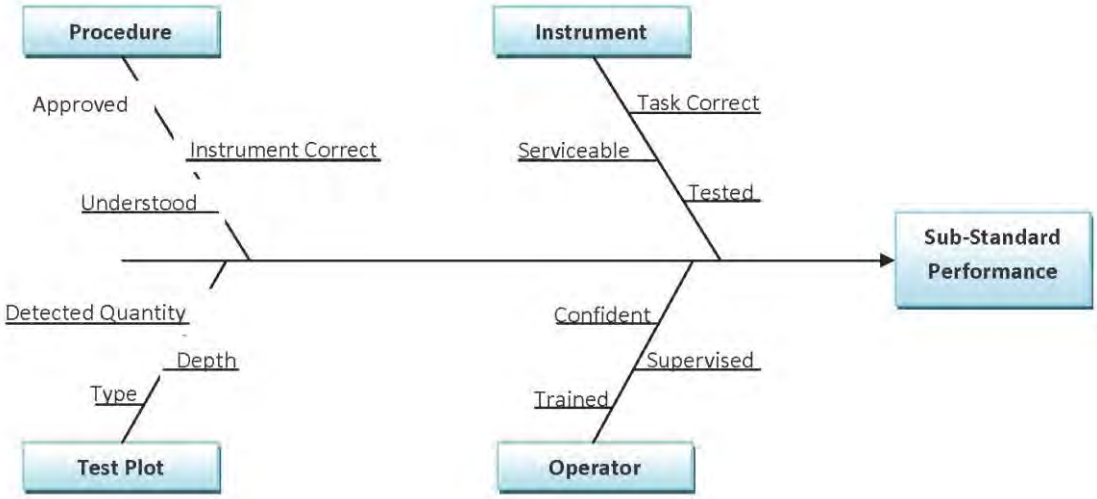

Figure 4-1: Cause and Effect Process

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 of equipment currently in use

- Acquisition of supplemental equipment
- Implementation of new procedures or modification of existing procedures
- Changes in QC procedures.

The UXOSO/UXOQCS will document the application of the corrective actions on the DN. Through follow-up phase surveillance, the UXOSO/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 UXOSO/UXOQCS is responsible for verifying that site personnel perform operational checks of instruments and equipment prior to using them onsite. The UXOSO/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 Work Plan. The UXOSO/UXOQCS will utilize the process outlined in Figure 1-1, Quality Control Process, and Table 4-1, Definable Features of Work Audit Procedures, to ensure all field tasks meet quality standards prior to submittal for the Quality Assurance process. The UXOSO/UXOQCS will submit a report to the Site Manager detailing the results of these checks.

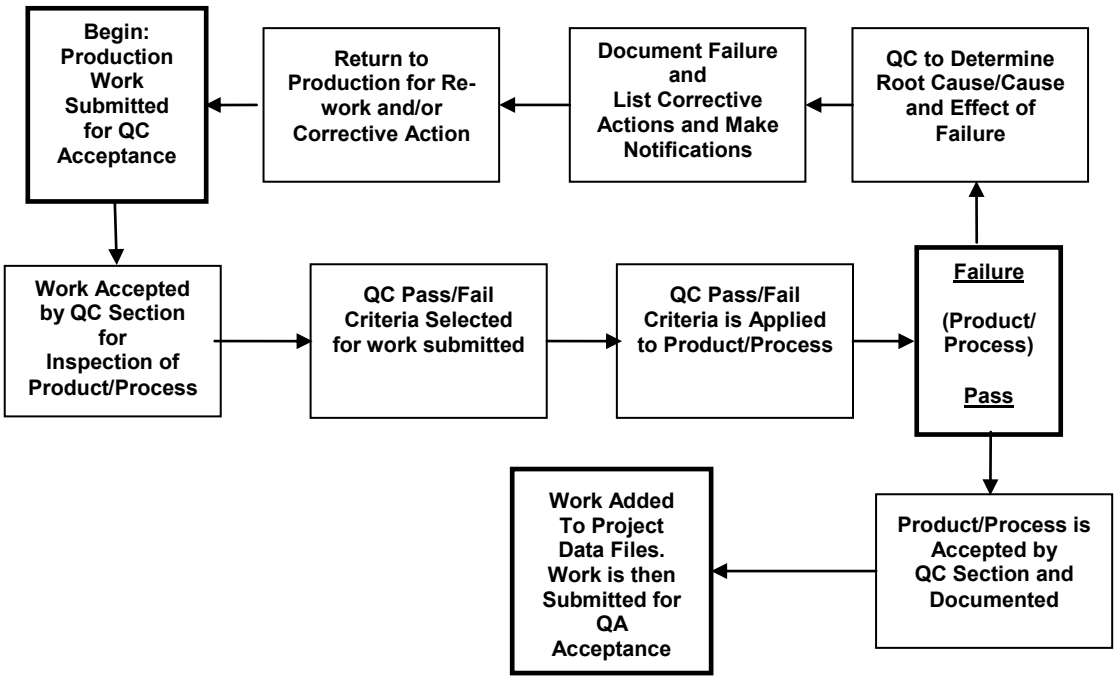

Figure 4-2: Quality Control Process

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, MBS/SSS data parameters, to support the field activities, will be tested with sufficient frequency and in such a manner as to ensure that accuracy and reproducibility of results are consistent with the manufacturer's specifications. Instruments or equipment failing to meet the standard will be repaired, recalibrated, 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.

4.5.2 CALIBRATION

The UXOSO/UXOQCS will coordinate with the ASI survey team to check and ensure that MBS and SSS equipment are calibrated or recalibrated in accordance with the applicable SOPs and manufacturer's recommendation or owner's manual. Calibrations will be completed on a prescribed schedule and the calibration results recorded in the daily field logbook.

Recalibration will be performed as necessary with the reason for the recalibration and the results recorded in the daily field logbook.

4.5.3 MAINTENANCE

The UXOSO/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's recommendation or owner's manual for equipment requiring regular upkeep.

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

- Vehicles
- Vessels (Boats)
- VideoRay Pro -3 ROV
- MBS Fathometer Equipment
- SSS Towfish Transponder
- Data Acquisition Systems
- Personal Protective Equipment
- Communications Equipment
- RTK-DGPS Equipment, and Personal Digital Assistant
- Emergency Equipment.

Replacement equipment will meet the same specifications for accuracy and sensitivity as the equipment removed from service. 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 UXOSO/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's 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 UXOSO/UXOQCS.

4.5.4 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, tailgate safety briefings, etc). These forms help to ensure uniformity of activities being conducted, inspected, and reviewed. Forms are located in Appendix F of the work plan. The following logbooks and records will be maintained on site and are subject to inspection by the UXOSO/UXOQCS.

4.5.5 UXO QUALITY CONTROL REPORT

The UXOSO/UXOQCS prepares daily QC Report and a weekly QC Report (the report forms are located in Appendix F). These documents are kept on-site. The weekly QC report is submitted to the PM for distribution to the appropriate personnel. This report includes the following information:

- The periodic assessments 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 UXOSO/UXOQCS.

4.5.5.1 Daily Journal

The Daily Journal will be maintained by the Team Leader; this journal 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 work plan, SSHP, policies or procedures
- Injuries and /or illnesses
- Safety briefings
- MEC encountered
- Relevant events and training
- Signature of the Team Leader.

4.5.5.2 Field Logbooks

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

- Date and team location
- Personnel and work performed
- Equipment and instrument checks
- Injuries and/or illnesses
- Changes to work instructions
- Work stoppage
- Visitors
- Other relevant events
- Signature of Supervisor.

4.5.5.3 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.

4.5.5.4 Quality Control Logbook

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

- Equipment testing and results
- QC inspections performed,
- Locations and identification numbers of emplaced Blind Seed Items/Industry Standard Objects (BSI/ISO)
- Work stoppage due to QC issues
- Equipment monitoring results
- Non-conformance reporting
- Other relevant events
- Date and teams checked
- Signature of UXOSO/UXOQCS.

4.5.5.5 Training Records

Training records will be maintained by the PM. 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 Team Leader, UXOSO or UXOSO/UXOQCS.

4.5.5.6 Underwater MEC and Anomaly Records

The underwater MEC and anomaly records are individually prepared records for each operating team. These records are prepared by the Team Leader, and are used to record data on anomaly and MEC encountered. These records also include:

- Date and target identifier
- Identification of item(s) located
- Classification
- Distance from marked target location and depth encountered
- Type, condition, depth, and location of any MEC encountered
- Disposition of MEC
- Location and identification number of recovered BSI/ISOs
- Other relevant data
- Signature of Supervisor.

4.5.5.7 Photographic Logbook

The Photographic Logbook will be maintained by the Team Leader. 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.

4.5.6 DAILY REVIEW OF FIELD DATA

During daily field activities or at least once daily, the UXOSO/UXOQCS will review field data to ensure accurate classification and documentation of recovered MEC related items. This review will allow for reconstruction of what an item was and whether or not its classification is correct.

4.6 CONTRACT SUBMITTAL QUALITY CONTROL PROCESS

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

- The USA Project Manager will take the lead in 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 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
- 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
- After the project team has performed a review of documents, the Corporate QC Manager and UXOSO/UXOQCS 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 work plans will be submitted to the PM immediately upon approval. The PM will be 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 divided into hydrographic and underwater visual surveys conducted at the site. Personnel responsible for the inspections, reviews, corrections, and reports are identified in the following paragraphs.

The UXOSO/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 Work Plan. The UXOSO/UXOQCS will utilize the process outlined in Figure 4-2, Quality Control Process, and Table 4-1, Definable Features of Work, to ensure all field tasks meet quality standards prior to submittal for the Quality Assurance process. The UXOSO/UXOQCS will submit a report to the Site Manager detailing the results of these checks.

4.7.1 CLASSIFICATION OF MEC-RELATED ITEMS

To ensure accurate classification of MEC-related items (with respect to their explosive hazard), as the information is used to make decisions about the response action, USA will inspect suspect MEC and classify these items in accordance with Table 4-2. The list is not all inclusive, but reflects the types of MEC related material that may be encountered at the project site. The numbers in the table refer to footnotes that are found on the next page. It is important to read the footnotes, as they provide additional information of importance to understanding.

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Table 4-2: Classifications of MEC-Related Items

Type of Material	Classification Following Inspection:					
	Presents Explosive Hazards			Does Not Present Explosive Hazards		
	MEC					
	UXO	DMM [1]	MC [2]	MC (3)	Munitions Debris	Other
Used military munitions, on a range, fired	X				X	
Unused military munitions, on a range, apparently discarded		X			X	
Used military munitions, in a burial pit, on a former range	X(4)				X	
Unused military munitions, in a burial pit on a former range		X(4)			X	
Explosives in the soil			X(5)	X		
Target from a range (other than small arms range)	X(6)	X(6)	X(6)			X(7)
Remnants of munitions from a former range	X(8)	X(8)	X(8)		X(9)	

Footnotes:

(1) Discarded Military Munitions (DMM): Munitions generally considered as DMM include: buried munitions; un-recovered kick outs from open detonations; munitions left behind or discarded accidentally during munitions-related activities; munitions intentionally disposed of without authorization during munitions-related activities. Munitions removed from storage for the purpose of disposal that are awaiting disposal are not DMM.

(2) Munitions Constituents: MC is both (a) an explosive; and (b) present in sufficient concentrations to present explosive hazards.

(3) This is MC that is either (a) not an explosive (e.g., lead, beryllium, and cadmium); or (b) an explosive not present in sufficient concentrations to present explosive hazards.

(4) Although military munitions in a burial pit will normally be DMM, some may be UXO. For explosives safety reasons, munitions in a burial pit should be approached as UXO until assessed by technically qualified personnel (e.g., Explosive Ordnance Disposal (EOD) personnel, UXO-qualified personnel) and determined that they are not UXO or that they do not present explosive hazards similar to UXO.

(5) Explosive soil is typically found in sumps and settling lagoons for explosives-laden wastewater, and in and around drainage ditches and pipes that carry the wastewater to such sumps and lagoons.

(6) A target is a type of range-related debris. Although a target is not MEC, it may contain UXO, DMM, or MC. Prior to its release from DoD control, its explosives safety status must be documented.

(7) A target's explosives safety status must be documented and any demilitarization required to remove its military characteristics must be performed prior to its release from DoD control.

(8) UXO, DMM, or MC may be found on operational ranges and on former ranges (previously referred to as closed, transferring or transferred ranges). An inspection of the material will determine into

which category this material falls. For example, if a projectile breaks apart on impact, one could find (a) a sheared-off fuze, which would be UXO or (b) explosive filler, which would be MC that broke away from the projectile's open body. If during an open detonation of an unserviceable munitions that is conducted on an operational range, the donor charge detonates, but the munitions being destroyed breaks up, but does not detonate, the remnants of the munitions would be DMM or, if explosive residue (e.g., clumps of TNT), MC.

(9) Fragments, while munitions debris, may be evidence of High Explosive (HE) usage at the site. For such fragments, USA will indicate evidence of HE in its classification. After determination of its explosives safety status, scrap metal from used munitions on a range that is documented as safe would, after any demilitarization required removing its military characteristics, be available for release from DoD control. In additions to these DoD requirements, other regulatory criteria may apply.

4.8 QUALIFICATIONS AND TRAINING

4.8.1 EMPLOYEE QUALIFICATIONS

The PM will maintain personnel files on each employee at the project site. These files include copies of necessary license, 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 PM 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

USA ensures that only qualified and properly trained personnel are assigned to positions on project sites. Prior to mobilization of personnel, USA ensures that training required by USA, 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 4-3 below.

Table 4-3: 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 USA management and supervisory personnel. This includes the Team Leader, UXOSO, UXOSO/UXOQCS, and UXO Technicians III (UXOTIIIs).
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	At least two site personnel will have current first aid and CPR training.

Training Course	Personnel Attending
30-Hour OSHA Construction Safety Course	Training Requirement for UXOSO IAW with EM 385-1-1, Section 01.A.17

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

- Familiarization with the Work Plan and its policies and procedures
- APP/SSHP/AHA/SOP orientation
- Emergency Response Plan training
- Personal Protective Equipment (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 onsite, visitors will be escorted at all times by a UXO technician).

Training is conducted by the Team Leader, UXOSO/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, USA will develop a Lessons Learned Program (LLP) to provide for the exchange of information regarding problems that may occur during the response RI activities on this project site.

4.9.1 LESSONS LEARNED 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
- To promote efficient and cost-effective business practice.

4.9.2 TEAM RESPONSIBILITIES

The USA project team will be responsible for identifying and submitting lessons learned for review and approval. Throughout this the MEC response activity, USA 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 Corps PM for potential discussion with the project development team during After Action Reviews.

5.0 EXPLOSIVES MANAGEMENT PLAN

NOT APPLICABLE

This plan is required only when explosives will be utilized. USA will not use explosives in the execution of the Environmental Baseline Survey field activities.

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6.0 EXPLOSIVES SITE PLAN

The Explosives Site Plan is not applicable.

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7.0 ENVIRONMENTAL PROTECTION PLAN

7.1 GENERAL

This Environmental Protection Plan (EPP) has been specifically developed to address environmental protection issues associated with performing Environmental Baseline Survey field activities at the Culebra Island site. 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 USA's operations.

Appendix M contains the revised *SOPs for Endangered Species Conservation and their Critical Habitat during underwater investigations at DERP-FUDS property No. I02PR0068, Culebra Island, Puerto Rico (CESAJ, 2012)*. These SOPs provide specific procedures for DERP-FUDS operations in Culebra and surrounding cays and is being referenced by section into this EPP. **Adherence to these SOPs will be strictly enforced.**

7.1.1 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.

7.1.2 ENVIRONMENTAL GOALS

The work at the Culebra MRS sites is being performed to gather the data necessary to:

- Document the bathymetry within the water portions of the MRSs;
- Document and verify the types of benthic habitats that are located within the proposed MEC and munitions constituents (MC) investigation areas of each MRS (documented along transect swaths);
- Investigate and document suspected MEC items that may be located on the surface of the seafloor within the MRSs; and
- Establish a RI transects design for conducting subsequent underwater geophysical surveys and intrusive investigations which takes into consideration the locations of critical habitat and endangered species.

The following are environmental goals of the project:

- Perform operations in a manner that minimizes the disturbance of corals, sea grasses, sediment, and other underwater vegetation
- Leave the investigation footprint areas in as near a natural condition as operationally possible.

To accomplish these goals, USA will implement procedures to control 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.

7.1.3 ENVIRONMENTAL COORDINATION

USA's Team Leader will coordinate all land resources management, waste management, pollution control, and abatement activities with the on-site USACE OE Safety Specialist, and USFWS/ NOAA NMFS/PR DNER personnel.

7.2 ENVIRONMENTAL RESOURCES AND EFFECTS

7.2.1 ENVIRONMENTAL SURVEY

Prior to beginning site activities, USA's Team Leader and UXOSO/UXOQCS, along with representatives of the USFWS Ecological Service and NMFS and the USACE OE Safety Specialist, will conduct a joint environmental survey, and develop a layout plan of the operating area on each MRS to document conditions of areas in and adjacent to the site of the work and access routes. The following items shall also be identified on the layout plan: endangered and protected species or habitats, and cultural or historical resource areas.

7.3 ENDANGERED /THREATENED 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. Section 3.0 of Appendix M of the EBS WP includes a detailed description of the following species: 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) coral.

7.3.1 SPECIES OF CORALS PROPOSED FOR LISTING UNDER THE ENDANGERED SPECIES ACT (ESA)

In addition to the list species under the ESA, those species being considered under the 20 October 2009, 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 recived and reviewed the petition and determined that the requested listing actions may be warranted for 82 of the 83 coral species. The completed status review and management report (NOAA Technical Memorandum NMFS-PIFSC-27) was issued in September of 2011. 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). Section 3.13.1 of Appendix M of the EBS WP includes a detailed description of each of these coral species.

7.3.2 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 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.

7.3.3 GENERAL CONSERVATION MEASURES

7.3.3.1 Date of Commencement:

USA 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.

7.3.3.2 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). USA shall submit their qualifications to the USACE for review and approval. The training or briefing will also include safety and emergency procedures.

7.3.3.3 Civil and Criminal Penalties:

USA 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).

7.3.3.4 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. USA 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.

7.3.3.5 Coordination:

All related work will be coordinated with the TPP Team prior to initiation. USA 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. USA will make any required project notifications to the appropriate USACE personnel, who will in turn notify the regulators and resource agencies.

7.3.3.6 Reports:

USA 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.

7.3.3.7 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 MEC items 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.

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.

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

If during underwater activities USA observes items that may have historic or archeological value, USA 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.

7.3.4 STAGING AREA AND SEA TURTLE NESTING MONITORING

The sea turtle nests monitoring will be limited to the areas used by USA's personnel. The beach monitoring efforts will consist of nests sighting and identification will avoid any sea turtle nests that are encountered. Any nest encountered shall be clearly marked (e.g. using flagging). All 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..

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.

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.

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.

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).

If sea turtle nests are found, USA's personnel will notify USACE, who will notify the FWS Boquerón Endangered Species Specialist, NMFS Boquerón Office and DNER Point of Contact (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 this section.

7.3.5 CORAL AND SEAGRASS AVOIDANCE MEASURES

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.

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

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.

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, USA shall provide and specify the type of equipment to be used and their recommended safety depths to avoid impacts to endangered and threatened species.

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 and out of water depths of at least 4 ft.

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 sea grass areas.

Vessels shall be maintained away from areas with corals and sea grasses Operations shall be conducted in such manner that bottom scour or prop dredging will be avoided when corals or sea grasses are present.

The following actions are prohibited:

- Walk on, sit on or stand on coral
- Collect coral (dead or alive)
- Anchoring on coral
- Touch coral with hands or equipment
- Discharge any pollutant or contaminant
- Dump trash

7.3.5.1 Anchoring*

Anchoring on an established seagrass beds will be avoided as much as possible (IAW Appendix M), however, if the need to anchor within seagrass is not avoidable, USA field teams will attempt to only anchor small boats in areas with sand bottoms in waters with depths of at least 4 ft, and avoid anchoring directly on seagrass to the maximum extent practicable. The ROV and underwater camera can be utilized to survey the underwater area to ensure the condition of the sea floor is known prior to anchoring. If mooring buoys are available, these will be used rather than weighing anchor.

If required to anchor within seagrass areas in order to complete effective underwater survey, the following procedures will be utilized:

- Anchor will be lowered from the support boat in a controlled manner, and the boat will complete minimal maneuvering to seat the anchor into the sea floor
- During retrieval, the support boat will slowly advance on the anchor line
- Once the support boat is over the anchor, vertical pressure will be exerted on the line in order to break the seating of the anchor from the sea floor
- The anchor will quickly be retrieved in a vertical direction through the water column, with the support boat performing minimal maneuvering.

All actions will be executed to avoid dragging the anchor across the sea floor during insertion/extraction to minimize impact to seagrass beds.

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 USA PM shall also contract the NOAA Office of Law Enforcement at 1-800-853-1964. The following information must 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 shall perform the following:

- Turn of 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 coral or seagrass is injured the USA PM shall follow the procedures described in Part 4.3.9.

7.3.6 MARINE MAMMALS AND SEA TURTLES AVOIDANCE MEASURES

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, USA's personnel will follow and implement the avoidance measures provided under this section.

A trained sea turtle/ marine mammal observer 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. USA 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.

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.

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.

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

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 USA 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.

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.

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.

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.

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

All sightings and actions taken shall be reported.

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 Appendix M of the WP.

- 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

7.3.7 SNORKELING OPERATIONS

All underwater investigation work will be conducted by qualified and trained snorkelers 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.

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. USA will maintain a log detailing equipment inspections.

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.

Based on dive site conditions, the amount of snorkelers in the water will be determined by USA.

The following general "best practices" will be followed:

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

7.3.8 SURVEY EQUIPMENT

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 cameras, marking buoys and floats, and GPS. USA shall provide and specify the type of equipment to be used and their recommended safety depths to avoid impacts to endangered and threatened species. Proper operation of equipment will be reviewed prior to use. Snorkeling teams will utilize handheld equipment operated from the surface. Equipment such as cameras, GPS/PDA, and portable depth sounders will be operated from a kickboard or will be attached to the snorkeler at all times.

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

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.

Any unintentional injury to protected species during diving operations will be reported immediately.

7.3.9 SPILL CONTROL AND PREVENTION

All fueling and maintenance of vehicles will be performed offsite 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 EPA or State EPA through approved channels.
- The fuel tank will not be filled to more than about three-quarters full to prevent overfilling in the field.

7.3.10 ALL STORAGE AREAS

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

7.3.11 VEHICULAR ACCESS ROUTES

Although most of the EBS field activities will be conducted on water, some areas of MRS 09 water areas may be accessed from land. USA 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, FWS, and the USACE OE Safety Specialist will be notified and approval from proper authority will be obtained prior to initiating off-road travel or operations. In such cases, the following 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.

7.3.12 TREES AND SHRUBS PROTECTION AND RESTORATION

It is unlikely that any trees will be removed during the Environmental Baseline Survey field work. Therefore, no provisions for tree restoration are required.

7.3.13 TEMPORARY FACILITIES

USA will not establish a site trailer command post. Trash will be collected and dumpsters will be dumped or removed, as appropriate.

7.3.14 DECONTAMINATION AND DISPOSAL OF EQUIPMENT

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

7.3.15 MINIMIZING AREAS OF DISTURBANCE

Procedures for minimizing areas of disturbance are described throughout this environmental protection plan and include such measures as:

- Complying with the procedures in Appendix M.

7.4 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.

7.5 AIR MONITORING PLAN

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

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8.0 PROPERTY MANAGEMENT PLAN

NOT APPLICABLE

This plan is required only when government property is used. USA will not use government property in the execution of this Task Order.

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9.0 INTERIM HOLDING FACILITY SITING PLAN FOR RECOVERED CHEMICAL WARFARE MATERIEL

NOT APPLICABLE

Not authorized by the Performance Work Statement.

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10.0 PHYSICAL SECURITY PLAN FOR RECOVERED CHEMICAL WARFARE MATERIEL SITES

NOT APPLICABLE

Not authorized by the Performance Work Statement.

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11.0 REFERENCES

The following are references applicable to this project. 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 onsite personnel and the local community.

11.1 U.S. ARMY CORPS OF ENGINEER 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 1110-1-4009. Engineering and Design – Military Munitions Response Actions, 2007.
- 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.

11.2 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.

11.3 DEPARTMENT OF DEFENSE DOCUMENTS

- DOD 6055.9-M, Ammunition and Explosive 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

11.4 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*.

11.5 U.S. ENVIRONMENTAL PROTECTION AGENCY

Risk Assessment Guidance for Superfund (RAGS), 1989.

11.6 FEDERAL REGULATION

- 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.
- U.S. Fish & Wildlife Service, Culebra National Wildlife Refuge, undated.

11.7 OTHER DOCUMENTATION/SURVEYS AND STUDIES

- Kendall, M.S.1, M.E. Monaco1, K.R. Buja1, J.D. Christensen1, C.R. Kruer2, and M. Finkbeiner3, R.A. Warner1. 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.

    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

APPENDIX A. PERFORMANCE WORK STATEMENT (PWS)

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Performance Work Statement
Remedial Investigation / Feasibility Study
at Culebra Island Site, Puerto Rico
I02PR0068
10 June 2009
Revision: 8
Revision Date: 10 February 2012

All changes are in bold and italicized text, newest changes are also underlined.

The purpose of Revision 7 dated 10 February 2012 is to affect the following changes:
Text was changed in the Objective to allow for a Decision Document for both the land and underwater portions of the RI/FS. The land portion of the RI/FS will require that the Final Decision Document be accepted by Huntsville by 15 December 2012.
Task 2b: Included a separate sub task for the Baseline Survey Report WP.
Task 2c: Included a separate sub task for the Underwater Investigation Phase WP.
Task 2d: Included a separate sub task for the Underwater Intrusive Phase WP.
-Task 4a: Added the requirement for the contractor to perform multi-beam bathymetry and the required standards.
-Task 4a1 Additional Underwater Intrusive Investigation: Added text to include intrusive investigation of additional underwater acreage.
-Task 4e Soldaldo Point: Text was added to change the investigation around Soldaldo Point. The text now states, the contractor shall investigate to 100 yards seaward of mean high tide and beyond up to an additional 24 acres to the extent of the exposure pathway for Soldaldo Point depicted in Appendix C Culebra Exposure Pathways. The contractor shall include multi-beam bathymetry, side scan sonar and underwater DGM in their approach. The contractor shall utilize International Hydrographic Organization (IHO) Order 1 or better and EM 1110-2-1003 Hydrographic Survey Manual (USACE 2002), where appropriate~~.~~
-Task 4e1 Additional Underwater Intrusive Investigation: Added text to include intrusive investigation of additional underwater acreage.
Task 5a: Added Subtask for underwater RI Report.
Task 6a: Added Subtask for underwater FS Report.
Task 7a: Added Subtask for underwater Proposed Plan.
Task 8a: Added Subtask for underwater DD.
Task 14: Changed text to "Contractor shall prepare, submit and gain approval of a Baseline Survey Report documenting the results from the multi-beam 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".
Changed section 4.6 to reflect changes in Project Management within Huntsville and Jacksonville
Additional Unit Prices were included in Appendix A for subtasks 5a-8a.
Contract Completion Date Remains 14 March 2014.

~~*The purpose of Revision 7 dated 16 September 2011 is to affect the following changes:*~~
~~*-Task 4 now includes Bathymetry, Side Scan Sonar and Underwater DGM. Unit prices have been added to Appendix D. Additionally, Appendix D includes a FFP for a WP Addendum.*~~

~~*The purpose of Revision 6 dated 30 August 2011 is to affect the following changes:*~~
~~*-Task 4a Luis Pena Impact Area: Text was added to change the investigation around Luis Pena. The text now states, the contractor shall investigate to 100 yards seaward of mean high tide and beyond up to an additional 379 acres to the extent of the exposure pathway for Luis Pena depicted in Appendix C Culebra Exposure Pathways.*~~
~~*-Added Task 14 to include an Underwater Baseline Survey Report.*~~
~~*-Appendix A: A FUP was added for both the ROV per acre*~~
~~*Appendix A: Task 14 was included to Appendix A.*~~
~~*-Appendix C: Included as a reference for the investigation water boundary for Luis Pena Impact Area.*~~

~~*The purpose of this revision dated 12 June 2009 is to affect the following changes:*~~
~~*Text was added to paragraph 3.11 to include an administrative record for each individual MRS.*~~
~~*Incorporate evacuations as part of Task 4, par 4.1and renumber subparagraphs.*~~
~~*Task 12, Environmental Sampling & Analysis has been changed to Firm-Fixed Price/Unit Price*~~
~~*Correct Appendix A Price Spreadsheet.*~~

1.0 OBJECTIVE: The objective of this task order is to obtain acceptance of a Decision Document ***for both the land portion and the underwater portion which meets*** ~~meeting~~ the requirements of ER 200-3-1 and CX Interim Guidance 06-

04. Work to be accomplished includes the conduct of a Remedial Investigation (RI), Feasibility Study (FS) and all necessary activities required to accomplish this objective. ***The Final Decision Document for the land portion shall be accepted by Huntsville on 15 December 2012.***

2.0 BACKGROUND: Work required under this Performance Work Statement (PWS) falls under the Formerly Used Defense Sites (FUDS), Military Munitions Response Program (MMRP). Munitions and Explosives of Concern (MEC) are a safety hazard and may constitute an imminent and substantial endangerment to site personnel. Applicable provisions of Chapter 29 of the Code of Federal Regulations (CFR) 1910.120 apply. The Contractor shall perform all work 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). All activities involving work in areas potentially containing MEC hazards shall be conducted in full compliance with United States Army Corps of Engineers (USACE), United States Army Engineering and Support Center Huntsville (USAESCH), Department of the Army (DA), Active Installation, and Department of Defense (DOD) safety regulations. All MEC encountered during this munitions response shall be destroyed on-site in coordination with the Unites States Coast Guard (USCG) and local environmental agencies.

2.1 Location: The Culebra Island Site, Formerly Used Defense Site, is located east of the main island of Puerto Rico and is part of the Commonwealth of Puerto Rico.

2.2 History: Culebra came under Navy control in 1901, and the Navy built a small base that same year and an airfield about 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 cays (small islands surrounding Culebra) in the early 1960s. Ordnance firing ended in September 1975

2.2.1 The Culebra Island National Wildlife Refuge is administered by the U.S. Fish and Wildlife Service (FWS) and encompasses approximately 1500 acres of the Island of Culebra, and about 23 surrounding cays**.** The remaining acreage is owned by the Commonwealth of Puerto Rico, primarily the Department of Natural and Environment Resources (DNER).

2.3 Previous Investigations:

1991 Inventory Project Report
1995 Archives Search Report
1997 Final Engineering Evaluation/Cost Analysis
2004 UXO Construction Support
2004 Archives Search Report Supplement
2005 Revised Inventory Project Report
2005 Supplemental Archives Search Report
2007 Site Inspection Report

3.0 SPECIFIC TASKS: Methods to be used to achieve task order objectives at the specified level of performance shall be determined by the Contractor. The Contractor will be evaluated periodically during each of the following tasks to ensure compliance with the PWS and to document that quality objectives, 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 modified for the specific task order requirements will be provided by the government. The QASP will be updated upon acceptance of the Contractor's Quality Control Plan (QCP). 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. Performance metrics are provided in Section 6.0. Minimum requirements for contractor performance and QC are provided in Section 7.0.

3.1 Task 1, Technical Project Planning (TPP): This is a Firm Fixed Price/Unit Price task. The objective of this task is for the Contractor to implement the TPP process IAW EM 200-1-2, and Interim Guidance Document 01-02. Disputes between the Project Delivery Team (PDT) and the regulators regarding the adequacy of DQO will be resolved by the USACE Project Manager. The Contractor shall anticipate 3 meetings to be conducted in the San Juan area. Meetings shall be for 1 day each plus travel. The Contractor shall plan for meetings to occur as follows: first meeting, pre-Work Plan with resulting TPP Memorandum; second meeting, to finalize Work Plan; third meeting, verify all data gaps have been filled and finalize Remedial Investigation Report. The Contractor shall also provide a unit price per TPP meeting in

the event more meetings are necessary. The Contractor shall organize and coordinate all meetings. The Contractor shall identify and involve all stakeholders, upon approval by the Government, to be included in the TPP process. The Contractor shall be responsible for the logistics of these meetings to include but not limited to, providing a facilitator, obtaining meeting location, sending invitation letters (after government review and acceptance). The Contractor shall prepare, submit for review and gain acceptance of a TPP memorandum containing the DQO's and other results of the TPP meetings, including a conceptual site model (CSM). The conceptual site model will be compatible with current GIS standards

3.1.1 Task 1a, Planning Site Visit (Optional): This task allows the contractor to attend a site visit to Culebra, PR to observe the area and gather pertain data to assist in preparations for writing the advanced package for the TPP. If a site visit is planned, the Contractor shall prepare and submit for acceptance an Abbreviated Accident Prevention Plan (AAPP).

3.2 Task 2, RI/FS Work Plan (WP): This is a Firm Fixed Price task. The objective of this task is the Contractor to prepare, submit and gain acceptance of a WP that is a detailed and comprehensive plan covering all aspects of the site characterization in accordance with data item description (DID) MR-001 and EM 1110-1-4009. An Explosive Safety Submission (ESS) has been prepared for Culebra. The government will amend the ESS and it shall be referenced in the WP.

3.2.1 Task 2a, Explosives Safety Submission Amendment (Optional): The contractor shall amend the current ESS and submit for acceptance in accordance with DID MR-060 and referenced in the WP.

3.2.2. Task 2b, 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 all 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 2c, 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 2d, 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 task. The objective of this task is for the Contractor to utilize GIS in the development of the Conceptual Site Model (CSM). The Government will provide an existing GIS data available. The GIS will be used to build upon and managed IAW DID MR-005-07.01. A pre and post-project response action geospatial data analysis shall be performed using a GIS. All available existing data that is applicable to the project shall be consolidated into the GeoDatabase and analyzed to relay pertinent information to the PDT. The analysis of data from the GIS shall support all conclusions of the CSM. The information attained through the pre-RI analysis shall be documented in the work plan. The information attained in the post-RI and FS analysis shall be documented in the RI and FS reports. The pre-RI analysis shall encompass social, environmental and/or economic entities that will be or may be impacted by response-action activities. The post-RI and FS analysis shall detail entities impacted by RI/FS activities and impacts of future response action activities (if applicable). The pre and post-RI and FS analysis 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. The Contractor shall incorporate layers that overlay on maps of the site that identify physical features, and MPPEH/MD and Range-Related Debris found during the investigation. Examples include: streets, anomalies, MEC positively identified, identifiable MD, sampling location, cultural resources, environmental, biological, and socio-economic variables. Archeological site location(s) will not be released to the public without written permission from USACE. The Contractor shall perform civil surveys IAW EM 1110-1-4009 and DID MR-005-07.01.

3.3.1 Task 3a, Landowner database and ROE (Optional): The contractor shall obtain property GIS data for all landowners with in the project boundaries. The contractor shall maintain property ownership data in the GIS, track and assist in obtaining property Right –of –Entry

3.4 Task 4, RI/FS Field Activities: This task is a Firm Fixed Price/Unit Price.

3.4.1 The objective of this task is for the Contractor to perform all necessary field activities to meet the overall objective of this task order and the DQOs established for this project. The Contractor shall characterize the nature and extent, per agreed upon requirements during TPP, of MEC contamination at the required munitions response sites (MRS) for the purpose of developing and evaluating effective remedial alternatives. This task shall include all field activities necessary to execute this task except MC sampling. MC sampling requirements are covered under the Environmental Sampling & Analysis task. All DGM shall be IAW DID MR-005-05.01 and requirements listed in Table 7-1 to 7-3. For this task order 1 acre of transects equals 14,520 feet (2.75 miles) of transects 3 feet wide. One acre's worth of grids equals seventeen (17) 50' x 50' grids or seventy (70) 25' x 25' grids. A pricing schedule is provided in Appendix A for unit price which will be used for price increase or decrease based on the final level of effort determined during TPP. The Government is responsible for the price of evacuation. The contractor shall be responsible for the coordination of evacuations.

3.4.1.1 Task 4a MRS 13 Cayo Luis Pena Impact Areas
The Cayo de Luis Pena Impact area consists of 342 land acres and 864 total MRS acres. The MRS is approximately one-quarter mile off the western coast of Culebra. The contractor shall perform 4 acres of DGM transects and 2 acres of grids. The contractor shall investigate 350 anomalies and perform 3 demolition shots. ~~*The contractor shall investigate up to 100 yards seaward of mean high tide; depth shall not exceed recreational diving depth.*~~ *The contractor shall investigate to 100 yards seaward of mean high tide and beyond up to an additional 379 acres to the extent of the exposure pathway for Luis Pena depicted in Appendix C Culebra Exposure Pathways. The contractor shall include* ***multi-beam*** ***bathymetry,*** *side scan sonar and underwater DGM in their approach.* ***The contractor shall utilize International Hydrographic Organization (IHO) Order 1 or better and EM 1110-2-1003 Hydrographic Survey Manual (USACE 2002), where appropriate***~~.~~

3.4.1.2 Task 4a1 Additional Underwater Intrusive Investigation. This is a Time and Materials Task
The contractor shall include intrusive investigation of 100 yards seaward of mean high tide and beyond up to an additional 379 acres to the extent of the exposure pathway for Luis Pena depicted in Appendix C Culebra Exposure Pathways. The contractor shall include downtime based on average weather conditions for Culebra.

3.4.1.2Task 4b MRS 10 Defensive Firing Area No. 1 (Optional)
This area consists of 547 acres on the southwest peninsula of Culebra, south of the town of Dewey and north of MRS 09. The contractor shall perform 5 acres of DGM transects and 1 acre of grids. The contractor shall investigate 350 anomalies and perform 3 demolition shots. The contractor shall investigate up to 100 yards seaward of mean high tide; depth shall not exceed recreational diving depth.

3.4.1.3 Task 4c MRS 11 Defensive Firing Area No. 2 (Optional)
The Defensive Firing Area No. 2 is located on the west side of Culebra between Northwest Peninsula and the town of Dewey. The MRS consists of 719 acres. The contractor shall perform 6 acres of DGM transects and 1 acre of grids. The contractor shall investigate 400 anomalies and perform 3 demolition shots. The contractor shall investigate up to 100 yards seaward of mean high tide; depth shall not exceed recreational diving depth.

3.4.1.4 Task 4d MRS 06 Artillery Firing Area (Optional)
The Artillery Firing Area (MRS 06) consists of 826 acres and is located on the eastern end of Culebra extending from a point at the most northern tip of Mosquito Bay, northeast to a point just west of Duck Point, and east to the end of the island. The contractor shall perform 6 acres of DGM transects and 2 acre of grids. The contractor shall investigate 450 anomalies and perform 4 demolition shots. The contractor shall investigate up to 100 yards seaward of mean high tide; depth shall not exceed recreational diving depth.

3.4.1.5 Task 4e MRS 09 Soldado Point Mortar and Bombing Area (Optional)
This area consists of 328 acres on the southern tip of the southwestern peninsula of Culebra. The contractor shall perform 2 acres of DGM transects and 1 acre of grids. The contractor shall investigate 200 anomalies and perform 2 demolition shots. ~~The contractor shall investigate up to 100 yards seaward of mean high tide; depth shall not exceed recreational diving depth.~~ ***The contractor shall investigate to 100 yards seaward of mean high tide and beyond up to an additional***

24 acres to the extent of the exposure pathway for Soldaldo Point depicted in Appendix C Culebra Exposure Pathways. The contractor shall include multi-beam bathymetry, side scan sonar and underwater DGM in their approach. The contractor shall utilize International Hydrographic Organization (IHO) Order 1 or better and EM 1110-2-1003 Hydrographic Survey Manual (USACE 2002), where appropriate.

3.4.1.6 Task 4e1 MRS 09 Additional Underwater Intrusive Investigation. This Task is Time and Materials. The contractor shall include intrusive investigation of 100 yards seaward of mean high tide and beyond up to an additional 24 acres to the extent of the exposure pathway for Soldaldo Point depicted in Appendix C Culebra Exposure Pathways. The contractor shall include downtime based on average weather conditions for Culebra.

3.4.1.6 Task 4f MRS 08 Cayo Norte Impact Area (Optional)
The Cayo Norte Impact Area includes only Cayo Norte and covers approximately 306 acres. The contractor shall propose on 3 acres of DGM transects, and one acre of grids. The contractor shall investigate 250 anomalies and perform 3 demolition shots. The contractor shall investigate up to 100 yards seaward of mean high tide; depth shall not exceed recreational diving depth.

3.4.1.7 MEC Disposal: The Contractor shall be responsible for the destruction of all MEC encountered during project activities.

3.4.2 Backfilling Excavations: All access/excavation/detonation holes shall be backfilled by the Contractor. The Contractor shall restore such areas to their prior condition.

3.4.3 MEC Accountability: The Contractor shall maintain a detailed accounting of all MEC items/components encountered. This accounting shall include the amounts of MEC, nomenclature and condition, location and depth of MEC, and disposition. The accounting system shall also account for all demolition materials utilized to detonate MEC on site. The Contractor shall take digital photographs of identifiable MEC found during the investigation.

3.4.4 Disposal/Disposition of MPPEH: All MPPEH and munitions debris shall be handled in accordance with Chapter 14, EM 1110-1-4009 and Errata Sheet No. 2.

3.5 Task 5, Remedial Investigation (RI) Report: This task is a Firm Fixed Price task. The objective of this task is for the Contractor to prepare, submit and gain acceptance of a RI report in accordance with EM CX Interim Guidance 06-04. The Contractor also shall incorporate all available data and data from previous reports into this RI. The Contractor shall prepare/update as an appendix to this report a determination of the Munitions Response Site (MRS) priority for each MRS covered under this task order using the Munitions Response Site Prioritization Protocol (MRSPP) worksheets. The Contractor shall attend, by teleconference, an onboard review after receiving comments on the draft RI Report.

3.5.1 Task 5a, Underwater Remedial Investigation Report: This task is a Firm Fixed Price task. The objective of this task is for the Contractor to prepare, submit and gain acceptance of a RI report in accordance with EM CX Interim Guidance 06-04. The Contractor also shall incorporate all available data and data from previous reports into this RI. The Contractor shall prepare/update as an appendix to this report a determination of the Munitions Response Site (MRS) priority for each MRS covered under this task order using the Munitions Response Site Prioritization Protocol (MRSPP) worksheets. The Contractor shall attend, by teleconference, an onboard review after receiving comments on the draft RI Report.

3.6 Task 6, Feasibility Study (FS) Report: This task is a Firm Fixed Price task. The objective of this task is for the Contractor to prepare, submit and gain acceptance of a FS report in accordance with EM CX Interim Guidance 06-04. The Contractor shall attend, by teleconference, an onboard review after receiving comments on the draft RI Report.

3.6.1 Task 6a, Underwater Feasibility Study Report. This task is a Firm Fixed Price task. The objective of this task is for the Contractor to prepare, submit and gain acceptance of a FS report in accordance with EM CX Interim Guidance 06-04. The Contractor shall attend, by teleconference, an onboard review after receiving comments on the draft RI Report.

3.7 Task 7, Proposed Plan: This task is a Firm Fixed Price task. The objective of this task is for the Contractor to prepare, submit and gain acceptance of a Proposed Plan IAW ER 200-3-1 FUDS Program Policy and MM CX Interim Guidance 06-04. The draft version of the Proposed Plan will be subject to a minimum 30-day public review.

3.7.1 Task 7a, Underwater Proposed Plan: This task is a Firm Fixed Price task. The objective of this task is for the Contractor to prepare, submit and gain acceptance of a Proposed Plan IAW ER 200-3-1 FUDS Program Policy and MM CX Interim Guidance 06-04. The draft version of the Proposed Plan will be subject to a minimum 30-day public review.

3.8 Task 8, Decision Document: This task is a Firm Fixed Price task. The objective of this task is for the Contractor to prepare, submit and gain acceptance of a Decision Document for each MRS in accordance with ER 200-3-1 FUDS Program Policy and MM CX Interim Guidance 06-04 and Appendix B. Appendix B provided new formatting requirements for the Decision Document and supersedes MM CX Interim Guidance 06-04 for formatting of Decision Documents.

3.8.1 Task 8a, Underwater Decision Document: This task is a Firm Fixed Price task. The objective of this task is for the Contractor to prepare, submit and gain acceptance of a Decision Document for each MRS in accordance with ER 200-3-1 FUDS Program Policy and MM CX Interim Guidance 06-04 and Appendix B. Appendix B provided new formatting requirements for the Decision Document and supersedes MM CX Interim Guidance 06-04 for formatting of Decision Documents.

3.9 Task 9, Community Relations Support: This task is a Firm Fixed Price/Unit Price task. The objective of this task is for the Contractor to successfully complete public meetings and support the Jacksonville District with community relations. The Contractor shall attend and participate in 3 public meetings. These meetings are different and in addition to TPP meetings. These meetings will be held on Isla Culebra. The Contractor shall provide a unit price per meeting for possible additional meetings. The support shall include, but is not limited to: preparation and delivery of briefings, graphics, maps, posters, and support of question and answer sessions. The Contractor shall also obtain the meeting site, perform public notification and prepare any correspondence necessary to meeting the objectives of this task. The USACE shall approve all correspondence, public notices and other materiel being presented to the public before use. 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 prepared and submitted with the Final Proposed Plan. The Contractor shall also develop and maintain a project website for viewing by the public and PDT members. The Contractor shall maintain this website for the 24 month period of performance. The Contractor shall provide a monthly unit price to maintain the site.

3.10 Task 10, Public Involvement Plan (PIP): The objective of this task is for the Contractor to update, submit and gain acceptance of the PIP in accordance with EP 1110-3-8.

3.11 Task 11, Administrative Record: This task is a Firm Fixed Price task. The objective of this task is for the Contractor to establish and maintain ***a separate*** Administrative Record for *each MRS*, for the on-going project in accordance with the guidance given 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. This task requires close coordination with the Jacksonville District (CESAJ) and USAESCH to secure all required documents to support the Administrative Record. The Contractor will secure a place to establish and house the Administrative Record in the local city or community of the project. The Contractor shall provide all final documents in the Administrative Record on CD/DVD to USAESCH and Jacksonville District**.** These files shall be suitable for placement on the PIRS web site. The Contractor shall submit 2 copies each to USAESCH and Jacksonville District.

3.12 Task 12, Environmental Sampling & Analysis: This task is a Firm-Fixed Price/Unit Price ~~*Time and Materials, Unit Price*~~ task. ~~*The task may be converted to firm fixed price after the completion of the TPP process.*~~

3.12.1 The objective of this task is for the Contractor to determine the presence of and the nature and extent of, the munitions constituents (MC) that are detected above the applicable regulatory criteria and to perform an ecological and human health risk assessment in accordance with the EPA Risk Assessment Guidance (RAGS) and USACE EM 200-1-4, Volumes I and II. Existing site data shall be reviewed and evaluated. Sampling shall be conducted to support the MC baseline risk assessment. The Contractor shall prepare and submit for acceptance a single sampling and analysis plan (SAP) that shall include a field sampling plan and a quality assurance project plan in accordance with DID MR-005-10.01 and UFP QAPP that describes their phased approach and addresses contaminants of interest and sample media (soil/groundwater/sediment/surface water). The price of the SAP shall be firm fixed price and shall be covered under the

Work Plan Task. The contractor shall propose the analytical methodology, media and analytical parameters including QC and QA requirements for determination of explosives and MC related metals in soil, sediment and water samples which will be used to execute this Task order. The contractor shall provide an independent laboratory to analyze QA samples separate from the contractor's primary laboratory. Data from the QA laboratory will be sent directly to the government. For the price proposal the contractor shall provide prices for 70 discrete samples for surface soil, 30 discrete samples for subsurface soil, and 20 discrete samples each for sediment and surface water. For background the contractor shall provide price for 20 discrete samples each for surface and subsurface soil, and 10 discrete samples each for sediment and surface water. The government does not intend to install monitoring wells. The contractor shall provide price for 10 each pre and post-detonation composite samples based on the CRREL 7-sample wheel approach (as described in ERDC SR96-15). Additionally, a price spreadsheet is provided in Appendix A for unit price required for this task order and will be used to increase or decrease the scope of the Task Order based on the final level of effort determined during TPP.

3.12.2 The SAP and the data deliverables shall be performed and submitted in accordance with DID MR-005-10.01 and acceptance be gained from the Government. The Contractor shall also provide a discussion on data evaluation and fate and transport analysis. The potential for fate and transport shall address all transport pathways, and it should also address future degradation products resulting from biodegradation, photolysis, and chemical reactions.

3.12.3 Any deviations from the accepted SAP shall be documented in the Daily Quality Control Reports (DQCR). Any deviations that may affect Data Quality Objectives (DQO's) shall be conveyed to USAESCH personnel [project manager (PM), project engineer (PE), project chemist, etc. immediately.

3.13, Beach Monitoring (optional) Fixed Unit Price
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).

3.14, Underwater Baseline Survey Report: Firm Fixed Price
~~*The Contractor shall prepare, submit and gain approve of a Baseline Survey Report documenting the results from the underwater ROV investigation for each MRS , as appropriate to include map(s) indicating location of surface MEC, coral species and other threatened and endangered plant species*~~ ***Contractor shall prepare, submit and gain approval of a Baseline Survey Report documenting the results from the multi-beam 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.***

4.0 SUBMITTALS AND CORRESPONDENCE:

4.1 Computer Files: All final text and spreadsheet files generated by the Contractor under this task order shall be furnished to the Contract Officer in **MS Office Suite 2003 compatible format**. Other computer files shall be in accordance with the DIDs. All computer files shall be submitted on CD or DVD.

4.2 PDF Deliverables: In addition to the paper and digital copies of submittals, all versions of any and all reports and/or plans shall be submitted in their entirety (including appendices), uncompressed, on CD or DVD in Adobe Portable Document Format (PDF) format along with a linked table of contents, linked tables, linked photographs, linked graphs and linked figures, all of which shall be suitable for viewing on the Internet. In the case of large reports, the appendices can be provided as one .pdf file separate from the narrative .pdf file. PDF files shall be produced from source documents wherever possible.

4. 3 Identification of Responsible Personnel: Each submittal shall identify the specific members and title of the Contractor's and subcontractor staff that had significant input into the report's preparation or review. All submittals shall be signed by a registered Professional-In-Charge.

4.4 Public Affairs: The Contractor shall not publicly disclose any data generated or reviewed under this contract. The Contractor shall refer all requests for information concerning site conditions to the Jacksonville District PAO with a copy

furnished to the USAESCH Project Manager. Reports and data generated under this contract are the property of the DoD and distribution to any other source by the Contractor, unless authorized by the Contracting Officer, is prohibited.

4.5 Submittals: The Contractor shall furnish copies of the plans, maps, and reports as identified in Table 4-1 to each addressee listed below in the quantities indicated in the Submittal Guidance table, Table 4-2. The Contractor shall submit 1 copy on CD with each hard copy of all submittals (WPs, Reports, Plans, etc) in accordance with paragraphs computer files and PDF Deliverables.

4.6 Addressees:

US Army Engineering & Support Center, Huntsville
Attn: CEHNC-OE-DC, (***~~Spencer O'Neal~~ Roland Belew***)
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: DESAJ-DP-S (***~~Daphne Ross~~ Tom Freeman***)
701 San Marco Blvd.
Jacksonville, FL 32207

Note: Addresses shall be verified by the Contractor.

4.7 Submittals and Due Dates.

Table 4-1 List of Deliverables

Submittals	**Due Dates (Calendar days)**
AAPP	14 days prior to site visit
Explosives Siting Plan	Separate MACOM approval before intentional physical contact with MEC on site
Proposed schedule	7 days after kick-off conference call
GIS on CD/DVD	3 weeks after NTP
Advanced TPP package & CSM	14 days before 1st TPP
Draft TPP Memorandum	TBD
Final TPP Memorandum	14 days after comments
Draft Public Involvement Plan	TBD
Final Public Involvement Plan	14 days after receipt of comments
Draft Work Plan	21 days after DQOs are determined (TPP)
Draft Final Work Plan	14 days after receipt of comments
Final Work Plan	14 days after receipt of comments
Draft Baseline Survey WP	***TBD***
Draft Final Baseline Survey WP	***TBD***
Final Baseline Survey WP	***TBD***
Draft Underwater Investigation WP	***TBD***
Draft Final Underwater Investigation WP	***TBD***
Final Underwater Investigation WP	***TBD***
Draft Underwater Intrusive Investigation WP	***TBD***
Draft Final Underwater Intrusive Investigation WP	***TBD***
Final Underwater Intrusive Investigation WP	***TBD***
Draft Baseline Survey Report	***TBD***
Draft Final Baseline Survey Report	***TBD***
Final Baseline Survey Report	***TBD***
Draft RI Report w/ GIS on CD/DVD	60 days after completion of fieldwork
Draft Final RI Report	14 days after receipt of comments

Final RI Report	14 days after on board Review
Draft FS Report	TBD
Draft Final FS Report	14 days after receipt of comments
Final FS Report	14 days after on board Review
Draft Proposed Plan	14 days after receipt of acceptance of the FS Report
Final Proposed Plan	7 days after receipt of comments
Draft Underwater RI Report w/ GIS on CD/DVD	***60 days after completion of fieldwork***
Draft Final Underwater RI Report	***14 days after receipt of comments***
Final RI Underwater Report	***14 days after on board Review***
Draft FS Underwater Report	***TBD***
Draft Final FS Underwater Report	***14 days after receipt of comments***
Final FS Underwater Report	***14 days after on board Review***
Draft Underwater Proposed Plan	***14 days after receipt of acceptance of the FS Report***
Final Underwater Proposed Plan	***7 days after receipt of comments***
PP Meeting Transcripts	with final Proposed Plan
Responsive Summary	With Decision Document
Draft Decision Document	14 days after acceptance of Proposed Plan
Draft Final Decision Document	7 days after receipt of comments
Final Decision Document	7 days after receipt of comments
Draft Underwater Decision Document	***14 days after acceptance of PP***
Draft Final Underwater Decision Document	***7 days after receipt of comments***
Final Underwater Decision Document	***7 days after receipt of comments***
Final Administrative Record (On CD/DVD)	Upon completion of the Record
Daily QC Report for Environmental Sampling	Daily during Environmental Sampling Activities
Analytical Data Submittal for QA Evaluation	30 days after completion of fieldwork
Electronic Laboratory Data Submittal	45 days after completion of fieldwork
Final GIS Files on CD	End of Project

4.8 Submittal Quantities

Provide the number of submittals shown in Table 4-2 to the addressees given in Section 4.6.

Table 4-2 Submittal Guidance

	Draft TPP/Plans /Reports/Documents	Draft Final/Final TPP /Plans /Reports/Documents	Others
USAESCH	*4*	4	TBD
CESAJ	*12*	12	TBD

4.9 Review Comments: Various reviewers will have the opportunity to review submittals made by the Contractor under this contract. The Contractor shall review all comments received through the Project Delivery Team/Contracting Officer and evaluate their appropriateness based upon their merit and the requirements of the PWS. The Contractor shall issue to the Project Manager a formal, annotated response to each. The Contractor shall not non-concur with a comment without discussing with the PM and/or comment maker. Where comments refer to a specific paragraph of a document and the paragraph number has changed since the comment was made, the Contractor shall note the new paragraph number in the annotated response to the comment.

4.10 Schedule: A final schedule shall be submitted a minimum of 30 days before commencing field work in a format compatible with Microsoft Project. A PDF version shall also be submitted. This is an electronic submittal only. The Contractor shall update the schedule in accordance with DID MR-085 Project Status Report.

4.11 Telephone Conversations/Correspondence Records/Meeting Minutes: The Contractor shall keep a record of each phone conversation, written correspondence concerning this Task Order and meeting minutes in accordance with DID MR-055 and DID MR-045. A copy of these records shall be attached to the Project Status Report.

4.12 Project Status Reports: The Contractor shall prepare and submit Project Status Reports in accordance with DID MR-085 and include any other items required in the PWS.

4.13 Period of Performance: The Completion Date for this Task Order is **14 March 2014.**

4.14 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.

5.0 REFERENCES:

5.1 Refer to "Basic Contract."

5.2 Data Item Descriptions: are available at the following: http://www.hnd.usace.army.mil/oew/didsindex.aspx. DIDs MR-005-05, MR-005-05A, MR-005-07 and MR-005-10 have been revised. The new DIDs are MR-005-05.01, MR-005-07.01 and MR-005-10.01. MR-005-05A is no longer used.

6.0 PERFORMANCE METRICS:

6.1 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 or subplans, but a few exceptions were noted and corrected by change pages	One or more documents or subplans required revisions to be resubmitted for approval prior to proceeding. However, no document or subplan required more than one backcheck, all original comments were resolved satisfactorily.	One or more documents or subplans required revisions to be resubmitted for approval prior to proceeding. Two backchecks were required on one or more documents or subplans before original comments were resolved satisfactorily.	One or more documents or subplans did not comply with contract requirements, or one or more documents or subplans required more than two backchecks before original comments were resolved satisfactorily, or one or more documents or subplans were rejected.
Performance indicator: Project Execution					
Process Compliance	Zero Corrective Action Requests (CAR)	1-5 CARs for non-critical violations to WP requirements	6-8 CARS for non-critical violations and/or 1 CAR for critical violation	8-10 CARS for non-critical violations and/or 2-4 CARS for critical violations	>10 CARS for non-critical violations and/or >4 CARS for critical violations, or any unresolved CARS
Project Execution	Zero letters of reprimand, grievances, or formal		Zero letters of reprimand, grievances, or formal	One letter of reprimand, grievance or formal complaint	More than one letter of reprimand, grievance or

	Exceptional	Very Good	Satisfactory	Marginal	Unsatisfactory
	complaints AND one or more unsolicited letters of commendation		complaints	that was resolved through negotiation	formal complaint that were resolved through negotiation
Task Completion			All final data and QC documentation submitted and accepted		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 complete and accepted by T.O date, project closed out/final invoice approved ahead of schedule	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 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			Yes		No

	Exceptional	Very Good	Satisfactory	Marginal	Unsatisfactory
Contractor or other causes identified, in writing to HNC CO/PM, in a timely manner to apply acceptable corrective actions.					
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 with Public, project delivery team and other stakeholders	Zero letters of reprimand, grievances, or formal complaints AND one or more unsolicited letters of commendation		Zero letters of reprimand, grievances, or formal complaints	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 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		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	All personnel proposed by Contractor were assigned to project, some personnel were substituted by lesser qualified individuals or HNC requested,

	Exceptional	Very Good	Satisfactory	Marginal	Unsatisfactory
	individuals.			reprimand received for personnel conduct from HNC.	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	<1 non-explosive related Class D, accidents, or <2 non-explosive Class C accidents IAW AR 385-40.	<2 non-explosive related Class C accidents, or 1 non-explosive Class B accident, IAW AR 385-40	1 Any Class A accident IAW AR-385-40, or Any explosive related accident.
*Major safety violations	0 accidents/injuries No safety violations	0 accidents/injuries No safety violations	0 accidents/injuries 1 non-explosive related safety violation.	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	2 safety violations.	3 safety violations	>3 safety violations

Classes of Accidents:

- **Class A:** Fatality or permanent total disability (Government Civilian, Military Personnel, and/or Contractor), or >$1,000,000 property damage.

- **Class B:** Permanent partial disability or impatient hospitalization of 3 or more persons (Government Civilian, Military Personnel, and/or Contractor), $200,000< $1,000,000 property damage.

- **Class C:** Lost Workday (Contractor) or Lost Time (Government Civilians), $20,000< $200,000 property damage.

- **Class D:** $2000 < $20,000 property damage.

* From Section C of Solicitation Number W912DY-04-R-0003, Amendment 0001 (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*

7.0 CONTRACTOR MINIMUM PERFORMANCE AND QC REQUIREMENTS: Underwater investigation QC shall be recommended by the Contractor in the QCP. Government QA is expected to be limited to visual observation of the Contractors work and QC operation. The government recognizes that submerged metallic items can move due to the local current and surf conditions and that prolonged seeding of test items (more than 1 day) is not feasible for the Culebra RI/FS. The government requests that the Contractor submit a modified Performance Requirement table for the underwater and beach portions of the project to meet the needs of the project and still insure acceptable data quality to meet the project objectives.

The following tables will be used for the land survey**.** The Contractor shall include in their QC plan specific tests that are itemized below. The values listed in the various requirements listed in Tables 7-1 and 7-2 below may be adjusted upon request, provided the Contractor supplies supporting documentation and rationales for Government concurrence. All reported QC results from these tests will be reviewed as part of government QA. In the event a requirement is not met and the contractor submits the data to the Government, the contractor shall provide rationales for accepting them. All such rationales will be reviewed as part of government QA. If the rationales are either insufficient or technically unfeasible, or are attempts to justify non-conformances that should be corrected to meet project needs, the Government will issue a Corrective Action Request to the contractor and the submittal(s) will be rejected. Some performance standards are default values and may be changed by the PDT to suit project needs. These requirements are marked with an asterisk (*). These QC requirements supersede the required QC entries in the DID MR-005-05.01 Access Database. The database template shall be used; however, the required fields will change based on these tables.

Table 7-1 Performance Requirements for RI/FS using DGM Methods [1]

Requirement	Applicability (Specific to Collection Method/Use)	Performance Standard	Frequency	Consequence of Failure[2]
Static Repeatability (instrument functionality)[3]	All	Response (mean static spike minus mean static background) +-10% of GPO/original value on all channels	Min 1 daily	Day's data fails unless seed item is mapped that day with repeatable anomaly characteristics (see Dynamic Detection Repeatability)
Along Line Measurement Spacing	All	98% <=25cm along line[4]	By dataset	Dataset submittal fails
Speed	Transects without seeds[5]	95% within max project design speed or demonstrated speed	By dataset	Dataset submittal fails unless new max speed successfully demonstrated at GPO.
Coverage(*)	Grids	>90% coverage at project design line spacing.[6]	By dataset or grid[7]	Submittal fails unless gaps filled, additional data collected, or government refund for missing acreage.
Dynamic Detection Repeatability	Grids	Test item anomaly characteristics (peak response and size) repeatable with allowable variation +/-25%.[8]	1 test item per grid or dataset. [7]	Submittal fails
	Transects	8. #anomalies on repeat segment w/in +-20% or +-8 of original or within range of adjacent sections (b) Test item (in test strip or on transect) anomaly characteristics (peak response and size) repeatable with allowable variation +/-25%. Or Fit coefficient[10] over test strip is acceptable.	(a) repeat 2% per lot[9] or (b) repeat test strip once per system per lot or daily; or 2 test items per system per lot	8. Lot submittal fails or (b) Lot (or day's data) fails
Dynamic Positioning Repeatability	Grid coverage	Position offset of Test item target <=35cm + ½ line spacing[11] (<=50cm + ½ line spacing for fiducially positioned data).	1 test item per grid or dataset [7] (same item as Dynamic Detection Repeatability)	submittal fails
	Transects with reacquisition/digging	8. Demonstrate reacquisition by reproducing randomly chosen anomaly signals (reac amplitude >= original & offset <= 1m) [12] or	(a) 2 targets per system per lot or (b) 2 test items per system per lot (can be same as detection	Lot submittal fails

Requirement	Applicability (Specific to Collection Method/Use)	Performance Standard	Frequency	Consequence of Failure[2]
		(b) Test item anomaly characteristics (peak response and size) repeatable with allowable variation +/-25% and position offset <=1m.	repeatability test items)	
Target Selection	All	All dig list targets are selected according to project design	By grid or dataset[7]	submittal fails
Anomaly Resolution(*)[13]	Verification checking by DGM re-mapping[14] Or Verification checking with original instrument of anomaly footprint after excavation [15]	If MEC[16]: 70% confidence <10% unresolved anomalies[17] If no MEC: 90% confidence <5% unresolved anomalies Accept on zero.	Rate varies depending on lot size. [18] See Acceptance Sampling Table.	Lot submittal fails
Geodetic Equipment Functionality(*)	All	Position offset of known/temporary control point within expected range as described in the approved work plan. [19]	Daily	Redo affected work or re-process affected data
Geodetic Internal Consistency	Grids with line/fiducial positioning	Grid corners are internally consistent within 30cm on any leg or diagonal.	Per Grid	Redo affected work (corner placement & data collection, or data processing)
Geodetic Accuracy	Points used for RTK or RTS base stations	Project network must be tied to HARN, CORS, OPUS or other recognized network[20]. Project control points that are used more than once must be repeatable to within 5cm	For points used more than once, repeat occupation[21] of each point used, either monthly (for frequently used points) or before re-use (if used infrequently[22]).	Re-set points not located at original locations or resurvey point following approved work plan.
Geodetic Repeatability(*)	Grid centroids or corners/transect points without anomaly reacquisition	Measured locations are reoccupied within 10m. [23]	1 per lot	Lot submittal fails

[1] These are the critical requirements for RI DGM methods. Contractors shall use additional methods/frequencies that they deem beneficial and as required in their SOPs.
[2] All failures also require a Root Cause Analysis.

[3] Item should be placed on a jig that ensures consistent geometry between the sensor and item to ensure repeatability, response not to exceed 500 units, or optionally use the Geonics calibration coil. Duration of data collection needed TBD by the contractor. Must compare to original to ensure instrument is consistent throughout the project. .It is recognized that this QC requirement may be redundant and could contradict results from seeding QC, however, in the event of seed failure, information from this test may aid in determining cause of failure, i.e. instrument or processing.
[4] 25cm based on institutional knowledge and common instrument physical dimensions. Assumes speed used achieves detection. This requirement can be relaxed if supporting documentation is provided to the Government for concurrence.
[5] Needed because increase in speed can reduce SNR and increase # false hits (alternatively this test can be supplanted by repeatable anomaly characteristics of seed items within the dataset).
[6] Recommended default line spacing is 0.6m for items of interest the size of 40mm grenades and smaller, else 0.8m
[7] The terms "grid" and "dataset" refer here to logical groupings of data or data collection event. Logical groupings of data are contiguous areas mapped by the same instrument and in the same relative time-frame. These can be grids, acres, or some other unit of area. A data collection event is similar to logical groupings of data but refers to data collected over a contiguous time frame, such as "morning", "afternoon", "battery life", or some other measure of contiguous time. It is recognized that physical marking of corners on the ground is not always beneficial to the government. Additionally, size and shape of the grid is not specified.
[8] A standard test item shall be placed within the survey area (i.e. a small pipe or flat plate with a small area response. Item can be placed flush with the surface or buried at a standard depth and standard orientation). This test does not demonstrate the detection capabilities of the MEC of interest. The standard response to this test item must be defined prior to the start of production field activities. Response repeatability to this standard test item in the mapping data will indicate data quality is consistent and sufficient for detection of the MEC items of interest.
[9] Fit Coefficient means how well the repeated data matches the original data. Method of calculation and acceptance criteria can be proposed by the Contractor, and could be based on the UX-Process repeatability gx value.
[10] Contractor shall propose the lot size and criteria for designation (i.e. woods vs. open)
[11] For 0.8m line spacing, this would be a 0.75m allowable error radius (or 0.9 for fiducial).
[12] Does not necessarily mean the peak response or actual item location (i.e. for transect data the response could still be ramping up off-line). This could also be demonstrated through blind seed items.
[13] Resolved is defined as 1) there is no geophysical signal remaining at the flagged/selected location, or 2) a signal remains but it is too low or too small to be associated with UXO/DMM, or 3) a signal remains but is associated with surface material which when moved results in low, or no signal at the interpreted location, or 4) a signal remains and a complete rationale for its presence exists.
[14] Mapping shall cover the required number of anomaly locations. This is used in-lieu of checking individual anomalies for those instances where it is quicker to re-map sections of land rather than return to individual anomalies. Only the data at the anomaly locations is reviewed for resolution.
[15] This may require leaving flags at excavated locations until QC is complete. It is up to the contractor to indicate which holes knowingly have metal left in them where the PDT has agreed such is acceptable. It is the contractor's responsibility to not put hot material back in the hole before QC is complete. As part of this requirement location accuracy must also be demonstrated (i.e. cleared location is within dynamic positioning error radius as described above). Contractor SOPs that incorporate post-excavation inspections using digital geophysical instruments can be used to meet the excavation verification need of this requirement provided appropriate QC protocols are in place to monitor and document the SOPs are followed. Acceptance sampling or alternative QC protocols to monitor and document the reacquisition SOP would be required to demonstrate the correct locations are excavated.
[16] If MEC (or intact or partial training or practice rounds) are not detected in a lot then the information from that lot may be used to support certain decisions where the confidence in the results must be greater than that for grids where MEC are detected.
[17] This is a statistical test number. It does not imply there are 10% bad units. It tests there are fewer than 10% bad units, including zero bad units. Values for confidence levels will be determined by the PDT and are dependent on the information needed. Stopping rules will take precedence over this standard (i.e. for high MEC density, decision could be made to stop because the team has enough data for characterization)
[18] For example, if lot size is 500 anomalies, to achieve a 90% confidence that there are less than 5% unresolved anomalies, 43 anomalies must be re-checked. If any one of the 43 is unresolved, then the confidence level has not been met, the lot submittal fails and all anomalies in that lot must be re-checked (i.e. accept on zero). The

contractor shall propose the lot size for government concurrence (i.e. The contractor determines the amount of risk they are willing to take. The larger the lot, the less sampling needs to be done, but the larger the risk of increased costs/rework if failure occurs.) For anomaly resolution, in order to use statistics/confidence levels, it is based on number of anomalies, not grids.

[19] Most high-accuracy systems should demonstrate repeatability between 5cm and 10cm. Typical accuracies achievable for some high-accuracy systems are: 2cm to sub-centimeter for RTK DGPS and RTS units depending on manufacturer and site conditions. Less accurate systems should demonstrate repeatability within manufacturer published ranges. Typical accuracies for less accurate systems are 5m to sub-meter for WAAS or satellite correction service DGPS units depending on manufacturer, correction service and site conditions, and 30m to 1m for USCG beacon corrected units depending on manufacturer.

[20] The plan for tying the project network to a common reference network must be described in the approved work plan. If monumentation is part of the plan, specific monumentation procedures and data quality objectives will also need to be specified and installation of monumentation or network control points shall follow all guidance and accuracies specified in EC 1110-1-73 – "Standards and Specifications for Surveys, Maps, Engineering Drawings, and Related Spatial Data Products".

[21] Repeat occupation means demonstrate the control points being used can be recovered and reoccupied and that they have not moved more than the requirement specification. This can be accomplished using the same methodology used to initially tie the local network to a HARN, CORS, OPUS, or other recognized network, or it can be accomplished by other means that achieve this requirement.

[22] An example of frequently used control points would be points used as RTK DGPS base stations. Infrequently used points could be those used during RTS operations where the control point was used during mapping and then again at some later time for reacquisition and QC statistical sampling. Infrequently used points could also include grid corners they are used for line and fiducial positioning and then subsequently re-used for reacquisition or QC statistical sampling.

[23] The exact location of a single transect/grid is not critical when the information is used only for characterization by interpolating over large areas (e.g. transect spacings are larger than geodetic accuracies). The acceptable accuracy may be tightened by the PDT if more exact positioning is needed (e.g. trying to characterize extents of small MRS's). If specific anomalies/locations must be recovered this metric must be revised to meet project needs and will likely have the same accuracy needs as the Geodetic Accuracy requirement.

Table 7-2 QC Requirements for RI/FS using Analog Methods[1]

Requirement	Limited Applicability (Specific to Collection Method/Use)	Performance Standard	Frequency	Consequence of Failure[2]
Repeatability (instrument functionality)	All	All items in test strip detected (trains ear daily to items of interest)[3]	Min 1 daily[4]	Remedial training and additional remedial measures as described in the approved work plan if due to operator error, or replacement of faulty equipment.[5]
Dynamic Repeatability	Transects used only for density estimates	Repeat a segment of transect & show #Counts repeated w/in the greater of +-20% or +-8, or w/in range of adjacent segments.	2nd party repeat of 2% per lot	Redo lot
	Transects with digging	Repeat a segment of transect & show extra flags/digs not greater than the greater of 20% or 8 flags/digs, or w/in range of adjacent segments.	2nd party repeat of 2% per lot	Redo lot
Coverage(*)	Grids	Blind coverage seeds and blind detection seeds recovered[6]: 75% if MEC 90% if no MEC[7]	Variable rate at 2, 3 or 4 times # operators, per lot.	Redo lot.
Detection & Recovery (*)	No DGM QC remapping	Blind detection seeds recovered: 80% if MEC 100% if no MEC	Per operator per lot: variable 1-2 large/deep and 1-3 small/ shallow[8]	Redo lot
	With DGM QC remapping	If MEC[9]: 70% confidence <10% unresolved anomalies[10] If no MEC: 90% confidence <5% unresolved anomalies Accept on zero. [11]	Rate varies depending on lot size. [Table showing acreage rates per lot size for varying confidence levels will be provided][12]	Redo lot
Anomaly Resolution(*)[13]	Verification checking of excavated locations (analog or digital instrument)	2nd party checks open holes to determine: If MEC: 70% confidence <10% anomalies unresolved[14] If no MEC: 90% confidence <5% anomalies unresolved	Rate varies depending on lot size. See Acceptance Sampling Table.[15]	Redo lot

Requirement	Limited Applicability (Specific to Collection Method/Use)	Performance Standard	Frequency	Consequence of Failure[2]
	Verification checking by DGM remapping[16]	Same as Detection & Recovery	Rate varies depending on lot size. See Acceptance Sampling Table.	Redo lot
Geodetic Equipment Functionality (*)	All	Position offset of known/temporary control point within expected range as described in the approved work plan.[17]	Daily	Redo affected work
Geodetic Accuracy	Points used for RTK or RTS base stations	Project network must be tied to HARN, CORS, OPUS or other recognized network[18]. Project control points that are used more than once must be repeatable to within 5cm	For points used more than once, repeat occupation[19] of each point used, either monthly (for frequently used points) or before re-use (if used infrequently[20]).	Re-set points not located at original locations or resurvey point following approved work plan.
Geodetic Repeatability (*)	Grid corners/transect points without anomaly reacquisition	Measured locations are reoccupied within 10m.[21]	1 per lot	Redo affected work

[1] These are the critical requirements for RI analog methods. Contractors shall use additional methods/frequencies that they deem beneficial and as required in their SOPs.
[2] All failures also require a Root Cause Analysis.
[3] The requirement is that each operator demonstrates positive detection on a daily basis of the smallest and largest expected MEC of interest when it is placed at both its best and worst orientations and buried between 95% and 100% of their respective maximum consistent detection depth. Maximum consistent detection depth is defined as producing any above background response on a minimum of the first three time gates of the EM61MK2 optimized for site conditions and having a $0.9m^2$ size or more as calculated using the Geosoft Oasis Montaj UCEAnalyseTarget.gx or equivalent routine.
[4] Random blind reconfiguration of test strip is also required (i.e. moving/adding items) at a frequency determined by the contractor and approved in the work plan, to address the potential for simply memorizing seed locations.
[5] Some examples of additional remedial measures are: removal of operator from mapping for one day, retesting on new blind strip meeting the same requirements for seed items (could move location of items in same area), 100% QC re-inspection of initial lanes by that operator, etc.
[6] Coverage seeds are small pieces of metal that will produce relatively large amplitude anomalies over small areas, such as small nails or ball bearings. Known location accuracy of placement is not critical. See endnote #8 for description of blind detection seeds.
[7] If MEC (or intact or partial training or practice rounds) are not detected in a grid/lot then the information from that grid/lot may be used to support certain decisions where the confidence in the results must be greater than that for grids where MEC are detected.
[8] Detection and recovery must be consistently demonstrated for the hard to detect items; therefore, the largest expected MEC and the smallest expected MEC shall be placed between 95% and 100% of their respective maximum consistent detection depth
[9] If MEC (or intact or partial training or practice rounds) are not detected in a lot then the information from that lot may be used to support certain decisions where the confidence in the results must be greater than that for grids where MEC are detected.

[10] This is a statistical test number. It does not imply there are 10% bad units. It tests there are fewer than 10% bad units, including zero bad units. Values for confidence levels will be determined by the PDT and are dependent on the information needed. Stopping rules will take precedence over this standard (i.e. for high MEC density, decision could be made to stop because the team has enough data for characterization)

[11] Unresolved anomaly for 'Detection & Recovery Testing' means a significant signal remains without a complete rationale for its presence. Default values for such a 'significant signal' are peak amplitude on sum channel >=30mv & anomaly width >=1.2m or anomaly size >=0.9m^2. This value may change but must be agreed upon by the PDT up front.

[12] The statistical calculations for this test are in progress. This is different from sampling of excavated holes, in that a portion of the acreage is re-mapped, and the amount re-mapped must be statistically valid to show, to some confidence level, that anomalies did not go undetected.

[13] This requires leaving flags at excavated locations until QC is complete. If shovel called to a flag during QC then the failure has already occurred—it is not important that something large or small comes out of the hole. Assumption here is "mapping coverage" is addressed through other means. It is up to the contractor to indicate which holes knowingly have metal left in them where the PDT has agreed such is acceptable. It is the contractor's responsibility to not put hot material back in the hole before QC is complete.

[14] Resolved is defined as 1) there is no geophysical signal remaining at the flagged/selected location, or 2) a signal remains but it is too low or too small to be associated with UXO/DMM, or 3) a signal remains but is associated with surface material which when moved results in low, or no signal at the interpreted location, or 4) a signal remains and a complete rationale for its presence exists.

[15] For example, if lot size is 500, to achieve a 90% confidence that there are less than 5% unresolved anomalies, 43 anomalies must be re-checked. If any one of the 43 is unresolved, then the confidence level has not been met , the lot submittal fails and all anomalies in that lot must be re-checked (i.e. accept on zero). The contractor shall propose the lot size for government concurrence (i.e. The contractor determines the amount of risk they are willing to take. The larger the lot, the less sampling needs to be done, but the larger the risk of increased costs/rework if failure occurs.) For anomaly resolution, in order to use statistics/confidence levels, it is based on number of anomalies, not grids.

[16] Mapping shall cover the required number of anomaly locations. This is used in-lieu of checking individual anomalies for those instances where it is quicker to re-map sections of land rather than return to individual anomalies. Only the data at the anomaly locations is reviewed for resolution.

[17] Most high-accuracy systems should demonstrate repeatability between 5cm and 10cm. Typical accuracies achievable for some high-accuracy systems are: 2cm to sub-centimeter for RTK DGPS and RTS units depending on manufacturer and site conditions. Less accurate systems should demonstrate repeatability within manufacturer published ranges. Typical accuracies for less accurate systems are 5m to sub-meter for WAAS or satellite correction service DGPS units depending on manufacturer, correction service and site conditions, and 30m to 1m for USCG beacon corrected units depending on manufacturer.

[18] The plan for tying the project network to a common reference network must be described in the approved work plan. If monumentation is part of the plan, specific monumentation procedures and data quality objectives will also need to be specified and installation of monumentation or network control points shall follow all guidance and accuracies specified in EC 1110-1-73 – "Standards and Specifications for Surveys, Maps, Engineering Drawings, and Related Spatial Data Products".

[19] Repeat occupation means demonstrate the control points being used can be recovered and reoccupied and that they have not moved more than the requirement specification. This can be accomplished using the same methodology used to initially tie the local network to a HARN, CORS, OPUS, or other recognized network, or it can be accomplished by other means that achieve this requirement.

[20] An example of frequently used control points would be points used as RTK DGPS base stations. Infrequently used points could be those used during RTS operations where the control point was used during mapping and then again at some later time for reacquisition and QC statistical sampling. Infrequently used points could also include grid corners they are used for line and fiducial positioning and then subsequently re-used for reacquisition or QC statistical sampling.

[21] The exact location of a single transect/grid is not critical when the information is used only for characterization by interpolating over large areas (e.g. transect spacings are larger than geodetic accuracies). The acceptable accuracy may be tightened by the PDT if more exact positioning is needed (e.g. trying to characterize extents of small MRS's). If specific locations must be recovered this metric must be revised to meet project needs and will likely have the same accuracy needs as the Geodetic Accuracy requirement, which is 30cm.

Table 7-3 Acceptance Sampling Table for Anomaly Resolution

	Lot size = **50** anomalies	**100**	**200**	**500**	**1000**	**2000**	**5000**	**10,000**
70% confidence <**10%** unresolved[1]	11	11	12	12	12	12	12	12
80% confidence <**10%** unresolved	14	15	15	16	16	16	16	16
90% confidence <**10%** unresolved	18	20	21	22	22	22	22	22
95% confidence <**10%** unresolved	22	25	27	28	29	29	29	29
70% confidence <**5%** unresolved	17	21	23	23	24	24	24	24
80% confidence <**5%** unresolved	21	27	30	31	31	32	32	32
85% confidence <**5%** unresolved	23	31	34	36	37	37	37	37
90% confidence <**5%** unresolved[2]	27	37	41	43	44	45	45	45
95% confidence <**5%** unresolved	31	45	51	56	57	58	59	59
80% confidence <**1%** unresolved	40	80	111	138	144	154	158	159
85% confidence <**1%** unresolved	43	85	123	158	172	181	186	187
90% confidence <**1%** unresolved[3]	45	90	137	184	205	217	224	227
95% confidence <**1%** unresolved	48	95	155	225	258	277	290	294

* Gray boxes show number of dug locations to check post-excavation. All must be shown to be resolved to meet confidence values (accept on zero)

[1] Default for RIFS where MEC has been recovered.

[2] Default for RIFS where no MEC has been recovered.

[3] Default for Removal Action.

8.5 GENERAL CONDITIONS:

8.6 The Contractor acknowledges that it has taken steps reasonably necessary to ascertain the nature and location of the work, and that it has assessed and satisfied itself as to the general and local conditions, which can affect the work or its price, including but not limited to:

- conditions bearing upon transportation, disposal, handling, and storage of materials, explosives, or scrap;

- the availability of labor, facilities, water, electric power, communications, and roads;

- uncertainties of weather, river stages, tides, or similar physical conditions at the site;

- the conformation and conditions of the ground, soil, geology, and vegetation (type, height, density), the distribution of each, and the seasonal effects on each;

- the character of equipment and facilities needed preliminary to and during work performance;

- Personal Protective Equipment (PPE) requirements including all effects on price or production due to the requirement to use PPE;

- exclusion zone requirements including all effects and prices of implementing and enforcing exclusion zones. The Contractor is responsible for evaluating, identifying the requirements of, and implementing/complying with all exclusion zones;

- responsibility for understanding and implementing the required safety and access control requirements and factoring them into its approach and price;

- the availability or price of qualified labor, material, and/or equipment;

- the availability or price of lodging for on-site personnel;

- the availability or location of explosives storage.

8.7 The Government has provided the Contractor with access to the site, which allowed the Contractor to become confident in its independent understanding of the site conditions. The Government strongly encourages prospective Contractors to use this time to perform the requisite site assessments necessary to ascertain the site conditions to a reasonable degree of accuracy The Contractor attests that the quantity and distribution of hot rocks, vegetation, terrain, soil condition, weather and other similar price drivers are reasonably ascertainable from the Contractor's research and assessment of the site in conjunction with the contractor verified data provided by the Government. Contractors are strongly encouraged to perform this site assessment and use their experienced judgment and reasoned interpolation and extrapolation of all the available site information to assess the general and local conditions, which can affect the work or its price. Contractors who do not perform a site assessment assume the risks associated with the decision to forgo this important source of information about the site. The Contractor is expected to apply due diligence in the research and development of its proposal and to know or reasonably estimate the conditions to be encountered that will affect the price, quality, or schedule of the work included in this task order. The Government expects the Contractor to assess the risk and factor this risk into its proposal. 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 fully understands those conditions. The Contractor accepts full and sole responsibility for identifying and considering all factors that may affect the price to execute the work. The Contractor attests that it has been provided the opportunity to make an independent assessment of the site, has gathered the information necessary to fully understand the conditions it will encounter during execution of this task order, and has used any data provided by the Government at the its own risk.

8.8 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 perform the work and for meeting the performance requirements of the PWS at the price proposed.

8.9 Use of the data provided as the basis of estimate for an accurate price proposal requires an experienced understanding of how the data of this type is collected, analyzed, interpreted, and presented. The Contractor is responsible for interpreting the data provided in the context of the conditions under which the data was collected and analyzed. The Contractor is responsible for recognizing the limitations of the data provided for assessments of this type. The Contractor is strongly encouraged to use the pre-proposal site visit to field verify its interpretation of the data and assumptions made during preparation of the proposal. The Government expects that Contractors will promptly notify the Contracting Officer (KO) if they have not been given adequate opportunity to assess the site conditions.

8.10 The Contractor attests that it has had sufficient opportunity to assess the conditions of the work and has used its experienced judgment and reasoned interpolation and extrapolation of all the available site information to assess the general and local conditions, which can affect the work or its price. The Contractor attests that any exceptions to any of the conditions of this PWS were clearly marked in the proposal in bold type as “Exception to the RFP”. The Contractor certifies that its proposal is not qualified or contingent upon the site conditions.

Appendix A
Price Spreadsheet

Culebra						
				If priced per unit		
Task	**Task Name**	**Task Pricing**	**Unit Price**	**Units**	**Number of Units**	**Total Price**
1	Technical Project Planning	FFP		LS		
	Additional meeting	FUP		per meeting		
1a	Planning Site Visit (optional)	FFP		LS		
2	RI/FS Work Plan	FFP		LS		
2a	Explosive Safety Submission Amendment	FFP		LS		
2b	***Baseline Survey WP***	***FFP***		***LS***		
2c	***Underwater Investigation WP***	***FFP***		***LS***		
2d	***Underwater Intrusive Investigation WP***	***FFP***		***LS***		
3	GIS	FFP		LS		
3a	Landowner database and ROE	FFP		LS		
4	RI/FS Field Activities					
4a	MRS 13 Cayo Luis Pena Impact Areas	FFP		LS		
4a1	***MRS 13 Additional underwater intrusive investigation***	***T & M***		LS		
4b	MRS 10 Defensive Firing Area No. 1 (Optional)	FFP		LS		
4c	MRS 11 Defensive Firing Area No. 2 (Optional)	FFP		LS		
4d	MRS 06 Artillery Firing Area (Optional)	FFP		LS		
4e	MRS 09 Soldado Point Mortar and Bombing Area (Optional)	FFP		LS		
4e1	***MRS 09 Additional Underwater Instrusive Investigation***	***T & M***		LS		
4f	MRS 08 Cayo Norte Impact Area (Optional)	FFP		LS		
	Civil Survey	Unit Price		per acre		
	Vegetation Removal – Light	Unit Price		per acre		
	Vegetation Removal – Medium	Unit Price		per acre		
	Vegetation Removal – Heavy	Unit Price		per acre		
	MEC Reconnaissance – Light Brush	Unit Price		per acre		
	MEC Reconnaissance – Medium Brush	Unit Price		per acre		
	MEC Reconnaissance – Heavy Brush	Unit Price		per acre		
	Underwater ROV per acre	*Unit Price*		*Per acre*		
	Transect geophysics	Unit Price		per acre		
	DGM Grids geophysics	Unit Price		per acre		
	Mag & Flag Grids geophysics	Unit Price		per acre		
	Underwater DGM Grids geophysics	Unit Price		per acre		
	Underwater Mag & Flag Grids geophysics	Unit Price		per acre		
	Underwater Transect geophysics	Unit Price		per acre		
	Sonar	Unit Price		per acre		
	Mob/Demob Geophysical Team	Unit Price		per mob/demob		

Culebra						
				If priced per unit		
Task	**Task Name**	**Task Pricing**	**Unit Price**	**Units**	**Number of Units**	**Total Price**
	Mob/Demob MEC Investigation Team	Unit Price		per mob/demob		
	Mob/Demob Sonar Team	Not Used		per mob/demob		
	Mob/Demob Underwater Geo Team	Unit Price		per mob/demob		
	Mob/Demob Underwater MEC Investigation Team	Unit Price		per mob/demob		
	Underwater Intrusive Investigation	Unit Price		per 10 anomalies		
	Demolition Shot	Unit Price		per Demo Shot		
	Underwater Demolition Shot	Unit Price		per Demo Shot		
	Intrusive Investigation	Unit Price		per 50 anomalies		
	Bathmetry	***FUP***		***Per mile***		
	Multi-Beam Bathymetry	***FUP***		***Per Mile***		
	Side Scan Sonar	***FUP***		***Per mile***		
	Stand-by Events (Installation Delays due to training etc.)	Not Used				
5	Remedial Investigation Report	FFP		LS		
5a	***Additional RI Report***	***Unit Price***		***Per report***		
6	Feasibility Study Report	FFP		LS		
6a	***Additional FS Report***	***Unit Price***		***Per report***		
7	Proposed Plan	FFP		LS		
7a	***Additional Proposed Plan***	***Unit Price***		***Per report***		
8	Decision Document	FFP		LS		
8a	***Additional Decision Document***	***Unit Price***		***Per document***		
9	Community Relations Support	FFP		LS		
	Additional Meeting	Unit Price		per meeting		
	Maintain Website	Unit Price		per month		
10	Public Involvement Plan	FFP		LS		
11	Administrative Record	FFP		LS		
12	Environmental Sampling & Analysis	FFP		LS		
	Sampling and analysis - Soil	Unit Price		per 10 Samples		
	Sampling and analysis - Water	Unit Price		per 10 Samples		
	Sampling and analysis – Sediment	Unit Price		Per 10 Samples		
	Pre & Post Detonation	Unit Price		per Sample set		
	Groundwater sampling	Unit Price		per Sample		
	Installation of monitoring well – Base Price	Unit Price		per well		
	Installation of monitoring well – Price per additional foot	Unit Price		per Foot		

Culebra						
				If priced per unit		
Task	**Task Name**	**Task Pricing**	**Unit Price**	**Units**	**Number of Units**	**Total Price**
	Subsurface Sampling, boring 0’ - 10’	Unit Price		per boring		
	Subsurface Sampling, boring 10’ - 15’	Unit Price		per boring		
	Subsurface Sampling, Hand Auger	Unit Price		per sample		
13	Beach Monitoring	FUP		Each		
	Project Biologist	Unit Price		Per Week		
	Project Biologist	Unit Price		Per Month		
	Project Biologist: Mobilization/Demobilization	Unit Price		Each		
14	*Baseline Survey Report*	FFP		LS		
					TOTAL	

Appendix B

1. REQUIREMENTS AND PROCEDURES:

a. General requirements for the development and review of FUDS MMRP decision documents and action memoranda are documented in references 3a and 3b. This interim guidance provides specific requirements for MMRP.

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

(4) 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 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.

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Remedial Action Decision Document Outline

PART 1: THE DECLARATION

The Declaration functions as the abstract and formal authorizing signature page for the DD.

1. PROJECT NAME AND LOCATION.
2. STATEMENT OF BASIS AND PURPOSE.
   Certify the factual and legal basis for the Selected Remedy.

3. ASSESSMENT OF PROJECT MRS.
   Certify that the MRS poses a threat to public health, welfare, or the environment.

4. DESCRIPTION OF SELECTED REMEDY.
   a. Describe the major components of the Selected Remedy in a bullet fashion.

   b. Describe the scope and role of this MRS.

   c. Describe how this remedial action addresses principal threats and other contamination at the MRS (i.e., what is being treated, what is being contained, and what is the rationale for each).

5. STATUTORY DETERMINATIONS.
   a. Describe how the Selected Remedy satisfies the statutory requirements of CERCLA §121 and discuss the applicability of the 5-year review requirements.

6. DATA CERTIFICATION CHECKLIST.
   The Declaration should certify that the following information is included in the DD (or provide a brief explanation for why this information is not included):

   a. Munitions and Explosives of Concern (MEC) and munitions constituents (MC) and their respective concentrations.

   b. Baseline risk represented by the MEC/MCs.

   c. Cleanup levels established for MEC/MCs and the basis for these levels.

   d. How MEC and MC will be addressed.

   e. Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and DD.

   f. Potential land and groundwater use that will be available at the MRS as a result of the Selected Remedy.

   g. Estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected.

   h. Key factor(s) that led to selecting the remedy (i.e., describe how the Selected Remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting criteria key to the decision).

7. AUTHORIZING SIGNATURE.

The following general paragraph and signature block. (*Note: Signature block may not appear alone on a page – it must be on the same page with the preceding paragraph*):

"This Decision Document presents the selected response action at [place]. The U.S. Army Corps of Engineers is the lead agency under the Defense Environmental Restoration Program (DERP) at the [FUDS property name] Formerly Used Defense Site, and has developed this Decision Document consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision document will be incorporated into the larger Administrative Record file for [FUDS property name], which is available for public view at [address]. This document, presenting a selected remedy with a present worth cost estimate of [$$], is approved by the undersigned, pursuant to Memorandum, DAIM-ZA, September 9, 2003, subject: Policies for Staffing and Approving Decision Documents (DDs), and to Engineer Regulation 200-3-1, Formerly Used Defense Sites (FUDS) Program Policy."

APPROVED:

(insert individual's signature block here) Date_____

For present worth cost estimate of $2M or less:
District Commander" Signature Block

For present worth cost estimate of more than $2M and less than or equal to $10M:
HQUSACE signature block for:
Chief, Department of Defense
Support Team
Directorate of Military Programs

For present worth cost estimate of more than $10M:
Signature block for ACSIM or DASA(ESOH) or both

PART 2: THE DECISION SUMMARY

The Decision Summary identifies the Selected Remedy, explains how the remedy fulfills statutory and regulatory requirements, and provides a substantive summary of the Administrative Record file that supports the remedy selection decision.

1. PROJECT NAME, LOCATION, AND BRIEF DESCRIPTION.
   a. Name and location.

   b. FUDS Project Number.

   c. Lead and support agencies (e.g., DoD, State, Tribes).

   d. Source of cleanup monies (e.g., ER-FUDS, ER-Army, ER-BRAC).

   e. Brief MRS description.

2. PROJECT HISTORY AND ENFORCEMENT ACTIVITIES.
   a. History of MRS activities that led to the current problems.

   b. History of federal, state, and local MRS investigations and removal and remedial actions conducted under CERCLA or other authorities.

c. History of CERCLA enforcement activities at the MRS (e.g., results of PRP searches, issuances of special notices to PRPs).

3. COMMUNITY PARTICIPATION.

a. Describe how the public participation requirements in CERCLA and the NCP were met in the remedy selection process (e.g., community relations plans, fact sheets, public notices, public meetings, public Restoration Advisory Board).

b. Describe other community outreach and involvement efforts.

c. Describe efforts to solicit views on the reasonably anticipated future land uses and potential future land uses.

4. SCOPE AND ROLE OF RESPONSE ACTION.

a. The planned sequence of actions.

b. The scope of problems those actions will address.

c. The authorities under which each action will be/has been implemented (e.g., removal, remedial).

5. PROJECT MRS CHARACTERISTICS: (Include maps, a site plan, or other graphical presentations, as appropriate.)

a. Describe the conceptual site model (CSM) on which the risk assessment and response action are based.

b. Provide an overview of the MRS, including the following:

(1) Size of MRS (e.g., acres).

(2) Geographical and topographical information (e.g., surface waters, flood plains, wetlands).

(3) Surface and subsurface features (e.g., number and volume of tanks, lagoons, structures, and drums on-site).

(4) Areas of archaeological or historical importance.

c. Describe the sampling strategy (e.g., which media were investigated, what sampling approach was used, over what area, when was the sampling performed).

d. Describe known or suspected sources of contamination.

e. Describe types of contamination and the affected media, including the following:

(1) Types and characteristics of MEC/MCs (e.g., toxic, mobile, carcinogenic, non-carcinogenic).

(2) Quantity/volume of MEC/MC that needs to be addressed.

(3) Concentrations of MEC/MCs in each medium.

(4) RCRA hazardous wastes and affected media.

f. Describe location of contamination and known or potential routes of migration, including the following:

(1) Lateral and vertical extent of contamination.

(2) Current and potential future surface and subsurface routes of human or environmental exposure.

(3) Likelihood for migration of MEC/MCs from current location or to other media.

(4) Human and ecological populations that could be affected.

g. For MRSs with groundwater contamination, describe the following:

(1) Aquifer(s) affected or threatened by site contamination, types of geologic materials, approximate depths, whether aquifer is confined or unconfined.

(2) Groundwater flow directions within each aquifer and between aquifers and groundwater discharge locations (e.g., surface waters, wetlands, other aquifers).

(3) Interconnection between surface contamination (e.g., soils, sediments/surface water) and groundwater contamination.

(4) Confirmed or suspected presence and location of non-aqueous phase liquids.

(5) If groundwater models were used to define the fate and transport of MEC/MC, identify the model used and major model assumptions.

h. Note other site-specific factors that may affect response actions at the MRS.

6. CURRENT AND POTENTIAL FUTURE LAND AND WATER USES.

a. Land Uses.

(1) Current on-site land uses.

(2) Current adjacent/surrounding land uses.

(3) Reasonably Anticipated Future Land Uses and Basis for Future Use Assumptions (e.g., zoning maps, nearby development, 20-year development plans, dialogue with local land use planning officials and citizens, reuse assessment).

b. Groundwater and Surface Water Uses.

(1) Current groundwater and surface water uses.

(2) Potential beneficial groundwater and surface water uses (e.g. potential drinking water, irrigation) and basis for future use assumptions (e.g., Comprehensive State Groundwater Protection Plan, promulgated state classification guidelines).

(3) If beneficial use is potential drinking water source, identify the approximate time frame of projected future drinking water use (e.g., groundwater aquifer not currently used as a drinking water source but expected to be utilized in 30 to 50 years).

(4) Location of anticipated use in relation to location and anticipated migration of contamination.

7. <u>SUMMARY OF PROJECT MRS RISKS.</u>

a. Human Health Risks.

(1) Identify the concentrations of MEC/MC in each medium.

(2) Summarize the results of the exposure assessment.

(3) Summarize the results of the toxicity assessment for the MEC/MC.

(4) Summarize the risk characterization for both current and potential future land use scenarios and identify major assumptions and sources of uncertainty.

b. Ecological Risks.

(1) Identify the concentrations of MEC/MC in each medium.

(2) Summarize the results of the exposure assessment.

(3) Summarize the results of the ecological effects assessment.

(4) Summarize the results of the ecological risk characterization and identify major assumptions and sources of uncertainty.

c. Basis for Response Action.

(1) Clearly Present the Basis for Taking the Response Action at the Conclusion of this Section.

8. REMEDIAL ACTION OBJECTIVES.

a. Present a clear statement of the specific RAOs for the MRS (e.g., treatment of contaminated soils above health-based action levels, restoration of groundwater plume to drinking water levels, and containment of DNAPL source areas) and reference a list or table of the individual performance standards.

b. Discuss the basis and rationale for RAOs (e.g., current and reasonably anticipated future land use and potential beneficial groundwater use).

c. Explain how the RAOs address risks identified in the risk assessment (e.g., how will the risks driving the need for action be addressed by the response action?).

9. DESCRIPTION OF ALTERNATIVES: The objective of this section is to provide a brief understanding of the remedial alternatives developed for the MRS.

a. Remedy Components. Provide a bulleted list of the major components of each alternative, including but not limited to:

(1) Treatment technologies and the materials they will be used to address (e.g., principal threats).
(2) Containment components of remedy (e.g., engineering controls, cap, hydraulic barriers) and the materials they will be used to address (e.g., low concentration source materials, treatment residuals).

(3) Land use controls (and entity responsible for implementing and maintaining them).

(4) Operations and maintenance (O&M) activities required to maintain the integrity of the remedy (e.g., cap maintenance).

(5) Monitoring requirements.

b. Common Elements and Distinguishing Features of Each Alternative. Describe common elements and distinguishing features unique to each response option. Examples of these elements include:

(1) Key ARARs (or ARAR waivers) associated with each alternative (e.g., action- and/or location-specific groundwater treatment units, manifesting of hazardous waste, and regulating solid waste landfills).

(2) Long-term reliability of remedy (potential for remedy failure/replacement costs).

(3) Quantity of untreated MEC/MC to be disposed off-site or managed on-site in a containment system and degree of residual contamination remaining in such waste.

(4) Estimated time required for design and construction (i.e., implementation time frame).

(5) Estimated time to reach cleanup levels (i.e., time of operation, period of performance).

(6) Estimated capital, annual O&M, and total present worth costs, discount rate, and the number of years over which the remedy cost estimate is projected.

(7) Describe uses of presumptive remedies and/or innovative technologies.

c. Expected Outcomes of Each Alternative.

(1) Available land uses upon achieving performance standards. Note time frame to achieve performance standards (e.g., commercial or light industrial use available in 3 years when cleanup levels are achieved).

(2) Available groundwater uses upon achieving performance standards. Note time frame to achieve performance standards (e.g., restricted use for industrial purposes in technical impracticability [TI] waiver zone, drinking water use in non-TI zone upon achieving cleanup levels in 50 to 70 years).

(3) Other impacts or benefits associated with each alternative.

10. COMPARATIVE ANALYSIS OF ALTERNATIVES. Compare the relative performance of each alternative against the others with respect to the nine evaluation criteria (summarize in a table if appropriate).

11. PRINICIPAL MEC/MC ISSUES. Identify the MEC/MC issues at the MRS and discuss how the alternatives will address them.

Note: The *Statutory Determinations* section of the DD should explain whether or not the Selected Remedy satisfies the statutory preference for remedies employing treatment that reduces toxicity, mobility, or volume as a principal element. By indicating whether the principal threats will be addressed by the alternatives, this section of the *Decision Summary* should provide the basis for that statutory determination.

12. SELECTED REMEDY.

a. Summary of the Rationale for the Selected Remedy.

(1) Provide a concise discussion of the key factors for remedy selection.

b. Detailed Description of the Selected Remedy.

(1) Expand on the Description of the Selected Remedy from that which was provided in the Description of Alternatives section and provide a brief overview of the RAOs and performance standards.

c. Cost Estimate for the Selected Remedy.

(1) Present a detailed, activity-based breakdown of the estimated costs associated with implementing and maintaining the remedy (include estimated capital, annual O&M, and total present worth costs discount rate and the number of years over which the remedy cost estimate is projected).

d. Estimated Outcomes of Selected Remedy.

(1) Available land use(s) upon achieving cleanup levels. Note time frame to achieve available use (e.g., commercial or light industrial use available in 3 years when cleanup levels are achieved).

(2) Available groundwater use(s) upon achieving cleanup levels. Note time frame to achieve available use (e.g., restricted use for industrial purposes in TI waiver zone, drinking water use in non-TI zone upon achieving cleanup levels in 50 to 70 years).

(3) Final cleanup levels for each medium (i.e., contaminant-specific cleanup levels), basis for cleanup levels, and risk at cleanup levels (if appropriate).

(4) Anticipated socioeconomic and community revitalization impacts (e.g., increased property values, reduced water supply costs, jobs created, increased tax revenues due to redevelopment, environmental justice concerns addressed, enhanced human uses of ecological resources).

(5) Anticipated environmental and ecological benefits (e.g., restoration of sensitive ecosystems, protection of endangered species, protection of wildlife populations, wetlands restoration).

13. STATUTORY DETERMINATIONS.

a. Explain how the remedy satisfies the requirements of §121 of CERCLA to:

(1) Protect human health and the environment.

(2) Comply with ARARs, or justify a waiver.

(3) Be cost-effective.

(4) Utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable (i.e., explain why the Selected Remedy represents the best option).

(5) Satisfy the preference for treatment as a principal element, or justify the selection of an alternative remedy.

b. Explain 5-year review requirements for the Selected Remedy.

14. DOCUMENTATION OF SIGNIFICANT CHANGES FROM PREFERRED ALTERNATIVE OF PROPOSED PLAN. If there are significant changes in the Selected Remedy from the Preferred Alternative:

a. Discuss the Preferred Alternative originally presented in the Proposed Plan.

b. Describe the significant changes in the Selected Remedy.

c. Explain the rationale for the changes and how they could have been reasonably anticipated based on information presented in the Proposed Plan or the Administrative Record file.

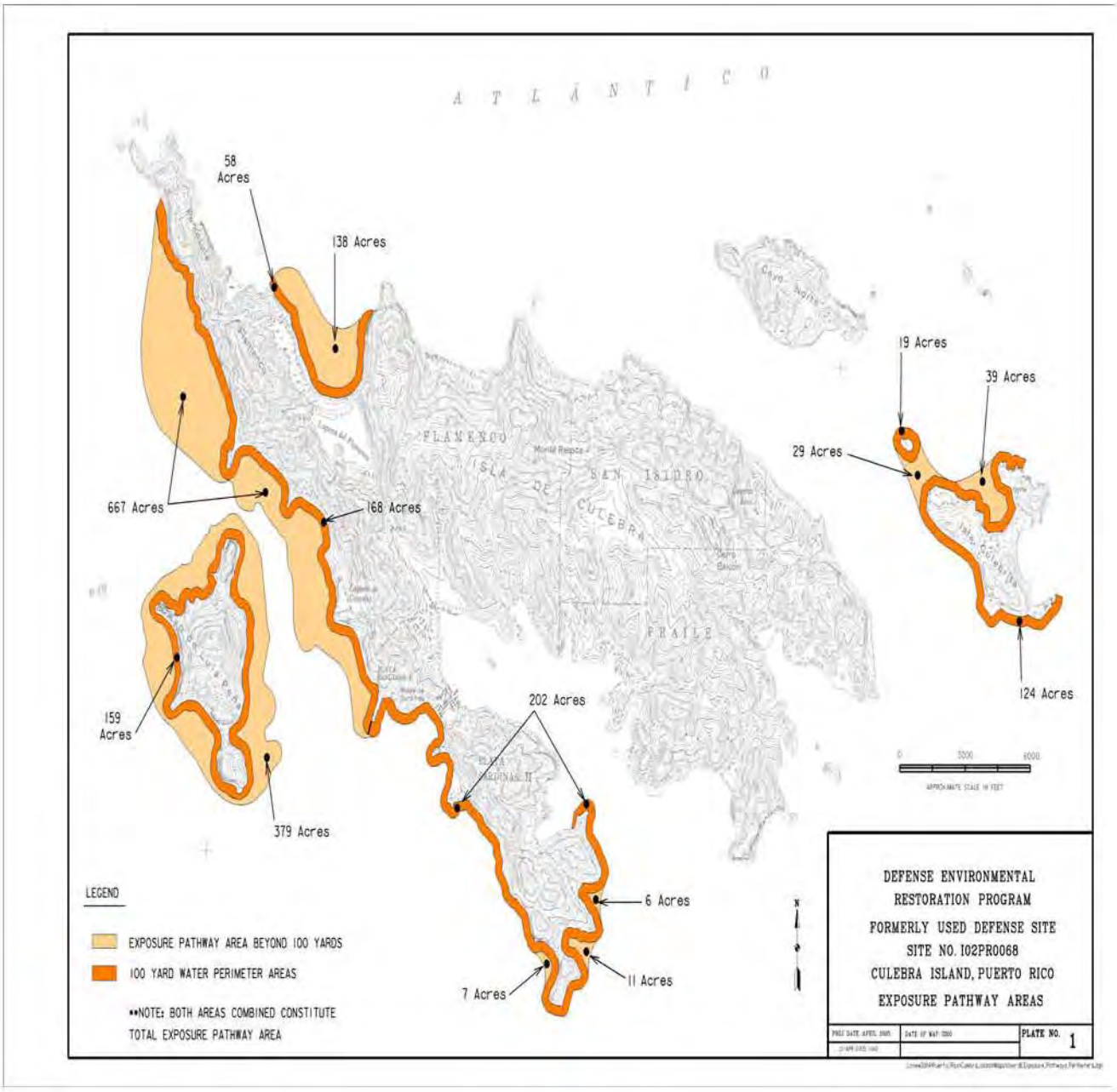
PART 3: THE RESPONSIVENESS SUMMARY

The Responsiveness Summary serves the dual purposes of: (1) presenting stakeholder concerns about the MRS and preferences regarding the remedial alternatives; and (2) explaining how those concerns were addressed and the preferences were factored into the remedy selection process. This discussion should cross-reference sections of the Decision Summary that demonstrate how issues raised by the community have been addressed.

1. STAKEHOLDER ISSUES AND LEAD AGENCY RESPONSES: Summarize and respond concisely to issues raised by stakeholders.

2. TECHNICAL AND LEGAL ISSUES: Expand on technical and legal issues, if necessary

Appendix C: Culebra Exposure Pathway Areas



APPENDIX B. SITE MAPS

Project maps are contained in Section 3 of the Work Plan.

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APPENDIX C. LOCAL POINTS OF CONTACT

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Robert Matos	DNER- National Reserves Div.	Puerto Rico Department National Environmental Resources (DNER)	P.O. Box 11488, PR 00910 Matos_resevas@yahoo.com	787- 983-7222
Mr. John Reyes	Marine Information Specialist	Prevention Department SECTOR	San Juan, Puerto Rico John.Reyes@uscg.mil 24 hours notification requirement for Broadcast Notice to Mariners (BNM)	(787) 475-6755 Cell (787) 729-5381 Office (787) 729-6704 Fax
Culebra				
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POC	Position	Organization	Address/Email	Telephone
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Explosive Supplier Control Demolition Austin Blasting Services Corp				
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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.	

POC	Position	Organization	Address/Email	Telephone
Meeting				
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Public Meeting Notification				
Culebra Calendar PO Box 761 Culebra, PR 00775-0761			www.Culebra-island.com To post a page on the Web site, contact Blue Horizon Realty, (787) 742-3298, or e-mail websmaster@Culebra-Island.com Post meeting notification flyers at: —Culebra Municipal Building —Culebra post office bulletin board —Culebra Island dive shops	

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 USA Environmental, Inc. 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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Attachment 3 Directions to the Hospital and Emergency Telephone Numbers

Attachment 4 Site Safety and Health Plan

Attachment 5 USA Drug Free Workplace Program

Attachment 6 Material Safety Data Sheets

Attachment 7 Hazard Control Plan

ACRONYMS AND ABBREVIATIONS

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
CP	Competent Person
CSHM	Corporate Safety and Health Manager
CSP	Certified Safety Professional
DGM	Digital Geophysical Mapping
EM	Engineer Manual
ERPCP	Emergency Response Plan and Contingency Procedures
EZ	Exclusion Zone
°F	Degrees Fahrenheit
FWS	U.S. Fish and Wildlife Service
HAZWOPER	Hazardous Waste Operations and Emergency Response
IDLH	Immediately Dangerous to Life or Health
MEC	Munitions and Explosives of Concern
MSDS	Material Safety Data Sheet
OSHA	Occupational Safety and Health Administration
OT	Oral Temperature
PEL	Permissible Exposure Limit
PPE	Personal Protective Equipment
PR	Pulse Rate
PWS	Performance Work Statement
SSHP	Site Safety and Health Plan
SUXOS	Senior Unexploded Ordnance Supervisor
TLV	Threshold Limit Value
USA	USA Environmental, Inc.
USACE	Unites States Army Corps of Engineers
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

ACCIDENT PREVENTION PLAN
Remedial Investigation/Feasibility study
Culebra Island Site, Puerto Rico

Plan Approval: _____ Date: Sept 6, 2012

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Plan Prepared By: _____ Date: Sept. 6, 2012

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Plan Concurrence By: _____ Date: Sept. 6, 2012

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USA Environmental, Inc.
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D.2 BACKGROUND INFORMATION

This Accident Prevention Plan (APP) has been prepared by USA Environmental Inc. (USA) for the Remedial Investigation/Feasibility Study at the Culebra Site in the Municipality of Culebra, Puerto Rico. The purpose of the project is to perform a Remedial Investigation to characterize the nature and extent of MEC contamination at the specified sites, and a Feasibility Study to develop and evaluate effective remedial alternatives.

Culebra came under Navy control in 1901, and the Navy built a small base that same year and an airfield about 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 cays (small islands surrounding Culebra) in the early 1960s. Ordnance firing ended in September 1975.

Culebra Island National Wildlife consists of Culebra Island and about 20 cays surrounding Culebra Island which are owned by the Fish and Wildlife Service (FWS). Total land area is about 7300 acres, and the FWS owns approximately 1500 of these acres. The rest (approximately 1200 acres) is owned by the Commonwealth of Puerto Rico (about 1200 acres), primarily the Department of Natural and Environment Resources.

Two endangered species of turtles, the Hawksbill and the Leather Back, are found at Culebra. In addition, there are two species that have been proposed for threatened status: the Loggerhead and the Green sea turtles. All four of these species use the Culebra area and most of the beaches for nesting sites.

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, and provides for contingencies that may arise while operations are being conducted during the Remedial Investigation process. The APP will interface with the USA Corporate Safety and Health Program.

D.2.2 PROJECT DETAILS

Contractor:

USA Environmental, Inc.
720 Brooker Creek Boulevard, Suite 204
Oldsmar, FL 34677

Contract Number: W912DY-04-D-0006

Task Order Number: 0022

Project Name: Remedial Investigation/Feasibility Study, Culebra Island Site, Puerto Rico.

D.3 PROJECT DESCRIPTION

MRS 13 Cayo Luis Pena Impact Areas: The Cayo de Luis Pena Impact area consists of 342 land acres and 864 total MRS acres. The MRS is approximately one-quarter mile off the western coast of Culebra. USA will perform 4 acres of DGM transects and 2 acres of grids. USA will investigate 350 anomalies and perform 3 demolition shots. USA will investigate up to 100 yards seaward of mean high tide; depth shall not exceed recreational diving depth.

MRS 10 Defensive Firing Area No. 1 (Optional): This area consists of 547 acres on the southwest peninsula of Culebra, south of the town of Dewey and north of MRS 09. USA will perform 5 acres of DGM transects and 1 acre of grids. USA will investigate 350 anomalies and perform 3 demolition shots. USA will investigate up to 100 yards seaward of mean high tide; depth shall not exceed recreational diving depth.

MRS 11 Defensive Firing Area No. 2 (Optional): The Defensive Firing Area No. 2 is located on the west side of Culebra between Northwest Peninsula and the town of Dewey. The MRS consists of 719 acres. USA will perform 6 acres of DGM transects and 1 acre of grids. USA will investigate 400 anomalies and perform 3 demolition shots. USA will investigate up to 100 yards seaward of mean high tide; depth shall not exceed recreational diving depth.

MRS 06 Artillery Firing Area (Optional): The Artillery Firing Area (MRS 06) consists of 826 acres and is located on the eastern end of Culebra extending from a point at the most northern tip of Mosquito Bay, northeast to a point just west of Duck Point, and east to the end of the island. USA will perform 6 acres of DGM transects and 2 acre of grids. USA will investigate 450 anomalies and perform 4 demolition shots. USA will investigate up to 100 yards seaward of mean high tide; depth shall not exceed recreational diving depth.

MRS 09 Soldado Point Mortar and Bombing Area (Optional): This area consists of 328 acres on the southern tip of the southwestern peninsula of Culebra. USA will perform 2 acres of DGM transects and 1 acre of grids. USA will investigate 200 anomalies and perform 2 demolition shots. USA will investigate up to 100 yards seaward of mean high tide; depth shall not exceed recreational diving depth.

MRS 08 Cayo Norte Impact Area (Optional): The Cayo Norte Impact Area includes only Cayo Norte and covers approximately 306 acres. USA will perform 3 acres of DGM transects, and one acre of grids. USA will investigate 250 anomalies and perform 3 demolition shots. USA will investigate up to 100 yards seaward of mean high tide; depth shall not exceed recreational diving depth.

USA will be responsible for the on-site destruction of all MEC encountered during the remedial investigation. USA will backfill excavations and detonation holes in order to restore the land to its original condition. All MPPEH will be inspected and disposed of on site, and MD will be collected and sent to a qualified recycler for disposition.

Table D-1: Site Description

Site Location	Approximate Size (Acres)
Various former range areas on and around Culebra, Puerto Rico	Entire site is 3,068 acres, investigation area is 34 acres.
Topography	**Present Usage**
☐ Forested	☐ Rural
☐ Tillage	☐ Commercial
☐ River/Creeks	☐ Urban
☐ Grassland	☒ Government
☒ Flat land	☐ Industrial
☒ Open Terrain	☐ Farming
☐ Wetland	☐ Ranching
☐ Arid	☐ Residential
☒ Other: Beaches	☒ 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). USA will perform a Remedial Investigation 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). All MEC encountered during this munitions response shall be destroyed on-site in coordination with the Unites States Coast Guard (USCG) and local environmental agencies.

D.5 CONTRACTOR ACCIDENT EXPERIENCE

USA's 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	Intrastate
2009	0.72	N/A
2008	0.70	N/A
2007	0.80	N/A
2006	0.78	N/A
2005	0.69	N/A

D.6 PHASES OF WORK REQUIRING ACTIVITY HAZARD ANALYSIS

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

- Geophysical Prove-Out Test Strip
- Location Surveying and Mapping
- MEC Investigation
- MEC Disposal Operations
- MPPEH Inspection
- Quality Control
- Vegetation Clearance
- Vehicle Operations
- Boat Transportation
- Boat 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.

Table D-3: Hazards Table

HAZARDS*	ACTION LEVELS**
Safety: include falling (sand, rocks, inclines, slippery surfaces); climbing (uneven terrain); walking (uneven terrain, surface indentations); hand and power tool operations (hammers, machetes, chainsaws, weed eaters) eye hazards; heavy equipment; boat operations and MEC.	None/Awareness/Avoidance
Chemical: lubricants and fuels for equipment.	Per Material Safety Data Sheets (MSDSs)
Physical: include heat injuries and noise.	Per Monitoring Requirements
Radiological: none anticipated.	Not Applicable
Biological Hazards: may be present; include biting and stinging insects, hazardous plants and wildlife.	None/Awareness/Avoidance
MEC: may be present on site; 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.)

Climbing: (e.g., Falls from structures > 4 ft high; deteriorated ladders or missing rungs, etc.)

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

Confined Space (e.g., Excavations > 4 ft deep, surface/underground utility vaults, open surface tanks/cisterns/septic tank, underground/above ground storage tanks, etc.) (DO NOT ENTER.)

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 SHALL 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), Occupational Safety and Health Administration (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 shall typically be defined as requiring site evacuation only, if significant hazards are encountered. Note: The activities for which this 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 of the site, reevaluation, and development of procedures designed by Safety Management that will address the potential exposure. Chemical exposures (releases) requiring evacuation shall 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

In recognition of the responsibilities of USA and the need for management to establish a policy with regard to the prevention of on-the-job injuries, this APP has been developed. Through application of these safety policies and procedures, it is USA's primary goal to reduce to a minimum the human suffering by employees resulting from occupational injuries. Not only can injuries have a serious physical and emotional impact on the employees themselves, but they can also have a negative effect on family members and co-workers.

In addition, we must recognize the deterrent and eroding effect injuries have on the potential profit. Insurance costs, combined with the indirect costs of injuries, are a matter of serious concern and it is USA's intention that they be reduced. This desired reduction could take place, over a long term, if the frequency of injuries is kept to a minimum. As it affects USA, the elimination of on-the-job injuries is an important responsibility of management. This responsibility must be assumed and treated in the same manner as our business philosophies relating to services rendered.

For USA's Corporate Safety and Health Program to become effective, it will be necessary for each employee to take a serious interest in the prevention of injuries. Management fully intends to provide, in administration of the program, the leadership and direction to which supervisory personnel and employees will respond. It is USA's earnest request that all concerned devote their serious attention toward making this Safety and Health Program an integral part of the day to day business operations. Always remember that no job is so important and no service is so urgent that we cannot take the time to perform our work safely.

All site operations will be performed in accordance with applicable Federal, state, and local regulations and procedures, OSHA requirements, client requirements, and USA's Corporate Safety and Health Program and this APP. Compliance with the 2008 edition of EM 385-1-1 is required by USA and any subcontractors working on this site. All USA employees and subcontractors will comply with the requirements of this plan.

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 PERSONNEL RESPONSIBILITIES

No person may work in a manner that conflicts with the intent of, or the inherent safety and environmental precautions expressed in these procedures. After due warnings, USA will dismiss from the site any person who violates safety procedures. USA employees are subject to progressive discipline and may be terminated for continued violations. All on-site personnel will be trained in accordance with this document.

D.8.1.1 USA Project Manager – Matt Tucker

Responsibilities include:

- Ensures conformance with USA corporate and US Army Corps of Engineers (USACE) policies and procedures
- Coordinates project with the Corps of Engineers personnel
- Ensures the project has the necessary resources to operate safely
- Ensures that the project personnel satisfy USA and USACE Safety & Health requirements
- Ensures that the project personnel implement the project APP
- Ensures that the project personnel have the appropriate regard for safe job performance.

D.8.1.2 USA Corporate Safety and Health Manager – Robert Crownover

Responsibilities for the Corporate Safety and Health Manager (CSHM) include:

- Oversees development and coordination of the APP, as required
- Makes changes to the APP if warranted by changed conditions
- Administers and enforces General Health and Safety Program
- Determines the level of personal protection required
- Investigates significant accidents and illnesses and implements corrective action plans
- Establishes air-monitoring parameters based on expected contaminants
- Establishes employee exposure monitoring notification programs
- Develops site-specific employee/community emergency response plans based on expected hazards
- Stops any operation that threatens the health or safety of the team or surrounding population
- Upgrades or downgrades levels of protection based on site observations or monitoring results.

D.8.1.3 USA Certified Safety Professional – Cheryl Riordan, CSP

Responsibilities for the Certified Safety Professional (CSP) include:

- Develops and coordinates the APP, as required
- Recommends changes to the APP if warranted by changed conditions
- Administers General Safety and Health Program
- Determines the level of personal protection required
- Confirms each USA team member's suitability for work based on physician's recommendation
- Conducts field safety and health audits to ensure APP and SSHP conformance and USA policy compliance
- Investigates significant accidents and illnesses and implements corrective action plans
- Certifies that all workers have proper training in accordance with (IAW) 29 CFR 1910.120(e)
- Updates equipment or procedures based on information obtained during site operations
- Investigates significant accidents and illnesses and implements corrective action plans
- Establishes air monitoring parameters based on expected contaminants
- Establishes employee exposure monitoring notification programs

- Develops site-specific employee/community emergency response plans based on expected hazards
- Stops any operation that threatens the health or safety of the team or surrounding population
- Upgrades or downgrades levels of protection based on site observations or monitoring results.

D.8.1.4 Senior UXO Supervisor – TBD

All site activities will be conducted under the supervision of the USA SUXOS. The SUXOS will oversee normal and emergency work and will perform any emergency notification. His/her responsibilities also include:

- Supervises all USA site activities
- Implements the field APP
- Coordinates with the Unexploded Ordnance (UXO) Safety Officer (UXOSO) on safety-related matters
- Determines evacuation routes
- Presents daily safety meetings
- Maintains logs and records in the field
- Implements changes to APP as directed by the CSHM, the CSP, or UXOSO.

D.8.1.5 UXO Safety Officer- (TBD)

Site activities will be conducted under the supervision of the USA UXOSO for safety on an as-needed basis. The UXOSO will act as safety oversight for normal and emergency work and will perform any emergency notification as the On-Scene-Incident-Commander. He/she also has the following responsibilities:

- Implements the field APP
- Enforces all provisions of the APP
- Determines evacuation routes
- Presents daily safety meetings
- Presents training requirements for site personnel and visitors
- Maintains safety logs and records in the field
- Implements changes to APP as directed by the Corporate Safety and Health Manager or CSP
- Administers and enforces General Health and Safety Program
- Enforces the level of personal protection required
- Investigates work-related accidents and illnesses and implements corrective action plans
- Establishes air monitoring parameters based on expected contaminants
- Establishes employee exposure monitoring notification programs
- Stops any operation that threatens the health or safety of the team or surrounding population
- Upgrades levels of protection based on site observations or monitoring results.

D.8.2 LINES OF AUTHORITY

Table D-4 lists contact information for project personnel and Figure D-1 contain the project personnel, their involvement on the project, the organization these individuals represent, and several ways to contact these individuals.

Table D-4: Project Contacts

Name	Organization	Telephone	Mobile Number	E-mail
Spencer O'Neal	USACE Project Manager	256-895-1574		Spencer.oneal@usace.army.mil
Doug Ralston	USA Program Manager	813-343-6368	813-500-1099	dralston@usatampa.com
Matt Tucker	USA Project Manager	813-343-6370	813-426-2426	mtucker@usatampa.com
Robert Crownover	Corporate Safety and Health Manager	813-343-6364	813-748-1642	rcrownover@usatampa.com
Cheryl Riordan	Certified Safety Professional	757-486-8567	813-426-2112	criordan@usatampa.com
TBD	SUXOS	813-343-6336		
TBD	UXO Safety Officer	813-343-6336		

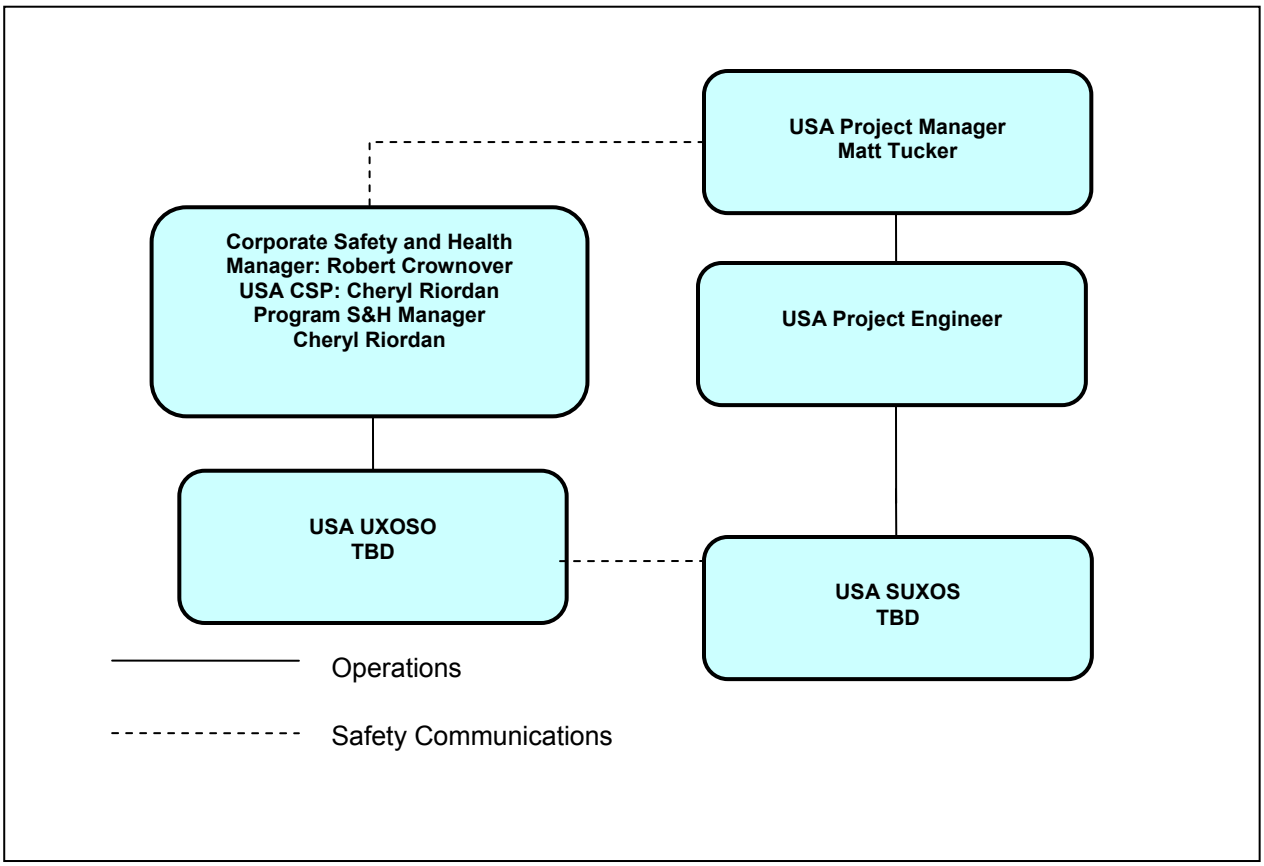


Figure D-1: Lines of Authority for USA Corporate and Site Activities

D.9 SUBCONTRACTORS AND SUPPLIERS

The USA subcontractor to be used on this project is Sea Ventures, who will provide transportation via boats to support the offshore operations.

D.9.1 MEASURES FOR CONTROLLING AND COORDINATING SUBCONTRACTORS

Before work is performed by the subcontractor, USA will negotiate and prepare an agreement that will detail all necessary and appropriate terms and conditions, including the Scope of Work. Once the subcontract is executed, USA will perform periodic reviews to ensure that requirements are met. These reviews will cover technical requirements, and cost and schedule status. The personnel at Sea Ventures will be responsible for providing boat transportation to and from the offshore sites and personal flotation devices for all personnel.

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 on site. All personnel will acknowledge that they have read, understood, and will abide by the Accident Prevention Plan and Site Specific Safety and Health Plan for this project, by signing the acknowledgement page. In addition, personnel must abide by the guidance given by the Senior UXO Supervisor (SUXOS) 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 Corporate Safety and Health Manager and the UXOSO will ensure that all USA 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. USA 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 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:

- Scope of Work
- Details of the Site Specific Safety and Health Plan
- 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
- 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 USA 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 or 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. Any visitor entering the exclusion zone (EZ) during hazardous waste operations will also be required to have current HAZWOPER training. The EZ, during hazardous waste activities, would include the project footprint and an area around the footprint equivalent to the fragmentation distance of the largest MEC item expected to be encountered on the site.

All current certifications and training tables for USA 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.

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 USA Corporate Safety and Health Program
- Regulatory requirements
- Management of hazardous waste site cleanup operations
- Management of site work zones
- How to communicate with the media and the public
- PPE selection and limitations
- Spill containment
- Monitoring site hazards.

The UXOSO, with specific responsibilities for safety and health guidance on site, will receive the training provided to general site workers and their supervisors. He also will receive advanced training in safety and health issues, policies and techniques. The UXOSO will also receive the 10-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 USA site 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/CPR trained First Responders.

D.10.2.4 Fire Prevention

Smoking and lighters are prohibited in the EZ or work zone. A cigarette butt receptacle will be provided in the support zone. No cigarette butts are to be discarded on the ground. No smoking is allowed except in an approved 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 USA employees performing work involving the handling and destruction of MEC must be graduates of the U.S. Naval Explosive Ordnance Disposal School (at a minimum Phase I, chemical; and Phase II, surface) or equivalent recognized training. A copy of their certificate of graduation will be kept on file at

corporate headquarters. UXO qualified personnel shall have knowledge and experience in military ordnance, ordnance components, and explosives location, identification, render safe, recovery/removal, transportation, and disposal safety precautions. UXO personnel shall have the knowledge and experience to effect 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 USA 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, procedures for safe storage and handling of the product, and response to emergencies. Personnel may request an MSDS for any hazardous material on the site at any time. USA personnel will be informed that the location of the MSDSs for this site will be in an MSDS binder in the UXOSO site vehicle. This training will occur as part of the initial mobilization training at the site.

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
- 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 that 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 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, and other hazards present at the site
- 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 for 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
- 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 USA project personnel necessary for the safe and efficient completion of field operations conducted in an EZ. This is limited to the USA work team members including the UXOSO, UXOQCS, SUXOS, and a USACE OESS.

All visitors (persons other than Essential Personnel) to the site, even if escorted, must receive, as a minimum, a briefing of on-site conditions, hazards, and emergency response procedures. The UXOSO will generally be the one providing the visitor briefing. All visitors to the EZ will be escorted at all times. When visitors enter the EZ, all MEC operations will cease, and will resume again after the visitor has left the area. Visitors will not be permitted in the restricted work areas unless they have the appropriate level of OSHA training and are medically approved as part of a company-sponsored medical surveillance program. Visitors not complying with the above requirements will not enter the restricted work areas; however, they may observe site conditions from a safe distance in the support zone. All visitors will sign the Visitor's Log prior to entering the site.

D.10.4 TRAINING DOCUMENTATION

A training record will be kept in each employee's individual file 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. USA site personnel will conduct safety inspections on a daily basis, or more frequently if conditions warrant. The UXOSO will be responsible for daily safety inspections of the project. During periods when the UXOSO is not present, the Senior UXO Technician 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 assigns an on-site Safety Representative who is responsible for conducting external inspections.

D.11.2 DAILY SITE INSPECTIONS

The UXOSO will be responsible for daily inspections of the project when present. The Corporate Safety and Health Manager or the CSP may make random inspections, as warranted.

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

D.12.1 GOALS AND OBJECTIVES

The goal for USA 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. USA 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 attached SSHP
- 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 USA'S CORPORATE SAFETY PROGRAM

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

The USA Corporate Safety and Health Manager and CSP have reviewed the scope of the project and, based on this review, have 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.

D.12.3 USA'S SAFETY INCENTIVE PROGRAM

USA builds an information database for each project it undertakes, which includes the rate/occurrence of accidents and injuries. Safety data, including injury and accident occurrence, are noted and incentives such as monetary bonuses and additional training courses are provided as rewards for superior employee performance for compliance with the project APP, SSHP, and corporate safety and health policies.

D.12.4 SAFETY PROGRAM NONCOMPLIANCE POLICIES AND PROCEDURES

USA management takes seriously employee noncompliance with safety requirements. Personnel not following procedures are warned and counseled in the proper safety procedures, and if the problem persists, are again counseled with notations made in their individual file. Continued noncompliance will lead to termination. On USA job sites, visitors are briefed about site safety requirements and are provided with the appropriate level of PPE. If visitors refuse to follow these procedures, they will be escorted from the site.

D.12.5 USA'S WRITTEN PROCEDURES FOR HOLDING MANAGERS AND SUPERVISORS ACCOUNTABLE FOR SAFETY

USA's commitment to safety and health is documented and required from the time an offer is made to a job applicant. Managers and supervisors are made responsible for enforcing safety and health as part of their job descriptions. They are ultimately responsible for protecting the welfare of the employees as well as minimizing the potential liability associated with on-the-job accidents.

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 USA for each project site.

The USA Project Manager and the USA Corporate Safety and Health Manager will be notified immediately by telephone of any accidents, and will follow up with USA's Accident Report Form (see Appendix E). USA's 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. USA will thoroughly investigate all accidents.

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) 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 USA employees should be reported for statistical purposes. All recordable incidents count against USA's recordable incident experience when they occur, to either an employee or a subcontractor working under the direct supervision of USA's Site Manager. Personnel man-hours will be defined as hours worked by all persons assigned to the project, including subcontractor employees under direct supervision of USA's Site Manager. These man-hours will be annotated on the Daily Operations Summary and/or the Weekly Operations Summary forms (see Appendix C of this Work Plan for forms) and transmitted to the Project Manager. The USA UXOSO will document and review with the Corporate Safety and Health Manager, 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 shall 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 USA Accident Report (ENG Form 3394), as appropriate, will be completed and forwarded to the Corporate Safety and Health Manager.

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 USA Corporate Office.

D.13.3 IMMEDIATE NOTIFICATION OF MAJOR ACCIDENTS

Should an accident occur resulting in a fatality, $100,000 or more in property damage, three or more persons being hospitalized, or possible adverse publicity to the Corps of Engineers, immediate notification will be made to the USACE Project Manager and/or Contracting Officer in person, telephonically, or by email. The reporting requirement of submitting an incident report still applies. The Corporate Safety and Health Manager will report the incident to OSHA, as required.

D.14 MEDICAL SUPPORT

A minimum of two USA personnel have been trained in cardiopulmonary resuscitation (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.

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 and in the site office. Personnel who have any type of injury (including first aid injuries) will report to the UXOSO so that he can replace used supplies in the first aid kit and he can investigate to determine the root cause(s) of the accident in order to prevent recurrences. The UXOSO will also be responsible for making the determination as to whether professional medical assistance will be required. The UXOSO will summon an ambulance, as required, and will direct emergency personnel to the victim and provide any assistance required by the emergency personnel. The ambulance will transport the victim to the designated hospital for treatment. Maps displaying the route to the hospital will be maintained in each site vehicle.

D.15 PERSONAL PROTECTIVE EQUIPMENT

When feasible, engineering controls and work practices, or a combination thereof, shall be used to protect site workers from safety and health hazards and to maintain personal exposures to hazardous substances below established exposure limits. The exposure limits used by USA 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 MSDSs, will be used if the substance is not listed by OSHA or the ACGIH. USA 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 on the Activity Hazard Analyses located in this APP. Personnel performing site tasks shall 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 USA personnel and visitors at the site will be Level D. The 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:

- Hard hat (around heavy equipment operations, vegetation clearance operations, or other operations that present a head hazard)
- Face shield (around vegetation clearance operations)
- Leather gloves
- Safety glasses with side shields or safety goggles
- Hearing protection, where required by high noise levels (in the vicinity of vegetation clearance operations or heavy equipment operations)
- Leather work boots with ankle support and non-slip soles; no steel toe shoes in the vicinity of magnetometer operations
- Cotton work clothes or coveralls
- Back supports (optional)
- Leg chaps (when working around vegetation clearance operations)
- Chemical-resistant work gloves (when performing equipment fueling operations or any other types of operations presenting a potential for chemical exposure)
- Type II personal flotation devices, during boat operations.

D.15.1.4.1 Eye Protection

All personnel shall use appropriate eye protection when exposed to eye hazards from flying particles, liquid chemicals, or other eye hazards. All personnel shall 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.

- All personnel who wear prescription lenses while engaged in operations that involve eye hazards shall 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 shall be distinctly marked to facilitate identification of the manufacturer.

Protective eye equipment, shall comply with American National Standards Institute Z87.1-89, “American National Standard Practice for Occupational and Educational Eye and Face Protection,” which is incorporated by reference as specified in Section 1910.6.

D.15.1.4.2 Head Protection

When personnel are working in the vicinity of vegetation clearance equipment, heavy equipment operations, or when the possibility of overhead hazards exist hard hats will be worn.

D.15.1.4.3 Body Protection

Special body protection is not expected to be required. Personnel will wear shirts and long pants or coveralls made of cotton to reduce the generation of static electricity.

D.15.1.4.4 Foot Protection

Because of uneven working surfaces and potential for tripping hazards common to an outdoor environment, all USA personnel shall wear sturdy leather work boots with ankle support and non-slip soles. Personnel using magnetometers for the detection of buried MEC will not wear steel-toed safety shoes, as they will affect the readings of the equipment. Safety toe boots will be required in the vicinity of heavy equipment operations and vegetation clearance operations.

D.15.1.4.5 Hand Protection

USA selects and 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. For most operations on this project, leather gloves will provide adequate protection against minor cuts, which are a hazard in most site operations. Chemical gloves will be required in fueling operations or any other operations with a potential for chemical exposure.

D.15.1.4.6 Hearing Protection

USA shall make hearing protectors available to all employees exposed to an 8-hour time-weighted average (TWA) of 85 dB or greater. Hearing protectors shall be replaced as necessary. Hearing protection will be required for all personnel working in and around any operations likely to produce high noise levels, such as during the use of chain saws and weed-eaters during vegetation clearance operations and heavy equipment operations.

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 USA 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, such as the start of drum sampling 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 Corporate Safety and Health Manager and 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 UXOSO will conduct the task hazard assessment and consult with the Corporate Safety and Health Manager and/or the CSP. The level and type of PPE to be used will be identified. The 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 Corporate Safety and Health Manager and/or CSP, 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 shall 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 shall not be used. It shall 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 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. For items used inside an EZ, site personnel will follow the requirements of the Site Specific Decontamination Plan and ensure that the PPE is properly decontaminated before removing the item from the EZ or Contamination Reduction Zone.

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 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 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 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 its SSHP, the SUXOS and/or UXOSO (as applicable) shall identify and assess the task hazards and relay that information to the Corporate Safety and Health Manager. The Corporate Safety and Health Manager or his staff will prepare an amendment to the SSHP and submit the amendment for approval from the Corps of Engineers. The amendment will be added to the SSHP upon Corps of Engineers approval.

The UXOSO will ensure PPE use complies with all applicable OSHA, USACE, 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

USA shall provide training to each employee who is required by this section to use PPE. Each affected employee shall 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 shall 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 the conduct of 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 UXOSO supervising and visually inspecting each individual's ability to properly don and use the PPE during initial use of the PPE.

When the UXOSO has reason to believe that any affected 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, situations where:

- Changes in the workplace render previous training obsolete

- Changes in the types of PPE to be used render previous training obsolete
- Inadequacies in an affected employee's knowledge or use of assigned PPE indicate 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 UXOSO will complete the Training form (see Table D-5). 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-5: USA 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 AND CONTINGENCY PROCEDURES

The 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 shall 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

An agreement will be established between USA and emergency response personnel and the hospital regarding responsibilities of each party in responding to a project site emergency. The UXOSO will verify all on-site emergency services information, to include procedures for requesting services. It shall be the 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 the site office and in each site vehicle
- 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 the emergency evacuation vehicle and all other site vehicles
- Conduct an emergency response drill to test the effectiveness of the Emergency Response Plan and Contingency Procedures (ERCP)
- Review and revise the ERCP 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 ERCP
- 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 Corporate Safety and Health Manager 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 of this type.

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. A meeting place off site will be identified in case of emergency evacuation 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.

D.16.2.2 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
- Fires and explosions.

D.16.2.3 Personnel and Lines of Authority

In the event of an emergency, the UXOSO will be designated as the On-Scene Incident Commander and will have the overall responsibility for implementation of the ERCP and coordination with responding off-site emergency services. In the event of a medical emergency, the UXOSO will summon the USA first responders to assist the victim. The UXOSO will make the determination as to whether professional medical assistance is required and will summon the ambulance, if required. The UXOSO may also direct USA personnel to assist the emergency rescue personnel.

Specific responsibilities of the 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 USA Corporate Safety and Health Manager
- 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 of 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, UXOSO will complete the USA Accident Report. The Corporate Safety and Health Manager will be responsible for notifying applicable Federal, state, and local authorities/agencies. Once the emergency has been resolved, the UXOSO, Project Manager, and Corporate Safety and Health Manager will conduct a follow-up investigation and critique. Actions will be taken to prevent recurrence.

All USA personnel and visitors will be responsible for:

- Reporting any site emergencies to the SUXOS or UXOSO
- Knowing the exit location and evacuation route within the EZ

- Knowing the pre-planned evacuation assembly point and going there in the event of an emergency
- Assisting emergency response personnel, as requested.

D.16.2.4 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 Site Safety and Health Plan, 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 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.

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
- Evacuate to the designated assembly point in the support zone
- Begin emergency procedures
- Notify off-site emergency response organizations.

After evacuation, the UXOSO will account for all personnel, ascertain information about the emergency, and advise responding on-site personnel. The 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 shall 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 UXOSO.

D.16.2.5 Safe Distances and Places of Refuge

The UXOSO will determine safe distances and places of refuge. Prior to the start of each work day, the UXOSO or SUXOS (as applicable) will hold a safety meeting with all personnel and discuss the following:

- Times when the gate to ranges may be locked
- Who has the gate key or combination on site
- 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.

D.16.3 EVACUATION PROCEDURES

The UXOSO will establish evacuation routes. Evacuation notification will be one long blast on an air horn, vehicle horn, or direct verbal communication. If evacuation is necessary, all personnel are to:

- Gather equipment to the extent safely possible
- Evacuate to the vehicle(s) location and prepare to move out.

D.16.4 MEDICAL EMERGENCY PROCEDURES

Any person(s) who become ill or injured during work activities must immediately inform the 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 UXOSO. The UXOSO will make the determination if professional medical assistance will be required, and he will summon the ambulance if necessary. All personnel at the work site will use the buddy system. All personnel using the buddy system will stay within sight of their partner. If a partner becomes incapacitated or severely ill, the UXOSO will be called. In the event that a cessation of work is ordered, all personnel should:

- Assist the First Responders, if required, in administering first aid
- Leave the area if the hazard warrants such action.

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 victim is brought to the medical treatment facility for treatment via ambulance (air or ground).

It is not anticipated that hazardous waste decontamination shall 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 MSDS are followed by the First Responders to clean as much of the chemical off as possible before treatment. The MSDS is taken with the victim to the medical treatment facility for treatment.

D.16.5 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 shall be applied whenever USA 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.

D.16.5.1 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. USA employees shall observe "universal precautions," and treat all body fluids as potentially infectious materials. USA shall provide 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 shall be provided. USA employees shall 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
- USA employees shall 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 shall 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.

D.16.5.2 Safe Work Practices

Safe work practices will be implemented whenever possible to eliminate or reduce the potential for employee exposure. Employees shall wash their hands immediately or as soon as feasible after removal of gloves or other PPE. Employees shall 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 shall immediately be disposed of in an appropriate puncture-resistant container or decontaminated.

Eating, drinking, smoking, applying cosmetics 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.

D.16.5.3 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.

USA shall provide appropriate PPE including gloves, face masks, eye protection, mouthpieces, etc., for protection against potentially infectious materials.

PPE shall 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 shall 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 shall be investigated and documented by the UXOSO and be approved by the Corporate Safety and Health Manager.

Single-use protective equipment, such as surgical gloves, shall 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, shall be cleaned and decontaminated after each use or when they become contaminated in order to maintain its effectiveness.

Multi-use protective equipment shall 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 shall be removed and disposed 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.

D.16.5.4 Decontamination Procedures

All equipment, working surfaces and non-working surfaces shall be decontaminated after contact with potentially infectious materials. A solution of ten parts water to one part bleach or equally effective material shall be used to clean contaminated areas.

Contaminated sharp objects shall be cleaned up using mechanical means, such as a brush and dustpan. Sharp objects shall not be picked up directly with the hands.

Two pairs of gloves, inner surgical gloves and outer utility gloves shall be worn for cleaning contaminated surfaces. A smock or apron and eye protection shall also be worn.

Only those employees directly involved with the decontamination efforts shall be allowed in the work area while cleaning is taking place.

All cleaning equipment shall 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 shall clean up his/her own blood or other potentially infectious materials.

D.16.5.5 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 shall 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, shall 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 shall 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 shall be handled as little as possible and with minimum agitation. Bags containing contaminated materials shall not be carried or handled from the bottom. All regulated waste will be disposed of in accordance with applicable Federal, state, and local regulations.

D.16.5.6 Emergency Medical Facilities

For most anticipated types of on-site injuries, site personnel will report to the 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 UXOSO (or the UXOSO will come to the victim) and will examine the victim and determine if further medical treatment is indicated. If required, the UXOSO will summon an ambulance to transport the victim to the nearest hospital.

The nearest medical treatment facility is the Culebra Health Clinic at (787) 742-3511. See Attachment 3 for directions to the medical treatment facility from the various work locations.

D.16.5.7 Material Safety Data Sheets

As part of the USA Hazard Communication Program, an MSDS binder will be maintained on site, which includes copies of MSDSs for all hazardous materials brought onto the site by USA. It will be kept in the UXOSO site vehicle during operations. This MSDS 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 USA UXOSO or the Corporate Safety and Health Manager 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 MSDS will be retrieved and given to the medical providers. MSDSs for chemicals expected to be used on this site are included in Attachment 6; however, if additional materials are purchased for use on the site, these MSDSs will be added to the site MSDS binder.

Chemical Inventory sheets will be prepared by the 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.

D.16.5.8 Training

Training in emergency procedures will be accomplished by performing drills. After any drill or real emergency scenario, the Project Manager, Corporate Safety and Health Manager, and UXOSO will evaluate the situation and determine any potential areas for improvement in the procedures. Procedures will be updated accordingly.

D.16.6 SPILL PLANS

USA will conduct cleanup operations in the event of a spill of hazardous material (e.g., fuel or oil from UXO field operations). The UXOSO will manage the collection of the spilled material with absorbent pads and containerize the pads or materials within Department of Transportation-approved drums for disposal as potential 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 UXOSO immediately
- The UXOSO shall notify the Project Manager of the spill/leak with relevant information (location, time, chemical identity, quantity, hazards listed on the MSDS), and any corrective actions/measures taken
- Locate the source and stop the leak/spill if it can be done safely (as dictated by the UXOSO)
- Begin containment and recovery of spilled material (as directed by the UXOSO), using appropriate PPE and spill cleanup equipment and materials
- Once notified, the USA Project Manager will in turn notify the USACE Project Manager and the Contracting Officer. The USACE Project Manager will advise USA if any additional actions are necessary.

D.16.7 FIREFIGHTING PLANS

In the event of a fire or explosion, the UXOSO will notify the police, fire department, and ambulance, as required. The UXOSO will also contact the Corps of Engineers site Safety Representative and Project Manager, and escort the response personnel to the location of the fire or explosion. The UXOSO will determine the extent of the fire, coordinate and manage the fire suppression effort until the fire department arrives, use available on-site fire extinguishers on incipient stage fires only, and provide

emergency first aid as needed. Site personnel will not fight fires containing explosives. The responding fire department personnel will be informed of the nature of the fire and, if explosives are present, the fragmentation distance from which to fight or contain the fire.

The decision on whether or not to try to extinguish a fire using available site personnel and equipment will be made by the UXOSO and based on whether the fire is small, large, or involves explosives.

The vessel will be equipped with a minimum of two 1-A:10-B:C fire extinguishers to be used in the event of a fire while the boat operations are taking place. 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.

D.16.7.1 Small Fires

A small fire is defined as a fire that can most likely be extinguished by site personnel using portable extinguishers. A small fire must also be free and clear of explosive materials, especially MEC. If a small fire occurs, the 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, police, ambulance, hospital, etc.), as needed.

If a fire extinguisher is used, this must be immediately reported to the UXOSO. 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 30 minutes after the fire has been extinguished to assure re-ignition does not occur. If personnel are not working in the area, the UXOSO should check the area of the fire periodically to assure re-ignition does not occur.

D.16.7.2 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 and the fire does not involve explosive materials, the UXOSO will direct personnel to conduct the following, if safe to do so:

- Evacuate all non-essential personnel from the site to an upwind location
- Notify the fire department and other emergency response services (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.16.7.3 Fires Involving Explosive Materials

If a fire occurs that involves explosive materials such as chemicals, fuels, or MEC, the UXOSO will order the immediate evacuation of all site personnel to an upwind assembly point at least fragmentation distance from the fire site. The UXOSO will then notify the fire department and any other emergency services (police, ambulance, hospital, etc.), as needed. At no time will USA 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 surrounding buildings or structures in order 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 UXOSO 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 UXOSO will determine whether or not it is considered to be hazardous. If it is non-hazardous, 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 of USA. 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.16.7.4 Explosions

In the event of an explosion, the UXOSO will order the evacuation of all site personnel to a safe, upwind assembly point at least fragmentation distance away. The UXOSO will then notify all necessary emergency response services. After an explosion has occurred, the site will remain barricaded for a minimum of 30 minutes before entry is permitted. The UXOSO will enter the site with a team member and inspect for the presence and condition of MEC. If MEC is non-hazardous, it will be removed to a secured collection point for later sale to a qualified recycler. If MEC is hazardous, a USA UXO Team will be notified and the MEC will be destroyed by the UXO team. Non-UXO-qualified personnel may not enter the area until all known MEC has been removed or destroyed. If visitors need to enter the site, they must first be briefed on the potential hazards of the site. They must be accompanied at all times by UXO-qualified personnel (escort). If MEC is discovered during the course of their visit, they must immediately leave the site until it can be rendered safe for re-entry.

D.16.7.5 Safe Distances and Places of Refuge

The EZ of this project is the actual project footprint and an additional distance around it of the hazardous fragment distance of the most hazardous MEC expected to be encountered on the site. Outside of that distance is the support zone. Normally, during an evacuation, personnel would evacuate to the support zone, where the UXOSO would take roll and account for all site personnel. An exception to this rule would be in the case of encountering a CWM item, in which case personnel would evacuate at least 450 ft upwind of the item. This location would change with the shifting winds, so it cannot be specifically identified.

D.16.7.6 Posting of Emergency Telephone Numbers

Emergency resources are listed in Table D-6.

Table D-6: 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

Contact	Phone Number
Emergency Management Office - Culebra	787-742-3849
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)
TEU (duty hours)	410-671-3601
TEU (after duty hours)	410-671-2773
USA Project Manager, Doug Ralston	813-343-6368
USA Corporate Safety and Health Manager, Robert Crownover	813-343-6364

D.16.8 WILD LAND FIRE PREVENTION PLAN

In order to prevent grass fires from starting in the area, USA 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. All flammable liquids brought to the site for the purpose of fueling equipment will be stored in an approved flammable liquid container in a designated flammable liquid storage area. No smoking will be permitted within 50 ft of the storage or use of flammable materials.

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.16.9 MAN OVERBOARD/ABANDON SHIP PLAN

USA is contracting with Sea Ventures to provide transportation back and forth from Culebra to the offshore operations sites. All personnel on the boat will be required to wear a Type II personal flotation device (PFD) for the duration of the boat ride. The buddy system will be in effect for the ride back and forth to the site. USA 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 boat is equipped with rescue equipment to assist in getting the individual back on board.

Visitors to the site will also be required to wear a Type II PFD during transportation by boat to and from the remote island sites. Visitors will receive a safety briefing by the UXOSO. A qualified UXO Technician will be responsible for escorting visitors for the duration of the visit. Should a visitor fall overboard, the same rescue procedures will apply.

D.16.10 HAZARD COMMUNICATION PROGRAM

The program establishes procedures for USA employees who handle and store chemical products at USA sites. 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 MSDSs. All MSDSs are requested from the suppliers at the time of order. If not available, then a recent MSDS will be downloaded from the Internet.

As part of the USA Hazard Communication Program, an MSDS binder will be maintained on site, which includes copies of MSDSs for all hazardous materials brought onto the site by USA. It will be kept in the UXOSO site vehicle during operations, and all USA personnel will be made aware of that fact. This MSDS 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 USA Corporate Safety and Health Manager or his staff will locate the required information and pass it on to the employee.

All USA 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 MSDS 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 USA Documentation of Training Form.

The UXOSO must ensure that project personnel can immediately obtain the required information about chemicals of concern during an emergency.

D.16.11 RESPIRATORY PROTECTION PLAN

Because of the type of work taking place, respirators are not expected to be required on these sites. Should unforeseen hazards develop, which would require a respirator, the USA Respiratory Protection Program would be followed per the USA Corporate Safety and Health Program.

D.16.12 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. However, if toxic material or chemical agents are encountered, an Activity Hazard Analysis will be conducted and a Health Hazard Control Program will be implemented.

D.16.13 LEAD ABATEMENT PLAN

As this work is a remedial investigation as opposed to a remediation project, the site will be characterized. Lead abatement will not be required.

D.16.14 ASBESTOS ABATEMENT PLAN

As asbestos is not expected to be encountered on these outdoor sites, an Asbestos Abatement Plan is not required.

D.16.15 ABRASIVE BLASTING

Abrasive blasting is not required on this project.

D.16.16 CONFINED SPACE/EXCAVATION PLAN

Excavation work will be taking place as part of the remedial investigation, however, the excavations are not expected to exceed 4 feet in depth. Should an excavation exceed 4 ft in depth, then the excavation would be considered a confined space and the USA Confined Space Program and the USA Excavation Safety Program would be implemented.

D.16.17 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. Should a particular site require it, the USA Lock Out/Tag Out program would be implemented per the Corporate Safety and Health Program and put into the SSHP.

D.16.18 CRITICAL LIFT PROCEDURES

Because USA will not be performing any crane operations on this project, critical lift procedures will not be required.

D.16.19 CONTINGENCY PLAN FOR SEVERE WEATHER

Rain and severe wind conditions can constitute a safety hazard to field operations at any site. The UXOSO will monitor the weather closely. If the area becomes wet, muddy, slippery, or windy such that an unacceptable level of risk exists for personnel who are working in proximity to MEC items, then MEC operations will cease until the UXOSO determines it to be safe to continue.

No MEC operations will take place if an electrical storm is within 10 miles of the site. The UXOSO and/or SUXOS will use an electrical storm monitor to determine if an electrical storm is approaching. MEC operations will cease when an electrical storm is within 10 miles of the site, and will not resume again until the UXOSO determines that the electrical storm is at least 10 miles past the site.

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.16.19.1 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 (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.16.19.2 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.16.19.3 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 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 diving operations would be considerably more hazardous.

Personnel should seek shelter in a substantial building. The 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 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 UXOSO, who will assure all USA Environmental 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.16.20 ACCESS AND HAUL ROAD PLAN

Because there are no plans to create access and haul roads for these project sites, the Access and Haul Road Plan is not required. The access roads to the site will be controlled by USA for the duration of site operations as a means of site control. This is further detailed in the Site Control Plans.

D.16.21 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.16.22 EMERGENCY RESCUE (TUNNELING) PLAN

As work on this project does not involve tunneling operations, this Emergency Rescue Plan is not required.

D.16.23 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.16.24 COMPRESSED AIR PLAN

As there are no plans to use compressed air on this project, a Compressed Air Plan is not required.

D.16.25 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.16.26 JACKING PLAN (LIFT) SLAB PLANS

As there will be no Lift Slab work on this project, this plan will not be required.

D.16.27 BLASTING PLAN

As all MEC disposal work on this project site will be handled by the USA UXO Team, explosive materials will be brought onto the site and used for disposal operations. Explosive operations on this project site are spelled out in the Work Plan in “Demolition, Explosive Storage, and MPPEH Disposal,” “MEC Disposal,” and “Explosive Management Plan.”

D.16.28 DIVING PLAN

Diving operations are not expected to occur on this site, so a Diving Plan will not be required.

D.16.29 PLAN FOR PREVENTION OF ALCOHOL AND DRUG ABUSE

The USA program is included as Attachment 5. All project personnel will be asked to read and abide by this plan. The policy will be posted at the job site.

D.16.30 FALL PROTECTION PLAN

Most of the work on these sites will be at ground level. However, there will be some excavation work involved in the Remedial Investigation. Excavations are not expected to reach 4 feet in depth, so sloping and/or shoring would not be required. However, personnel working in the vicinity of excavation operations will be made aware of the slip/trip/fall hazards in the area and advised to watch their step around the excavations. USA personnel on site will ensure that no unauthorized personnel enter the EZ of the site, and the excavations will be backfilled as soon as possible after work within them has been completed.

D.16.31 STEEL ERECTION PLAN

As no steel erection will be taking place on this project, this plan is not required.

D.16.32 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.16.33 SITE SANITATION PLAN

Adequate sanitation facilities will be provided at each work site 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 shall be provided on site at all times, and will be supplied in accordance with the following provisions:

- Containers used for potable water shall 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 shall be clearly labeled as to its contents and not used for any other purpose.
- Water shall 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.
- Water coolers of drinking water will be placed in the support zone.
- 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 fire fighting 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." There shall at no time be a cross connection or open potential between a system furnishing potable water and a system furnishing non-potable water.
- Chemical toilets will be available at the work site. The toilet will be equipped with toilet paper, toilet paper holder, light, washing facilities, locking door, and adequate ventilation.
- Hand and face washing facilities will be set up in the support zone of the work area. These will be utilized by all personnel exiting the EZ prior to eating, drinking, tobacco use or other hand-to-face activities. Washing facilities will consist of potable running water, soap, and drying towels. A portable eyewash will be available in site vehicles.
- Waste Disposal: A trash receptacle will be present in the support zone for the disposal of hand drying materials, any disposable PPE, paper towels used to dry hands, and other generated site debris.

D.16.34 FIRE PREVENTION PLAN

In order to prevent fire from occurring, every step will be taken to keep the site neat and clean. All equipment and materials not in use will be put away in designated locations. Trash cans with lids will be at the site, 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. Equipment will never be fueled in the back of a pick-up truck containing a bed liner. Personnel handling explosive and/or flammable materials will wear cotton under and outer garments to prevent build-up and transfer of static electricity.

D.16.34.1 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.17 CONTRACTOR INFORMATION

USA is the prime contractor on this project. This APP and attached SSHP are based on USA procedures. Sea Ventures will be a subcontractor on this project to provide boat transportation to and from the offshore operations sites and to provide support to the offshore operations. This subcontractor 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:

- Geophysical Prove-Out Test Strip
- Location Surveying and Mapping
- MEC Investigation
- MEC Disposal Operations
- MPPEH Inspection
- Quality Control
- Vegetation Removal
- Vehicle Operations
- Boat Transportation
- Boat Operations

D.18.1 SAFETY HAZARDS

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 listed below and in individual Activity Hazard Analyses found in Attachment 2.

D.18.1.1 Slip, Trip, and Fall Hazards

As this project covers a variety of sites, sites will be sandy, with rocky areas as well. As with any outdoor site, there is generally an uneven walking/working surface, which makes for the possibility of slip, trip, and fall hazards. Site personnel shall be instructed to make themselves aware of foot placement at all times to avoid slips, trips, and falls. The use of sturdy leather work boots with ankle support and non-slip soles will reduce the risk of slips, trips, and falls.

D.18.1.2 Cuts/Laceration Hazards

MEC scrap surfaces and buried debris can be expected to have sharp and rusted surfaces. Project personnel should expect a high likelihood of cuts/lacerations if proper care is not taken. During all activities involving the handling of MEC, MEC scrap, and site materials and tools, personnel shall wear leather work gloves to prevent injury to hands.

D.18.1.3 Pinched/Crushed Fingers and Toes

The weight of MEC scrap expected to be recovered and handled during MEC inspection activities is expected to pose only a light to moderate hazard to fingers and toes. The mishandling of even light materials can cause injuries to site personnel. All site personnel are required to wear leather work boots and gloves while activities are being conducted. Personnel shall utilize proper lifting techniques and when appropriate, shall use additional personnel or material handling equipment for heavy objects.

D.18.1.4 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 shall 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 may 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.

D.18.1.5 Material Lifting

Many types of objects are handled in normal day-to-day operations. Care shall 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 shall be free of oil, grease, and water, which might prevent a firm grip.
- The hands and especially the fingers shall be kept away from any points that cause them to be pinched or crushed, especially when setting the object down.
- The item shall be inspected for metal slivers, jagged edges, burrs, rough or slippery surfaces, and pinch points, and gloves shall be used, if necessary, to protect the hands.
- The feet shall 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, shall face the direction in which the object is being carried.

D.18.1.6 Munitions and Explosives of Concern

MEC may be present and located during site activities. UXO-qualified personnel will follow the requirements of the USA Safety Program, and the Basic Safety Concepts and Considerations for Ordnance and Explosives Operations, which outline the safety and health precautions to be taken if MEC

are encountered and/or destroyed. All non-UXO qualified personnel will follow the safe work practices listed below:

- Non-UXO-qualified personnel will receive site-specific MEC recognition training prior to participation in site activities.
- No soil penetrating activities will be allowed without the area first being cleared by UXO-qualified personnel.
- Non-UXO-qualified personnel will be escorted on site by UXO-qualified personnel, until such time as the area is cleared.
- Once an area has been cleared and flagged, non-UXO-qualified personnel may perform duties in the area unescorted, but shall not leave the cleared area unescorted.
- 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.
- In order to protect other personnel and the general public, an EZ will be set up at a determined hazardous fragment distance all around the project footprint area of the work area, based on the most significant MEC item expected to be encountered on the site. A safe separation distance of at least K40 distance will be maintained between UXO teams working on the site. However, if MEC with a larger fragmentation distance is encountered on the site, the EZ will be extended to the hazardous fragment distance of the larger item. USA will have control of the entrance to the project area until the area has been cleared. Should personnel not associated with the project operations need to enter the EZ, it will be coordinated with the SUXOS. All MEC operations will halt for the duration of time the person is within the EZ. Once they have departed the area, MEC operations may resume.
- Hazardous MEC disposal operations will be performed by USA UXO teams. MDAS that is non-hazardous will be inspected and certified as non-hazardous, and will be collected in a secured location until the conclusion of the project work. After the project work has been completed, the non-hazardous MDAS will be sold to a qualified recycler.

D.18.2 CHEMICAL HAZARDS

The only anticipated chemical hazards that would be expected during site activities are those fuels and oils brought on site for equipment use and maintenance. All site personnel will follow the procedures and precautions outlined in the appropriate MSDS. The MSDS binder will be kept in the UXOSO site vehicle and will be available to all employees on request. Chemical Warfare Materiel (CWM) is not expected to be found on these sites.

D.18.3 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.

D.18.3.1 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. Equipment will never be refueled in the back of a pick-up truck with a bed liner. 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.

D.18.3.2 Noise Hazards

Protection against the effects of noise exposure shall be provided when the sound levels exceed those shown in Table D-7, 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 D-7, feasible administrative or engineering controls shall be utilized. If such controls fail to reduce sound to a safe level, PPE shall 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.

Table D-7: 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.	

USA shall make hearing protection available to all employees exposed to an 8-hour time-weighted average of 85 dB or greater. Hearing protection shall be replaced as necessary. Hearing protection will be required for all personnel working in and around any operations likely to produce high noise levels, such as during the use of chain saws and weed-eaters used for vegetation clearance operations and around heavy equipment operations.

USA provides 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.

D.18.3.3 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 and/or the use of semi-permeable or impermeable clothing, 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 by USA personnel for the prevention, control, and/or treatment of heat-related illnesses.

D.18.3.3.1 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. Impermeable PPE interferes with the evaporation of perspiration and causes the body to retain metabolic and environmentally induced heat. 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 UXOSO will inspect the 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 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 UXOSO throughout the day.

D.18.3.3.2 Heat Stress Disorders

This section outlines the major heat-related illnesses that may result from exposure to high heat environments and/or the use of semi-permeable or impermeable clothing. 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.

- 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.

- 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.

- 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 2 gallons per day. Transfer to a medical facility if symptoms do not subside, or become more severe.

- 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 (because the individual may still be wet from having sweat while wearing protective clothing earlier). 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; lie down and keep the head 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.

D.18.3.3.3 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 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 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 four (4) to twelve (12) ounce cups and liquids will be provided on site. Acceptable liquids will include water and an electrolyte replacement solution. It is recommended that the water to balanced electrolyte liquids be taken at a 2:1 ration with the intake of water being twice the intake of the balanced electrolyte liquids. Liquids containing caffeine are to be avoided.

When ambient conditions and site workload requirements dictate, as determined by the 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, protective clothing, 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.
- Cooling devices will be provided to aid in body heat exchange. Cooling devices may include cooling jackets, vests, or suits and field showers or hose-down areas. Depending on the severity of the heat exposure, some form of artificial cooling may be required to ensure protection of the workers.
- 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.

D.18.3.3.4 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 Table D-8). 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. If semi-permeable or impermeable clothing is used, monitoring will start at 70 °F. 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 UXOSO will use the WBGT readings to monitor temperature and humidity and establish work/rest cycles. Depending on the conditions at the site, the UXOSO may also monitor the worker's heart rate as an indication of potential heat stress. However, if monitoring with the heart rate method indicates the need for closer, more direct monitoring, the oral temperature method will be implemented. The need for monitoring body water loss will be determined by the UXOSO, and will be based upon observation of the sweat loss experienced by site personnel during their work cycle. The frequency of physiological monitoring will be determined using the information presented in Table D-8.

For monitoring the body's recuperative ability toward excess heat, both of the following techniques should be used as a screening mechanism unless the UXOSO modifies the procedures and documents the log. Monitoring of personnel wearing impermeable clothing should commence when the ambient temperature is 70 °F or above, and 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.

Table D-8: Suggested Frequency of Physiological Monitoring for Fit and Acclimatized Workers[a]

Adjusted Temperature[b]	Normal Work Ensemble[c]	Impermeable Ensemble
90 °F (32.2 °C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5 - 90 °F (30.8 - 32.2 °C)	After each 60 minutes of work	After each 30 minutes of work
82.5 - 87.5 °F (28.1 - 30.8 °C)	After each 90 minutes of work	After each 60 minutes of work
77.5 - 82.5 °F (25.3 - 28.1 °C)	After each 120 minutes of work	After each 90 minutes of work
72.5 - 77.5 °F (22.5 - 25.3 °C)	After each 150 minutes of work	After each 120 minutes of work

[a] For work levels of 250 kilocalories/hour.

[b] Calculate the adjusted air temperature (at adj) by using this equation: at adj °F = ta °F + (13 x % sunshine). Measure air temperature (at) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow. (100 percent sunshine = no cloud cover and a sharp, distinct shadow; 0 percent sunshine = no shadows.)

[c] A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.

- **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 UXOSO will conduct WBGT monitoring to assist in controlling the potential for site workers experiencing heat-related adverse health effects. The UXOSO will use a real-time direct reading WBGT monitor and, after estimating the work load, use the values expressed in Table D-9 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 UXOSO may also implement the heart rate, OT and water weight loss monitoring.

Table D-9: 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.

- **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.

- **Oral Temperature Monitoring**

If deemed necessary by the UXOSO, and the conditions warrant, oral temperature (OT) monitoring will be conducted. The worker's OT will be taken and recorded prior to initiation of site activities using a clinical thermometer placed under the tongue. The OT must be taken prior to consumption of cool liquids and will be done at the end of each work period or at a frequency determined by Table D-9. Whenever the OT exceeds 99.6 °F, the work cycle must be shortened by one third, without changing the length of the rest period. If a worker's OT has exceeded 99.6 °F, test the OT again at the end of the rest cycle, and do not allow the worker to return to work until the OT drops below 99.6 °F. If a worker's OT exceeds 100.4 °F, the worker will not be allowed to work in impermeable or semi-permeable PPE for the remainder of that workday.

- **Body Weight Loss**

If expected site conditions and work requirements have the potential for causing excessive fluid loss, the UXOSO will monitor the workers' fluid loss by weighing each worker prior to and again at the conclusion of each day's site activities. This measurement will be needed to ensure that proper hydration is being maintained and that the total amount of water weight loss throughout the day does not exceed 1.5% of the employee's body weight. Body weights will be taken with the workers wearing undergarments only. If, as determined by the UXOSO, site conditions and work requirements cause an extreme amount of fluid loss, body weights will also be taken prior to the lunch break. Calculation of the water weight loss, and assessing the effectiveness of hydration, shall be conducted as follows:

Once the ending weight is obtained subtract it (W_{end}) from the daily starting weight (W_{start}) to obtain the weight lost (W_{lost}) during a given work period, i.e.,: (W_{start}) - (W_{end}) = (W_{lost}).

Multiply the starting weight by 1.5% to obtain permissible weight loss (W_{perm}), i.e.,

(W_{start}) x 0.015 = (W_{perm}).

Compare (W_{lost}) to the (W_{perm}); if (W_{lost}) is less than or equal to (W_{perm}), then hydration during the measured period has been adequate, but if (W_{lost}) is greater than (W_{perm}), then hydration should be increased during the next work period.

D.18.3.3.5 Heat Stress Documentation

The 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, OT, and/or water loss calculations being recorded in the Site Safety Log, and/or Site Monitoring Log.

D.18.4 IONIZING RADIATION HAZARDS

Ionizing radiation is not expected to be an issue on these project sites.

D.18.5 BIOLOGICAL HAZARDS

Biological hazards that are usually found on site include hazardous plants, bees, spiders, mosquitoes, ticks, snakes, and rodents. Employee awareness and the safe work practices outlined in the following paragraphs should reduce the risk associated with these hazards.

D.18.5.1 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 is hypersensitive to bee, wasp, or hornet stings, he must inform the 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 UXOSO if a stinging insect nest is located or suspected in the area.

- Any nests located on site will be flagged off and site personnel will be notified of its presence.
- If stung, site personnel will immediately report to the UXOSO to obtain first aid treatment and to allow the 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 UXOSO and co-workers know where it is kept.

D.18.5.2 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 D-2.

Figure D-2: 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 UXOSO will brief site personnel as to the identification and avoidance of the spiders. As with stinging insects, site personnel shall report to the UXOSO if they locate either of these spiders on site or notice any type of bite while involved in site activities.

D.18.5.3 Hazardous Plants

During the conduct of site activities, a number and variety of hazardous plants may be encountered. The ailments associated with these plants range from mild hay fever to varying forms of contact dermatitis. However, the plants that present the greatest degree of risk to site personnel (i.e., potential for contact vs. effect produced) are those that produce skin and tissue injury.

D.18.5.3.1 Plants Causing Skin and Tissue Injury

Contact with splinters, thorns, and sharp leaf edges is of special concern to site personnel, as is the contact with the pointed surfaces found on branches, limbs, and small trunks left by site clearing and grubbing crews. This concern stems from the fact that punctures, cuts, and even minor scrapes caused by accidental contact may result in non-infectious skin lesions, and the introduction of fungi or bacteria through the skin or eye. This is especially important in light of the fact that the warm moist environment created inside impermeable protective clothing is ideal for the propagation of fungal and bacterial infection. Personnel receiving any of the injuries listed above, even minor scrapes, will report immediately to the UXOSO for initial and continued observation and care of the injury.

D.18.5.3.2 Plants Causing Skin Reactions

The poisonous plant of greatest concern is poison ivy, called “pica pica” locally. Poison ivy thrives in all types of light and usually grows in the form of a trailing vine; however, it can also grow as a bush and can attain heights of 10 feet or more. As illustrated in Figure D-3, Poison ivy has shiny, pointed leaves that grow in clusters of three.

Figure D-3: Examples of Hazardous Plants

Poison Ivy	Leaves and Fruit of Manchineel Tree

The skin reaction associated with contacting this plant is caused by the body's allergic reaction to toxins contained in oils produced by the plant. Becoming contaminated with the oils does not require contact with just the leaves. Contamination can be achieved through contact with other parts of the plant such as the branches, stems or berries, or contact with contaminated items such as tools and clothing. Being downwind from areas where these plants are burning can also produce reactions. The allergic reaction associated with exposure to these plants will generally cause the following signs and symptoms:

- Blistering at the site of contact, usually occurring within 12 to 48 hours after contact
- Reddening, swelling, itching and burning at the site of contact
- Pain, if the reaction is severe
- Conjunctivitis, asthma, and other allergic reactions if the person is extremely sensitive to the poisonous plant toxin
- If the rash is scratched, secondary infections can occur. The rash usually disappears in 1 to 2 weeks in cases of mild exposure and up to 3 weeks when exposure is severe. Preventive measures, which can prove effective for most site personnel, are:
- Avoid contact with any poisonous plants on site, and keep a steady watch to identify, report, and mark poisonous plants found on site
- Wash hands, face or other exposed areas at the beginning of each break period and at the end of each workday
- Avoid contact with, and wash on a daily basis, contaminated tools, equipment, and clothing
- Barrier creams, detoxification/wash solutions and orally administered desensitization may prove effective and should be tried to find the best preventive solution
- Keeping the skin covered as much as possible (i.e., long pants and long sleeved shirts) in areas where these plants are known to exist will limit much of the potential exposure

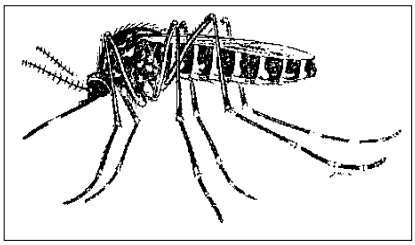
D.18.5.3.3 Poisonous Tree

The poisonous Manchineel Tree grows in the Caribbean region. The tree is also referred to as Manzanilla de la muerte "Little Apple of Death," as it is one of the most poisonous trees in existence. It resembles an apple tree. It has grayish bark and grows up to 45+ feet in height. It has shiny green leaves and spikes of small, greenish flowers. Its fruits, which look similar to an apple are green to greenish-yellow in color. They are normally found on or near coastal beaches and their roots stabilize the sand from erosion.

The tree and its parts contain strong toxins. It will secrete a white, milky substance during rainfall. Standing beneath the tree during rainfall is said to cause blistering of the skin due to contact with this substance. Burning the tree can cause blindness if smoke reaches the eyes. The fruit can be fatal if eaten. Do not stand under the tree, and do not touch the bark, branches, leaves or fruit of this tree, as it will result in contact dermatitis. Skin contact can cause blistering, burns, erythema, swelling and inflammation. If ingested it will cause burning and swelling of the mucosa, esophageal ulcerations, edema, and cervical lymphadenopathy, making it impossible to swallow, difficult to talk and hard to breathe. The fruit is poisonous and should not be ingested, as it can be fatal.

Treatment of exposure includes cleaning the skin with soap and water to remove the plant latex, being careful to avoid further exposure, and using antihistamines to minimize the immune response and the edema. If an exposure to this tree is suspected, report it immediately to the UXOSO, and he will arrange for transport to the hospital emergency room for treatment.

D.18.5.4 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 UXOSO, who will authorize you to visit a physician for an examination and possible treatment.

D.18.5.4.1 Protective Measures

Standard field gear (work boots, 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 shall 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 33 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.

D.18.5.5 Ticks

The CDC has noted the increase of Lyme Disease and Rocky Mountain Spotted Fever, 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.

D.18.5.5.1 Protective Measures

Standard field gear (work boots, socks and light-colored coveralls) provide good protection against tick bites, particularly if the joints are taped. However, even when wearing field gear, the following precautions shall 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 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

D.18.5.6 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 is to be taken by site personnel during activities which may bring them in contact with local wildlife.

D.18.5.7 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 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.

D.19 LOGS, RECORDKEEPING, AND REPORTS

USA will perform and document safety inspections, as well as maintain a site visitor log. Personnel records will be kept on site, which 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.

D.19.1 SAFETY INSPECTION LOGS

The UXOSO will perform and document daily and weekly safety inspections of all site operations on a scheduled and non-scheduled basis. The 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 D-10. When discrepancies are observed, follow-up will be documented in the UXOSO log until the corrective actions required have been completed.

Table D-10: 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
Motor Vehicles	Daily
Safe Access and Fall Protection	Weekly, if applicable
HTRW	Daily, if applicable

D.19.2 VISITOR LOG

The Visitor's Log will be maintained by the 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 EZ of the site. Visitors will be escorted by UXO personnel at all times within the EZ. MEC operations will cease while visitors are within the EZ.

D.19.3 RECORD KEEPING

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
- 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.

D.19.3.1 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. The files will then be transferred to the Corporate Office in Oldsmar, Florida, at the end of site operations.

D.19.3.2 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 Oldsmar, Florida, office.

D.19.3.3 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.

D.19.4 FINAL REPORT

USA 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.

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APPENDIX D, ATTACHMENT 1.
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

Form approved OMB no. 1218-0176

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.

Establishment name USA Environmental, Inc.

City _____ State _____

Identify the person			Describe the case			Classify the case											
						CHECK ONLY ONE box for each case based on the most serious outcome for that case:				Enter the number of days the injured or ill worker was:		Check the "injury" column or choose one type of illness:					
(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)	(M) Injury	Skin Disorder	Respiratory Condition	Poisoning	Hearing Loss	All other illnesses
								Job transfer or restriction	Other record-able cases								
						(G)	(H)	(I)	(J)	(K)		(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.

Injury	Skin Disorder	Respiratory Condition	Poisoning	Hearing Loss	All other illnesses
(1)	(2)	(3)	(4)	(5)	(6)

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.

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APPENDIX D, ATTACHMENT 2.
ACTIVITY HAZARD ANALYSES

This attachment contains the following Activity Hazard Analyses related to the Environmental Baseline Survey effort:

- Boat Operations
- Boat Transportation
- Equipment Check
- Bathymetric and Geophysical Operation
- Quality Control
- Snorkeling Operations
- Vehicle Operations.

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ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)

Date: 23 April 2012

Project: Underwater Baseline Survey

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	Frequent	Likely			
Catastrophic	E	E			
Critical	E	H			
Marginal	H	M			
Negligible	M	L			

Add Identified Hazards

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	
X	• Locate MEC under water using geophysical equipment as well as visual survey of video taken with equipment in order to characterize the site. • A scan sonar/magnetometer and an ROV will both be used under water in order to detect MEC under water at various depths. • 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, fall hazards • Muscle strain carrying instruments • Heat Stress • Biological hazards – bees, wasps, mosquitoes, spiders. • Noise • Sunburn • Hazardous weather conditions	• On-site MEC Training. • Boat Operator will assure that boat is well maintained and in good condition prior to taking on passengers. • Boat Operator will assure 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 rescue hook, life preserver 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. • Follow appropriate lifting/carrying procedures. • Heat stress monitoring, drinking water, work-rest schedule, and cool shelter for breaks. • Training in biological hazards avoidance. • PPE for noise and cuts/lacerations. • Use insect repellants 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 through video taping of underwater conditions. items is not intended or anticipated. • Personnel will remain seated while boat is in motion. • All personnel will wear personal flotation devices while on boat. • Good housekeeping standards will be enforced. 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.	

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	• Boat • Scan sonar/magnetometer • ROV • Generator	• 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 techniques • Training in lifting and carrying techniques • All site personnel will have current HAZWOPER training	UXOSO will assure that all controls are being followed; all equipment is being utilized and that all personnel have received appropriate training. • Equipment inspected daily prior to use • Daily serviceability check of magnetometers
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): Robert D Crownover

Digitally signed by Robert Crownover
DN: cn=Robert Crownover, o=USA Environmental, Inc, ou=Safety and Quality, email=rcrownover@usatampa.com, c=US
Date: 2012.09.06 10:33:03 -04'00'

	PRINT	SIGNATURE		
SUXOS Name:	_____	_____		_____
UXOSO Name:	_____	_____		_____
Employee Name(s):	_____	_____	**Date/Time:**	_____
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ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)

Date: 23 April 2012 Project: Underwater Baseline Survey

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	Frequent	Likely			
Catastrophic	E	E			
Critical	E	H			
Marginal	H	M			
Negligible	M	L			

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	
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 assure 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 Operator will assure that boat is well maintained and in good condition prior to taking on passengers • Boat Operator will assure 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 • All passengers will wear personal flotation device at all times while on boat • Boat will be equipped with rescue equipment to handle a man-overboard situation (such as rescue hook, life preserver 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	

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS
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, spiders. • Weather hazards • Sunburn • Noise from boat engine	• 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 • 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 rescue hook, 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 repellants 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. 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

Add Items

	EQUIPMENT	TRAINING	INSPECTION
X	• Boat • Storm 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 assure that all controls are being followed; all equipment is being utilized and that all personnel have received appropriate training. • Assure that Boat Operator is providing daily inspection of their boats • Equipment inspected daily prior to use

ACTIVITY HAZARDS ANALYSIS

	EQUIPMENT	TRAINING	INSPECTION
X	• First Aid Kit • Fire Extinguishers • Communication equipment (radios, cell phones and extra batteries • Man overboard rescue equipment (hook, rope, 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
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.

Involved Personnel:

Acceptance Authority (digital signature): Robert D Crownover

Digitally signed by Robert Crownover
DN: cn=Robert Crownover, o=USA Environmental, Inc, ou=Safety and Quality, email=rcrownover@usatampa.com, c=US
Date: 2012.09.06 10:34:29 -04'00'

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UXOSO Name:	_____	_____		_____
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ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)

Date: 23 April 2012 Project: Underwater Baseline Survey

Activity: Equipment Check

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	Frequent	Likely			
Catastrophic	E	E			
Critical	E	H			
Marginal	H	M			
Negligible	M	L			

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	
X	• The UXOQCS will obtain an inert 155mm round or an item with a similar signature, which will be lowered to the ocean floor in an area that is free of other debris/ anomalies.	• 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 • Heat stress monitoring, drinking water, work-rest schedule, and cool shelter for breaks • Training in biological hazards avoidance • Use insect repellants as necessary • PPE – leather or canvas work gloves, personal flotation device • Use sunscreen and wear cap • Boat will be equipped with rescue equipment to handle a man-overboard situation (such as rescue hook, life preserver 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.	

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	
X	• Prior to the start of operations each day, the scan sonar/ magnetometer will be towed near the item and 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, 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 • Heat stress monitoring, drinking water, work-rest schedule, and cool shelter for breaks • Training in biological hazards avoidance • Use insect repellants as necessary • PPE – leather or canvas work gloves, personal flotation device • Use sunscreen and wear cap • Boat will be equipped with rescue equipment to handle a man-overboard situation (such as rescue hook, life preserver 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.	
X	• Prior to start of operations each day, the ROV will be taken to the item and 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, 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 • Heat stress monitoring, drinking water, work-rest schedule, and cool shelter for breaks • Training in biological hazards avoidance • Use insect repellants as necessary • PPE – leather or canvas work gloves, personal flotation device • Use sunscreen and wear cap • Boat will be equipped with rescue equipment to handle a man-overboard situation (such as rescue hook, life preserver 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.	
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 equipment area to another location as work on the project progresses.	• 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	• 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 • Heat stress monitoring, drinking water, work-rest schedule, and cool shelter for breaks • Training in biological hazards avoidance • Use insect repellants as necessary • PPE – leather or canvas work gloves, personal flotation device • Use sunscreen and wear cap • Boat will be equipped with rescue equipment to handle a man-overboard situation (such as rescue hook, life preserver 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.	

ACTIVITY HAZARDS ANALYSIS

EQUIPMENT	TRAINING	INSPECTION
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, safety sunglasses and cap). Hearing protection will be required if noise from generator reaches hazardous levels.	PPE Training	PPE inspected daily prior to use
X	• Scan sonar/magnetometer • ROV • Generator	• UXO personnel will meet training and experience requirements outlined in DDESB TP 18 • Site specific MEC training will be presented to all site personnel • Instrument 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 assure that all controls are being followed; all equipment is being utilized and that all personnel have received appropriate training. • Equipment inspected daily for serviceability prior to use • Daily serviceability check of magnetometers
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 flora/fauna to include first aid • Emergency response procedures	• 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

Involved Personnel:

Acceptance Authority (digital signature): Robert Crownover

Digitally signed by Robert Crownover
DN: cn=Robert Crownover, o=USA Environmental, Inc, ou=Safety and Quality, email=rcrownover@usatampa.com, c=US
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Activity Hazard Analysis (AHA)

Activity/Work Task: **Bathymetric & Geophysical Operation**	Overall Risk Assessment Code (RAC) (Use highest code)	**M**
Project Location: **Culebra, PR**	**Risk Assessment Code (RAC) Matrix**	
Contract Number:		
Date Prepared: **March 18, 2011**		
Prepared by (Tom Dolce):		
Reviewed by (Rick Reichard):		
Notes: (Field Notes, Review Comments, etc.)		

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

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

- E = Extremely High Risk
- H = High Risk
- M = Moderate Risk
- L = Low Risk

Job Steps	Hazards	Controls	RAC
Pre-sampling health and safety meeting, review emergency procedures, review boat operations, towfish use, winches, davits and equipment mount use. This includes geophysical system verification activity, geophysical and bathymetric surveys inclusive of grid surveys and anomaly reacquisition support. This is exclusive of dive support operations which would fall under other AHA's.		**<u>Situational awareness</u> is a control which will be critical in all aspects of this AHA.** **Situational awareness consists of LOCATION, LOCATION, AND LOCATION.** **Can you answer the following four questions:** **1) Where am I and where is my buddy?** **2) What things can hurt me?** **3) How do I get out?** **4) Where is the essential equipment (GPS, keys, phone, emergency contact numbers etc.)?**	
	1. Strains and sprains	**Treatment of Sprains and Strains:** First aid measures for a sprain or strain can best be remembered by the acronym RICE - Rest, Ice, Compression, and Elevation. ***Rest*** the injured area. Try not to move or put pressure on the affected joint. A sling or splint may be recommended to immobilize the joint and allow damaged ligaments or muscles to heal. ***Ice*** the affected area to reduce swelling. After 24 hours, either ice or heat may be applied to reduce pain.	**L**

		***C**ompress* the joint by wrapping it in an Ace bandage to help reduce swelling and pain. ***E**levate* the joint to reduce swelling.	
	2. Head Injuries	An OSHA-approved hardhat will be donned whenever there is an overhead hazard. In the event of a head injury, emergency procedures as outlined in the SSHP will be followed. Emergency contact information and a map to the hospital are included in the SSHP and will accompany the field crew at all times.	**M**
	3. Crushed and pinch fingers, hands and toes	If necessary, work gloves and steel-toed boots will be worn by the field crew. In addition, a first aid kit will accompany the field crew.	**M**
	4. Catching or snagging of fingers, loose clothing, straps, etc.	Excessively loose clothing will be avoided by the field crew. Any loose straps associated with clothing or PPE will be secured or tucked in.	**M**
	5. Electrical	Check to make sure all connections are sealed and water tight.	**L**
	6. Noise	Hearing protection must be used when conditions are over 85 dBA. This is associated with the generator noise.	**L**
	7. Struck-by hazard, run into equipment or debris	Be aware of swinging towfish as they are being deployed and retrieved and support with tie lines to prevent swaying.	**L**

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
Boat, Magnetometer, Side-Scan Sonar, Fathometer, EM Systems, Generators, Winches, equipment mounts, PPE to include gloves, work boots, eye protection, and hearing protection as necessary. Depending on condition requirements also make sure everyone has an adequate supply of water and emergency food or snacks. There should be at least one small first aid kit. Other items may include warm gloves, hats, lifejackets, flashlights. maps, compass, GPS, cell phones, survival gear, (matches/lighter, knife, emergency blanket, raingear, etc.)	At least one member onsite will hold current certification in first aid and CPR. These personnel will also be current in OSHA training in accordance with 29 CFR 1910.120 (HAZWOPER) and enrolled in a medical monitoring program in accordance with 29 CFR 1910.120(f). These personnel will receive UXO awareness as a component of their site-specific training. Team members will also have 8-hr Supervisor's Training in accordance with 29 CFR Part 1910.120(e) for Supervisors.	Workers will inspect PPE and gear before each use in accordance with the manufacturer's instructions. If equipment fails to function properly during inspection or during use, equipment is to be replace or repaired. Inspect contents of first aid kit.

	PRINT	SIGNATURE		
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UXOSO Name:	_____	_____		_____
Employee Name(s):	_____	_____	**Date/Time:**	_____
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ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)

Date: 23 April 2012

Project: Underwater Baseline Survey

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	Frequent	Likely			
Catastrophic	E	E			
Critical	E	H			
Marginal	H	M			
Negligible	M	L			

Add Identified Hazards

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	
X	• Inspection of Project Documentation, Site Conditions, Work Performance and Operations.	• Underwater MEC hazards • Uneven and/or moving working surfaces of the boat – slip, trip, fall hazards • Muscle strain carrying instruments • Heat Stress • Biological hazards – bees, wasps, mosquitoes, spiders. • Noise • Sunburn • Hazardous weather conditions	• On-site MEC Training • ROV and other equipment will be characterizing levels of underwater MEC contamination through video taping of underwater conditions. Contact with MEC items is not intended or anticipated. • Boat Operator will assure that boat is well maintained and in good condition prior to taking on passengers. • Boat Operator will assure 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 rescue hook, life preserver 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. • All personnel will wear personal flotation devices while on boat. • Good housekeeping standards will be enforced. 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 • Wear the appropriate PPE for the task being performed • Heat stress monitoring, drinking water, work-rest schedule, and cool shelter for breaks • Training in biological hazards avoidance • Use insect repellants 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 • Use sunscreen and wear cap • Ensure required site documentation is on hand	

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	
X	• Inspection of Material and Packaging of Containers	• Uneven and/or moving working surfaces of the boat – slip, trip, fall hazards • Muscle strain carrying instruments • 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 remain seated while boat is in motion. • All personnel will wear personal flotation devices while on boat. • Good housekeeping standards will be enforced. 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 • Wear the appropriate PPE for the task being performed • Use insect repellants 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	

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	
X	• Inspection of Completed Project Documentation	• Uneven and/or moving working surfaces of the boat – slip, trip, fall hazards • Muscle strain carrying instruments • 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 remain seated while boat is in motion. • All personnel will wear personal flotation devices while on boat. • Good housekeeping standards will be enforced. 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 • Wear the appropriate PPE for the task being performed • Use insect repellants 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	
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 • Training in hearing protection program	• PPE inspected daily prior to use
X	• Appropriate geophysical equipment • ROV	• 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 techniques • Training in lifting and carrying techniques • All site personnel will have current HAZWOPER training	The UXOSO will assure that all controls are being followed; all equipment is being utilized and that all personnel have received appropriate training. • Equipment inspected daily prior to use • Daily serviceability check of magnetometers
X	• Communications equipment • First aid kit • Fire extinguishers • WBGT monitor	• Emergency response procedures • Heat Stress symptoms/first aid • Site-specific flora/fauna 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): Robert O Crownover

Digitally signed by Robert Crownover
DN: cn=Robert Crownover, o=USA Environmental, Inc, ou=Safety and Quality, email=rcrownover@usatampa.com, c=US
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ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)

Date: 23 April 2012 Project: Underwater Baseline Survey

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	Frequent	Likely			
Catastrophic	E	E			
Critical	E	H			
Marginal	H	M			
Negligible	M	L			

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	
X	• Pre-snorkeling operations brief, task assignments, and check equipment.	• Uneven working surfaces – slip, trip, fall hazards • Biological hazards – hazardous marine life • Sunburn • Weather hazards	• On-site MEC Training. • Boat will be equipped with rescue equipment to handle a man-overboard situation (such as rescue hook, life preserver with 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. • 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. return to the boat to evacuate.	
X	• Locate and move boat to snorkeling area.	• Underwater MEC hazards • Weather hazards • Hazardous tides • Sunburn • Drowning • Weather hazards	• On-site MEC training • PPE – personal flotation device • Boat will be equipped with rescue equipment to handle a man-overboard situation (such as rescue hook, life preserver with rope, or similar equipment), and personnel trained in its use. • Personnel will remain seated while boat is in motion • Use sunscreen • Buddy system will be implemented • 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.	

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS
X	• Perform visual MEC survey via snorkeling operation. • Take underwater digital photographs and depth sounding with handheld equipment.	• Underwater MEC hazards • Weather hazards • Hazardous tides • Biological hazards – hazardous and venomous sea life. • Sunburn • Drowning	• On-site MEC training • Be observant while walking. • Use fins to protect feet. • Training in biological hazards avoidance • PPE – personal flotation device, snorkel, mask, fins • Use sunscreen • Buddy system will be implemented • Boat will be equipped with rescue equipment to handle a man-overboard situation (such as rescue hook, life preserver with rope, or similar equipment), and personnel trained in its use. • All personnel will be familiar with emergency signal to request assistance • 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. return to the boat to evacuate.
X	• Return to shore.	• Heat stress • Sunburn • Drowning • Weather hazards	• Be observant while walking. • Personnel will wear rubber soled shoes to prevent slipping while on boat, and will avoid stepping in wet areas that could be slippery. • PPE – personal flotation device • Use sunscreen • Boat will be equipped with rescue equipment to handle a man-overboard situation (such as rescue hook, life preserver with rope, or similar equipment), and personnel trained in its use. • 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.

Add Items

	EQUIPMENT	TRAINING	INSPECTION
X	Appropriate clothing and PPE to include personal flotation device, diving mask, snorkel, diving fins	PPE Training	PPE inspected daily prior to use
X	• Digital camera • Depth sounding equipment	• 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 • 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	UXOSO will assure that all controls are being followed; all equipment is being utilized and that all personnel have received appropriate training. • Equipment inspected daily for serviceability prior to use

ACTIVITY HAZARDS ANALYSIS

	EQUIPMENT	TRAINING	INSPECTION
X	• Communications equipment • First aid kit • Fire extinguishers Man overboard rescue equipment (hook, rope, life ring) • WBGT monitor • Weather radio	• Emergency response procedures. including distress signals • Site-specific flora/fauna to include first aid • Equipment familiarity training	• Equipment inspected daily for serviceability 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): Robert D Crownover

Digitally signed by Robert Crownover
DN: cn=Robert Crownover, o=USA Environmental, Inc, ou=Safety and Quality, email=rcrownover@usatampa.com, c=US
Date: 2012.09.06 10:35:25 -04'00'

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SUXOS Name:	_____	_____		_____
UXOSO Name:	_____	_____		_____
Employee Name(s):	_____	_____	**Date/Time:**	_____
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ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)

Date: 23 April 2012 Project: Underwater Baseline Survey

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	Frequent	Likely			
Catastrophic	E	E			
Critical	E	H			
Marginal	H	M			
Negligible	M	L			

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	
X	• Identify the hazards associated with vehicle operations • Inspect vehicle	• Potential for vehicle accidents during field operations	• Daily vehicle inspections will be performed to ensure a safe operating vehicle • Must have a valid driver's license. • Fire extinguisher and first aid kit must be with vehicle.	
X	• Drive to destination	• Potential for vehicle accidents during field operations • Fire hazards • Be aware of animals in the road way	• Always wear a seat belt • Use a ground guide when reversing and/or as needed • 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 • Assure vehicle is chocked while loading/unloading cargo • Must have a valid driver's license. • Fire extinguisher and first aid kit must be with vehicle. • No passengers will be transported in back of a pick-up truck. passengers will be in a seat with a seat-belt in use during vehicle operation. • No smoking is permitted in vehicles	
X				

Add Items

EQUIPMENT	TRAINING	INSPECTION

ACTIVITY HAZARDS ANALYSIS

	EQUIPMENT	TRAINING	INSPECTION
X	• Vehicles • Chocks • Blocking and bracing equipment	• 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 • Vehicle familiarity	UXOSO will assure that all controls are being followed; all equipment is being utilized and that all personnel have received appropriate training. • Vehicle inspected daily prior to use • Equipment inspected daily prior to use
X	• First Aid Kit • Fire Extinguisher • Communication equipment	• Emergency procedures training • Fire extinguisher training	• Communications equipment checked daily prior to use • First aid kits checked daily and inspected weekly • Fire extinguishers checked daily and inspected weekly
X			

Involved Personnel:

Acceptance Authority (digital signature): Robert D Crownover

Digitally signed by Robert Crownover
DN: cn=Robert Crownover, o=USA Environmental, Inc, ou=Safety and Quality, email=rcrownover@usatampa.com, c=US
Date: 2012.09.06 10:32:45 -04'00'

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UXOSO Name:	_____	_____		_____
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APPENDIX D, ATTACHMENT 3.
HOSPITAL INFORMATION

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HOSPITAL INFORMATION

All site personnel will be briefed on this information prior to the commencement of operations.

The following are the identification and location of the Medical Treatment Facility for this project.

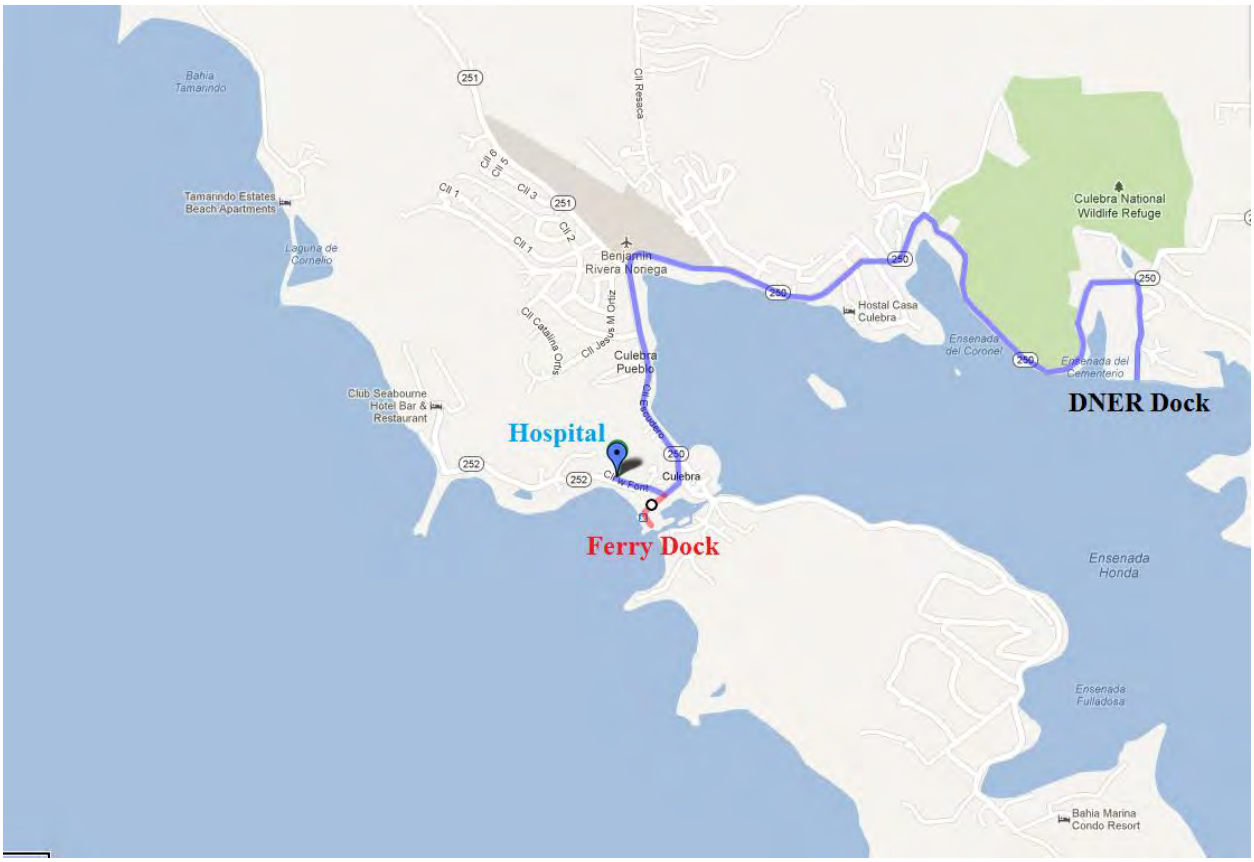

Figure 1: Medical Facilities Location

- **Criteria for Alerting the Local Community Responders**

In the event of an on-site emergency, the individual team leader or first person aware of the emergency will contact the UXOSO by cell phone, field radio, or in person, as circumstances allow. The UXOSO will normally be responsible for summoning emergency medical services. If the order is given to evacuate the site of all personnel, each on-site team leader will assemble, account for, and evacuate all team personnel to the pre-designated staging area in the support zone. The First Responders shall render emergency first aid treatment and the UXOSO will authorize site personnel to assist, where required. The UXOSO will determine the need for professional medical attention and summon an ambulance or AEROMED flight if necessary, to transport injured personnel for further medical treatment at the medical treatment facility.

- **Directions to Medical Treatment Facility:**

Directions to the medical treatment facility from Flamenco Beach in Culebra: Drive Southeast on Highway 251 road from Flamenco Beach or the unnamed resort, to the City of Dewey. Pass the Airport on your left. Continue along the bay until you approach the first major intersection. Turn right at the first intersection on Highway 250. Travel towards the Ferry Dock. (Follow the signs for the hospital.) Turn right on the road to Melonea. The hospital will be on the right side of the road.

Directions to the medical treatment facility from Culebrita: For any accident or medical emergency while on the Isle of Culebrita, Sea Ventures (the commercial water transport company) will return to Culebra. The vessel will dock at the public docks near the Plaza in the City of Dewey. Drive from the parking area near the public dock and turn on the unnamed major road in the city going toward the bay. (Follow the signs for the hospital.) Turn left on the road to Melonea. The road to the hospital will be on the right side of the road.

Table 1: Emergency Phone Numbers

Culebra Health Clinic	787-742-3511
AEROMED Medical Evac.	787-756-3480 (Evac to Medical Facilities)
Fire Department	787-742-3530
Police Department	787-742-3501
Poison Control Center	800-552-6337
USA Occupational Physician (California)	831-647-8700

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APPENDIX D, ATTACHMENT 4.
SITE SAFETY AND HEALTH PLAN

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SITE SAFETY AND HEALTH PLAN

Plan approval:

Cheryl M. Riordan _____ Date: Sept 6, 2012

Cheryl M. Riordan
Certified Safety Professional
USA Environmental, Inc.
(813) 343-6412

Plan concurrence:

James Walden _____ Date: Sep 6, 2012

James Walden
UXO Safety Manager
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(813) 343-6374

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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 Environmental Baseline Survey on Culebra, Puerto Rico. The purpose of the project is to perform an in-depth study to gather the necessary data to determine the underwater habitat within the Culebra Island Munitions Response Sites (MRSs) 09 and 13 (water areas).

1.1 SITE DESCRIPTION

The sites involve former range areas in the waters around Culebra Island. Project location is Culebra Island (MRSs 09 and 13), approximately 17 miles east of the main island of Puerto Rico and also includes surrounding islands Cayo Luis Peña (MRS 13), located approximately three-quarter mile off the western coast of Culebra Island and Soldado Point (MRS 09), located approximately on the southern peninsula of Culebra Island.

The objective of this project is to document, in the form of a Baseline Survey Report (BSR), the various underwater biological habitats that reside within the water portions of MRSs 09 and 13. The BSR will be utilized by project stakeholders to establish the parameters for conducting subsequent RI/FS field activities (Underwater Surveys and Intrusive Investigations) within MRSs 09 and 13.

1.2 CONTAMINANT CHARACTERISTICS

The munitions of concern are listed in Table 1-1.

Table 1-1: Munitions of Concern

Site	MEC
MRS 13	75mm MKI and HE projectiles; 37mm projectiles; 5-inch HVAR MKI; 5-inch MK41
MRS 09	5-inch battery rounds; 30-lb bombs; 100 pound AN-M30A1 HE bombs; 81mm mortars; 3-inch Common MK3 Mod 7; 37mm MKII; small arms ammunition

2.0 HEALTH AND SAFETY HAZARD ASSESSMENT

An Activity Hazard Analysis (AHA) has been conducted and documented for each activity warranted by the hazards associated with the activity (see Attachment 2 for the site-specific AHAs). The following AHAs have been prepared for all anticipated field operations:

- Boat Operations
- Boat Transportation
- Equipment Check
- Bathymetric & Geophysical Operation
- Quality Control
- Snorkeling 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 Safety Officer (UXOSO). Control measures will be developed and coordinated by USA safety personnel. All site personnel are responsible for continuous assessment of variable hazards and the implementation of risk controls.

2.1 HAZARD MITIGATION

The hazards listed in the AHAs above will be addressed through a combination of training, engineering controls, and personal protective equipment (PPE).

2.1.1 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 munitions and explosives of concern (MEC) or MEC pieces that could be hazardous will be given to all site workers. When MEC or pieces of MEC are encountered, site personnel will contact a UXO-qualified person to handle the situation.

2.1.2 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, hearing protection (as required), leather or canvas work gloves, and rubber-soled footwear. The hearing protection will be worn only in if the noise from the boat's motor 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 Corporate Safety and Health Manager (CSHM), 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 CSHM. 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.

2.1.3 WORK STOPPAGE

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 UXOSO will be notified and will evaluate the situation. The UXOSO will, in consultation with the Corporate Safety and Health Manager, determine what steps need to be taken to make the situation safe for operations to continue.

2.1.4 EMERGENCY EVACUATION

In the event of an emergency that requires evacuation of the site, verbal instruction or one blast of a horn will be given by the UXOSO to evacuate the area. Personnel will assemble in the boat, and the boat will head for the dock. After evacuation, the UXOSO will account for all personnel, ascertain information about the emergency, and advise responding on-site personnel. The 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 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 UXOSO.

2.1.5 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 and will immediately inform a UXO-qualified USA worker, who will then handle the situation. If unauthorized personnel are observed in the work area, all operations will cease until the area is cleared of unauthorized personnel.

3.0 SAFETY STAFF

See Section D.8 of the Accident Prevention Plan.

4.0 HEALTH AND SAFETY STAFF ORGANIZATION AND RESPONSIBILITIES

See Section D.8 of the Accident Prevention Plan

5.0 SITE-SPECIFIC TRAINING

See Section D.10 of the Accident Prevention Plan.

6.0 SITE-SPECIFIC MEDICAL SURVEILLANCE

Medical surveillance of USA 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 USA personnel on the project site will participate in the USA 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 Project Manager, in conjunction with the CSHM, will ensure that all health assessments address the site-specific health hazards to which workers may be exposed.

Physicals will be scheduled through the CSHM, 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.

Contractors 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.

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 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 USA 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

USA will have a 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 UXOSO will be contacted whenever an incident occurs. He 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 UXOSO will summon the ambulance to 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 at Attachment C. The map and directions, as well as the emergency telephone numbers, will be kept in each site vehicle. Emergency equipment will also be kept in each site vehicle, 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, USA maintains a policy of providing these employees with restricted duty assignments whenever possible to allow them to continue to be productive.

6.7 RECORDKEEPING

USA will retain and maintain copies of all physician statements, exposure records, and associated information for USA 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 USA at the Corporate Office located in Oldsmar, Florida. Examining physicians will be responsible for maintaining records related to laboratory analyses and other tests for each USA employee examined. All records, whether maintained by USA or by the examining physician, will be kept on file for a period of 30 years beyond an employee's termination.

7.0 PERSONAL PROTECTIVE EQUIPMENT

The Personal Protective Equipment Program for USA is described in the Personal Protective Equipment section of the Accident Prevention Plan (APP). Because of the expected hazards at these sites during most operations, Level D PPE will be required. Level D PPE is a work uniform affording minimal protection, used for nuisance contamination only. The following Level D equipment will be required on this site:

- Cap for protection from the sun
- Leather or canvas work gloves
- Safety glasses with side shields or safety goggles
- Hearing protection (as required by high noise levels, if the boat motor noise reaches hazardous levels)

- Rubber-soled footwear to prevent slipping while on boat
- Cotton work clothes
- Chemical-resistant gloves (as required when working around equipment fueling operations or while handling other types of chemicals)
- Personal flotation devices, while on boat
- Back supports (optional).

8.0 MONITORING AND SAMPLING PLANS

Chemical 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. 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.

8.1 HEAT STRESS MONITORING

Heat stress monitoring will be conducted using Wet Bulb Globe Temperature (WBGT) readings and/or additional methods (pulse method, oral temperature method, or water weight loss method) as required as soon as the temperature reaches 75 ºF or higher. Work/rest cycles will be implemented based on the requirements of the APP. Monitoring will be performed by the UXOSO and the results will be documented. Plenty of drinking water will be made available on the site to maintain hydration of site personnel. Balanced electrolyte drinks may also be provided to help replace the chemicals the body loses through sweating. If balanced electrolyte drinks are provided on site, it is recommended that workers drink water to the balanced electrolyte drink at a ratio of 2:1 (two drinks of cold water to each drink of balanced electrolyte drink).

8.2 METEOROLOGICAL MONITORING

Rain can constitute a safety hazard to field operations at this site. The UXOSO will be responsible for monitoring the weather closely. If the 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 monitor 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 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 back to the docking area for shelter until the storm has passed and the UXOSO has determined it is safe to resume operations. PERIMETER MONITORING

No perimeter monitoring of USA operations will be required on this site.

9.0 HEALTH AND SAFETY WORK PRECAUTIONS AND PROCEDURES

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 physical characteristics of each site, including wind direction, site access, and the location of communication devices and safety/emergency equipment.
- Site personnel are to report any other unusual or potentially hazardous condition to the 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 Corporate Safety and Health Manager 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.
- Eating, drinking, smoking, chewing gum, tobacco, or any other hand-to-face activities are prohibited on site, except in designated areas after both face and hands have been washed.
- When required to sit or kneel on the ground, avoid contaminated surfaces.
- Placing equipment on contaminated surfaces should be avoided.
- Climbing on or over obstacles is prohibited. Stacks of materials can be unstable and could cause injury.
- Open flames of any type are prohibited on site.
- Bringing defective or unsafe equipment on site is prohibited.

Only authorized employees may enter the work site. Visitors must check in with the UXOSO, receive an appropriate safety briefing, and be escorted by the UXOSO at all times while on site.

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, USA does not anticipate work permits for the work associated with this project. Under the Performance Work Statement (PWS) and activities anticipated for this project, 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.

9.4 SPILL CONTAINMENT

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.

9.5 DRUM, CONTAINER, AND TANK HANDLING

Drum, container, and tank handling are not anticipated under this SOW.

9.6 COMPREHENSIVE ACTIVITY HAZARD ANALYSIS OF TREATMENT TECHNOLOGIES

Treatment technologies are not expected to be used on this project.

9.7 MATERIAL SAFETY DATA SHEETS

The Material Safety Data Sheets are located in Attachment 6.

9.8 SUBCONTRACTOR CONTROL

See the "Subcontractors and Suppliers" section of the Accident Prevention Plan.

9.9 BOATING SAFETY

A Boat Operator will be the USA subcontractor for boat transportation for this project work. This company and its boats are registered in Puerto Rico. They have experienced Captains, familiar with the waters throughout Puerto Rico. The Boat Operator will be taking the USA Project Team to remote island sites and off-shore sites for the performance of this Environmental Baseline Survey.

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 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 Coast Guard and the Hospital will be available with each radio and cell phone.

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 USA personnel are all trained in the use of fire extinguishers to put out fires in the incipient stages. The boat is also equipped with a First Aid kit. USA 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 for the duration of time on the boat. 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.

9.9.1 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 have a boat for their multi-beam bathymetry and side scan sonar operations.

9.9.2 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. Contact with MEC items is not intended or anticipated.
- Personnel will remain seated while boat is in motion.
- All personnel will wear personal flotation devices while on boat.
- 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.

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 entering the work area of this project site. Authorized Government personnel will undergo the mobilization training, along with all USA personnel and any subcontractors who may be required to work on this site, 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 UXOSO during the Tailgate Safety Briefing to inform the workers of the location of hazardous areas on the site, the assembly areas 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 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 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 Underwater Baseline Survey is to 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 USA 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:

- Potential chemical, biological, physical or explosive hazards
- Expected weather conditions
- Planned site activities.

The degree of site access control will include the following.

- Controlled site ingress/egress points – Work area is marked by warning signs on buoys, advising vessels of explosive hazards and warning them not to enter. These will be clearly visible to anyone approaching the site and vice versa. Worker/visitor registration – All personnel working on the site sign in daily at the time of their daily safety briefing in the morning. All visitors to the site must sign the visitor log when they report to the site for their visitor briefing.
- Escort of visitors – All visitors to the site will be escorted by the UXOSO. 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 be conducted by voice, hand signals and/or radio. If off-site communication is required, it will be established through the use of Puerto Rican cellular telephones and radio.

11.0 PERSONNEL HYGIENE AND DECONTAMINATION FACILITIES AND PROCEDURES

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. 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. In particular:

- Hand and face washing facilities will be set up at the USA work site and will be utilized by all personnel prior to eating, drinking, tobacco use, or 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.

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 FACILITIES AND PROCEDURES

Because chemical contamination is not anticipated at this site, basic washing of equipment is all that will be required.

13.0 ON-SITE FIRST AID AND EMERGENCY PROCEDURES AND EQUIPMENT

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. First aid kits are assigned by the Safety Office and approved by the Occupational Health Physician. The UXOSO will be charged with providing regular inspections of the emergency supplies, replacing any items that are used, and maintaining readiness.

A 5-lb ABC fire extinguisher will be kept in each site vehicle for emergency use on site. 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 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 PLAN 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 “Emergency Response Plan and Contingency Procedures” under the “Plans, Programs and Procedures” section of the APP.

15.0 EVACUATION PLAN

In the event of an emergency requiring evacuation, the evacuation signal will be given as an alarm or through verbal instructions or a single blow of a horn. Personnel will assemble in the boat. The UXOSO will account for all personnel and the boat will go to the docking area. The UXOSO will summon emergency response personnel, if required.

Potentially hazardous weather conditions will be closely monitored by the UXOSO. The 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 UXOSO.

After the emergency situation has been controlled and eliminated, or has passed the Project Manager, UXOSO, and CSHM will review the way the emergency was handled and change procedures if necessary.

16.0 LOGS, REPORTS, AND RECORDKEEPING

See the "Logs, Reports, and Recordkeeping" section of the APP.

17.0 ON-SITE WORK PLANS

The approved Work Plans will be maintained on site by the SUXOS, UXOSO, and UXOQCS, which include the APP/SSHP, the Explosives Safety Submission, Snorkeling Plan and the Quality Control Plan. These plans will be fully implemented for the duration of site operations. If new hazards are encountered that are not fully addressed within these documents, the documents will be amended in accordance to the requirements of DoD 6055.9 and will be sent for approval through the same appropriate channels that approved the original plans.

18.0 COMMUNICATION PROCEDURES

On-site communication will generally be verbal, as most personnel will be working on the boat. There may also be an alarm signal used to summon snorkelers to the boat for the purposes of site evacuation.

Off-site communication will be by Puerto Rican cellular telephone and radio. Cellular telephones from the U.S. mainland will not work here.

19.0 SPILL CONTAINMENT PROCEDURES

Small-quantity containers of chemicals will be used at the work sites, which will minimize the amount of hazardous materials that could potentially become part of a spill should an accident occur. The majority of chemicals used will include fuels and lubricants for use in equipment. Spill cleanup kits will be available for use to clean up these chemicals in the event a spill occurs. Chemical-resistant gloves will be used during all cleanup activities. The spilled chemical and the contaminated soil will be cleaned up, placed in labeled plastic bags, and stored in containers until such time as they can be sent to a certified disposal facility.

20.0 CONFINED SPACE PROCEDURES

Because of the nature of this SOW, confined spaces are not expected to be an issue on these sites.

21.0 FIRE PROTECTION REQUIREMENTS

Through appropriate use and storage of flammable products, USA intends to prevent fires as much as feasible during operations on this site. Should a fire occur, all site teams will have at least one ABC fire extinguisher with them during the course of operations. Fire extinguishers are the first line of defense should a fire start. USA personnel will be trained in the use of fire extinguishers and they will be instructed to try to fight a fire only in the incipient stages. The Coast Guard will be summoned, should assistance be needed in the event of a fire.

After the fire has been extinguished, the area will be closely monitored by the UXOSO for a period of at least 1 hour for a small fire, to ensure that re-ignition does not occur.

22.0 INCIDENT REPORTING REQUIREMENTS

Should an accident or mishap occur on the site, regardless of the severity, it will be fully investigated by USA and all reports and records will be documented on the USA Accident Report Form. Copies will be maintained on site for the duration of site activities. A permanent copy will be maintained in the USA-Oldsmar Office. Accidents/incidents shall be reported in accordance with EM 385-1-1. All accident/incident reports will be reviewed by the CSHM to ensure all root causes of the accident/incident have been adequately addressed in order to prevent future recurrences on this or any other project sites.

The Site Manager will notify the USACE technical representative immediately and fill out and submit the ENG Form 3394 form to the Contracting Officer or designated representative for review within one working day after the event.

Any accident involving a fatality or three or more hospitalizations from the same incident will be reported telephonically to the nearest OSHA Area office within 24 hours by the CSHM. If all information is not known at that time, an initial report will be made and a follow-up report will be submitted after all of the facts are documented.

APPENDIX D, ATTACHMENT 5.
USA'S DRUG FREE WORK PLACE PROGRAM

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DRUG FREE WORK PLACE PROGRAM

January 01, 2012

The USA ENVIRONMENTAL, INC. program is an extension of our work safety and employee health programs. The program requires refraining from substance abuse both on and *off* the job as a condition of continued employment.

WHAT IS SUBSTANCE ABUSE?

Federal Acquisition Regulation Clause 23.500 defines substance abuse as the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance in the workplace. USA ENVIRONMENTAL INC.'s program further expands that definition as follows: Substance abuse includes but is not limited to the consumption, by any means, of any legal or illegal substance that alters an individual's normal behavior and results in intoxication and/or renders the employee incapable of safe/efficient job performance. Substance abuse also includes over use or abuse of legally prescribed drugs. Also prohibited are the use of, selling, trading, giving away, possession or offering for sale illegal drugs, prescription drugs, or alcohol whether on company property, while operating a company vehicle or company-leased vehicle (on or off company property and during working or non-working hours), or operating a personal vehicle while on company business.

USA ENVIRONMENTAL SUBSTANCE ABUSE TESTING PROGRAM

The substance abuse program includes substance abuse testing under the following situations:

1. Pre-employment testing.
2. Testing for reasonable suspicion of substance abuse.
3. Testing following on-the-job accidents.
4. Testing as part of all "fitness for duty" medical examinations.
5. Quarterly testing for a period of 2 years after program completion for all employees participating in a substance abuse rehabilitation program.
6. Random testing of employees to promote abstinence.
7. Testing following a 30-day or greater layoff or return to work following a leave of absence or termination.

A urine, saliva or blood specimen will be analyzed for the presence of any of the following substances:

1. Marijuana - Cannabinoids, THC
2. Cocaine
3. Methadone - Dolophine, Methadose
4. Barbiturates - Nembutal, Tuinal, Seconal, etc.
5. Amphetamines - Desoxyn, Biphetamine, Dexedrine, etc.
6. Methaqualone - Qualudes
7. Opiates - Codeine, Percodan, Paregoric, Morphine, etc
8. Propoxyphene - Darvon, Dolene, etc.
9. Phencyclidine - (PCP)
10. Benzodiazepines - Librium, Valium, Xanax, Serax, Halcion, etc.

(Alcohol as required through breathalyzer or other testing means – Ethyl Alcohol as a beverage or as part of a medication)

A list of the most common drugs or medication by brand name, common name, as well as chemical name, which may alter or affect a drug test will be provided to all job applicants and employees at the time of testing.

A form is provided for employees or job applicants to report, voluntarily and confidentially, the use of prescription or non-prescription medications both before and after being tested.

Specific confirmation testing will be performed for all positive screening test results. Employees testing positive for prescription drugs that are commonly abused must produce evidence from their attending physician to justify the treatment necessity for use of the drug(s).

USA ENVIRONMENTAL, INC. is responsible for testing costs, except for test costs incurred by the employee or job applicant challenging test results.

RANDOM TESTING

Unless prohibited by law, USA ENVIRONMENTAL, INC. reserves the right to randomly test its employees for substance abuse. The number of personnel tested and the frequency of tests will be solely at the discretion of USA ENVIRONMENTAL, INC. or as contractually specified by USA ENVIRONMENTAL INC.'s clients.

REASONABLE SUSPICION TESTING

Employees reporting to work or a USA ENVIRONMENTAL, INC. job site who demonstrate impaired conduct will be interviewed by two (2) supervisors or managers to determine the cause of the irregular behavior.

If both supervisors conclude that the irregular behavior is unsafe the employee will not be allowed to continue working and will be transported home or to a medical facility. The employee will not be allowed to drive any motor vehicle. If a medical problem is not the cause, the employee may be tested for substance abuse. The employee may also be tested for substance abuse regardless of the cause of irregular behavior.

Reasonable suspicion testing shall also be conducted when there is:

1. An independently corroborated report of observed substance abuse.
2. Evidence that an individual tampered with a drug test during his or her employment with USA ENVIRONMENTAL, INC.
3. Information that an employee caused or contributed to an accident while at work.
4. Evidence that an employee has used, possessed, sold, solicited, or transferred drugs while working on USA ENVRIONMENTAL, INC. premises or while operating vehicles, machinery or equipment belonging to USA ENVIRONMENTAL, INC.

Supervisors will complete an incident report for observed irregular conduct, documenting their observations and the results of the employee interview. Final disposition of the incident will be documented with signatures and the dates listed by both supervisors.

A copy of the supervisor's report will be provided to the employee with appropriate employee's signature of receipt.

This confidential Incident Report will be retained by USA ENVIRONMENTAL, INC. for a period of at least one (1) year.

CONSEQUENCES OF POSITIVE TEST OR TEST REFUSAL
Refusal or failure to submit to testing or positive test results following an on-the-job injury disqualifies an employee from Workers' Compensation benefits.

Testing positive for abused substances will eliminate applicants from employment consideration.

Any employee may be terminated from employment for a positive test result. Refusal or failure to submit to testing following an on-the-job accident or random test will result in termination of employment.

Any employee who is given a "second chance" must seek treatment. Time away from work for treatment will be in a leave without pay status. The USA ENVIRONMENTAL, INC. Employee Assistance Program (EAP) will coordinate the employee's treatment plan. If the employee is enrolled in the employee health benefit plan or another medical plan, it may provide benefits to help pay for this treatment.

A second positive test for abused substances will result in termination.

OTHER GROUNDS FOR TERMINATION
An employee bringing onto the USA ENVIRONMENTAL, INC. premises or job sites; having possession of; being under the influence of; possessing in the employee's body, blood or urine (at levels exceeding or equal to established cut-off levels, 38F-9.007 (4)); or using, consuming, transporting, selling, attempting to sell, or giving away any illegal drugs (including prescription drugs illegally obtained or prescribed for the individual only), or alcohol, at any time, is guilty of misconduct and is subject to discipline to include discharge, suspension without pay or other actions even for a first offense. USA ENVIRONMENTAL, INC. reserves the right to inspect the property and person of individuals suspected of illegal drug or alcohol possession while on company property or at company job sites (see Right to Inspect).

CHALLENGING TEST RESULTS
An employee may challenge a confirmed positive test by submitting an explanation in writing to the Human Resources Department concerning personal circumstances that might have affected test results. This challenge must be submitted within 5 working days following the employee's notification of a confirmed positive test result. The donor of a tested specimen will be responsible for providing all necessary documentation, i.e., a doctor's report, signed prescription or current prescription container with relevant information and other related supporting documents.

USA ENVIRONMENTAL, INC. will, within 15 days of receipt of the employee's written explanation or challenge of positive test results, provide a written explanation to the employee

as to whether, and if so, why, the employee's explanation is unsatisfactory, along with a copy of the positive test results.

The employee or job applicant desiring to challenge a test result will be responsible for notifying the original testing laboratory of an alternate HRS licensed laboratory, for the purpose of transferring, under Chain of Custody, a portion of the employee's or job applicant's specimen for re-testing. The employee may have a portion of their original specimen re-tested during a period of 180 days following written notice of a positive test result. When an employee undertakes a challenge to the result of a test, it shall be the employee's responsibility to notify the laboratory and the sample shall be retained by the laboratory until the matter is settled. Retesting will be at the employee's expense.

In the case of a denial of a workers' compensation claim, an employee may undertake an administrative challenge by filing a claim for benefits with a judge of compensation claims, concerning workplace injury. Other challenges not involving workplace injuries must challenge a test result in a court of competent jurisdiction.

Employees or job applicants may call the testing laboratory for technical information regarding prescription or non-prescription medications that may affect test results.

Employees and job applicants may report, in confidence, to their manager or Human Resources Director, the use of prescription or non-prescription medications that may affect job performance or testing results, either before or after testing.

Job applicants or employees whose drug test results are confirmed positive shall not by virtue of the result alone, be defined as having a "disability" under the Americans with Disabilities Act.

GETTING HELP
Employees who require a treatment program will be referred to USA ENVIRONMENTAL, INC.'s Employee Assistance Program (EAP).

Employees may inspect this program file and/or receive more information on the program on a confidential basis, in the USA ENVIRONMENTAL, INC. Human Resources Office, during normal hours of operation.

REQUIREMENT TO NOTIFY USA OF A CONVICTION
Any employee convicted of a criminal drug statute violation must notify USA ENVIRONMENTAL, INC., Attention: Human Resources Department, within 5 calendar days of the conviction. This notification must be in writing.

CONFIDENTIALITY OF INFORMATION
All drug test information, reasonable suspicion reports, or other related information concerning an employee or applicant will remain confidential and will not be disclosed except under conditions required by law.

Release of such information under any circumstances, other than those required by law, will be

solely pursuant to a written consent voluntarily signed by the person tested. The consent duration and precise information to be disclosed will be stated.

GOVERNMENTAL COMPLIANCE

The Drug Free Work Place Program is implemented pursuant to the requirements of Florida Statute 440.102 and Administrative Rules 38F-9-001 through 38F-9.014 of the Florida Department of Labor and Employment Security, Division of Workers' Compensation, and 48 CFR 23.500 (Federal Acquisition Regulation 23.500). Laws may be amended at project sites in other states due to those states' requirements.

Robin Miller
Human Resources Director

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APPENDIX D, ATTACHMENT 6.
MATERIAL SAFETY DATA SHEETS

This attachment contains the following MSDSs applicable to this site:

- Diesel Fuel #2
- Hydraulic Fluid
- Unleaded Gas.

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The Valvoline Company

Date Prepared: 05/12/03

MSDS No: 999.0013902-009.001I

DIESEL FUEL #2

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1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Material Identity
Product Name: DIESEL FUEL #2
General or Generic ID: HYDROCARBON

Company	Telephone Numbers	
The Valvoline Company P.O. Box 14000 Lexington, KY 40512	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.

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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 containers to explode.

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, CO_2, 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.

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.

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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

*** MATERIAL SAFETY DATA ***

PRIMARY APPLICATION- MOTOR FUEL

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

2. COMPOSITION / INFORMATION ON INGREDIENTS

EXPOSURE GUIDELINES

COMPONENT/CAS NO.	LO%	HI%	OSHA TWA	OSHA STEL	ACGIH TWA	ACGIH STEL	TWA	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

MSDS
UNLEADED GASOLINE

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

MSDS
UNLEADED GASOLINE

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
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

- 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

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.

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APPENDIX D, ATTACHMENT 7.
HAZARD CONTROL PLAN

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APPENDIX D - ATTACHMENT 7: HAZARD CONTROL PLAN

HAZARD-BASED HAZARD CONTROL PLAN, OPERATION WORK PLAN (OWP)

D7.0 ENVIRONMENTAL BASELINE SURVEY, CULEBRA ISLAND SITE, PUERTO RICO

D7.1 POINT OF CONTACT

Robert Crownover, Corporate Safety and Health Manager, (813) 343-6364

D7.2 DEFINITION OF WORK

USA shall provide the necessary personnel and equipment to perform the Environmental Baseline Survey. All MEC encountered will be accounted for to include identification, condition, depth, and location.

D7.3 IDENTIFICATION OF PRINCIPAL HAZARDS

- Munitions and Explosives of Concern
- Underwater Operations
- Vehicle Operations

D7.4 RISK EVALUATION

MEC is a safety hazard and may constitute an imminent and substantial endangerment to site personnel. During this Environmental Baseline Survey, it is the Government's intent that USA will not have direct contact with MEC/UXO encountered on site and that USA work is to be performed in accordance with the Comprehensive Environment Response, Compensation, and Liability Act (CERCLA), Section 104 and the National Contingency Plan (NCP), Sections 300.120(d) and 300.400(e).

D7.4.1 BASIS OF EVALUATION

- Exposure to hazards associated with MEC. These items, if moved or handled improperly, could detonate, either killing or seriously injuring personnel at the work site. Work on this site will involve MEC avoidance.
- Transportation hazards inherent in the driving of vehicles.
- Hazards associated with the snorkeling operations**.**

Initial Risk without Controls (Check One) ☐ High ☐ Medium ☒ Low ☐ Minimal

Note: High or medium risks require risk analysis.

Residual Risk with Controls (Check One) ☐ High ☐ Medium ☐ Low ☒ Minimal

Reviewed by USA Environmental Safety and Health Point of Contact:

Robert Crownover, CSHM _____ **on** _____
Name **Date**

Approved By: USA Environmental Certified Safety Professional

Cheryl Riordan, CSP _____ **on** _____
Name **Date**

D7.5 AUTHORIZATION RESPONSIBILITY

Work Authorization			Worker Authorization	
	Initial Risk	**Residual Risk**		**Residual Risk**
Minimal	No Review	Supervisor Approval	**Minimal**	Supervisor
Low	S & H Consultation	Corporate Safety Approval	**Low**	Corporate Safety Approval
Medium	S & H Concurrence	CSP Approval	**Medium**	CSP Approval
High	S & H/Peer concurrence	Will Not Be Approved. Full Review Required.	**High**	Worker Will Not Be Approved

D7.6 HAZARD CONTROL

This portion of the Hazard Control Plan (HCP), when approved, defines the manner in which each hazard will be controlled to an acceptable level, thus certifying the adequacy of the controls. The hierarchy of controls [engineering, administrative, and personal protective equipment (PPE) as a last resort] has been utilized in identifying and employing control systems.

TABLE 7-1: MEC/UXO LOCATION AND IDENTIFICATION

Task	Hazard Scenario	Hazard Control
MEC/UXO Location	Improper handling of MEC/UXO during environmental baseline survey of project area.	Training and supervision of personnel. This is a MEC/UXO avoidance project site. Direct contact with MEC/UXO will not occur. Most operations will be performed remotely from the boat using an ROV and other underwater equipment to characterize the site. UXO-qualified personnel will maneuver equipment from the boat while watching a video feed, so that MEC/UXO on the ocean floor is not disturbed by the equipment. There will be some snorkeling operations for taking underwater photographs and depth sounding that will not involve disturbing MEC/UXO on the ocean floor.

TABLE 7-2: UNDERWATER OPERATIONS

Task	Hazard Scenario	Hazard Control
Underwater Operations	Contact with MEC/UXO, drowning, contact with hazardous marine life	Only UXO-qualified personnel will perform snorkeling operations for locating and identifying MEC/UXO through photographs and depth sounding. MEC/UXO will not be moved or handled. Buddy system will be implemented. If hazardous marine life is observed from snorkelers or from personnel operating from the boat, snorkeling operations will cease and personnel will return to the boat. Rescue and communication equipment are available from the boat. Personnel will be trained to recognize hazardous marine life and to perform rescue operations. PPE for the task performed will be worn. Other underwater operations will be performed remotely with personnel monitoring underwater instrument operations from the boat on the surface.

TABLE 7-3: VEHICLE OPERATIONS

Task	Hazard Scenario	Hazard Control
Operation of vehicles	Vehicle accident, fire	All personnel operating vehicles will have current driver's license from their state of residence, All vehicles will be inspected daily to assure they will be in optimum condition for driving, All passengers will be in a seat with seatbelt fastened while vehicle is in motion. All vehicles will be equipped with a fire extinguisher, first aid kit and communication equipment.

D7.7 PERFORMING THE WORK SAFELY

Fill out each section below. If a section is not applicable to your project, type in "NA."

D7.7.1 TRAINING REQUIREMENTS

Individual training records and certifications are maintained on the project site for review and inspection:

- 40-hour HAZWOPER training.
- 8-hour HAZWOPER refresher training, as required annually.
- 8-hour Supervisor's training (UXO Technicians III and above), as required annually.
- EOD/UXO training and certification for UXO personnel.
- MEC/UXO identification, hazards, and precautions.
- First Aid and CPR training for selected personnel (two, minimum) who remain on site during operations.
- Equipment specific training and certification.

D7.7.2 APPLICABLE INSTITUTIONAL REQUIREMENTS

N/A

D7.7.3 OPERATING PROCEDURES

See Standard Operating Procedures (SOPs) for the following:

- Snorkeling Operations
- Avoidance Procedures of MEC/UXO

D7.7.4 WASTE INFORMATION

Consult with the USA Project Manager for proper evaluation and/or disposal of waste if generated by USA personnel or operations.

D7.7.5 EMERGENCY PROCEDURES

In the event of an emergency (injury or illness), refer to the procedures and contacts listed in the APP/SSHP and Attachment 3 for the specific medical treatment facility for the project.

D7.7.6 NATIONAL ENVIRONMENTAL POLICY ACT (NEPA)/ESH IDENTIFICATION (ID)

Not required for this project.

D7.7.7 NEPA TRACKING NUMBER:

Not required for this project.

D7.7.8 ESH ID TRACKING NUMBER:

Not required for this project.

D7.7.9 SAMPLING RESULTS (DATA)

None required at this time.

D7.7.10 REQUIRED PERMITS

None required for this project.

D7.7.11 STEPS FOR SAFE SHUTDOWN

None required for this project.

D7.8 REVIEW AND IMPROVEMENT

The review cycle for this HCP is one year. At the end of a year, the system will be evaluated for changes in the SOW, the potential hazards, or other conditions that might warrant revision of the HCP system. Any significant modifications that impact the safety envelope of the activity at any time require updating the HCP and reauthorization.

Change control of this document is accomplished by retaining the master HCP document at USA Environmental, Inc.

End of Document

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APPENDIX E. RESERVED

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APPENDIX F. FORMS

This appendix contains the following project forms:

- Accident Investigation Report (ENG Form 3394)
- Accident Investigation Instructions (ENG Form 3394)
- Accident/Illness/Near Miss Report
- Daily Quality Control Report
- Daily Site Report
- Demobilization Prep Initial and Followup
- Heat Stress Alert
- Heat Stress Monitoring Log
- Hydrographic Survey MBS Prep Initial and Followup
- Hydrographic Survey SSS Prep Initial and Followup
- Mobilization and Site Training Prep Initial and Followup
- Personnel Qualification Verification Form
- Project Reporting and Submittals Prep Initial and Followup
- Record of Safety Violation or Non-Compliance
- Safety Inspection Report
- Safety Meeting/Training Record
- Site Visitor Log
- Tailgate Safety Briefing
- Underwater Visual Investigation Prep Initial and Followup
- Work and Staging Areas Prep Initial and Followup.

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(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
☐ ON DUTY ☐ TDY
☐ OFF DUTY

h. EMPLOYMENT STATUS AT TIME OF ACCIDENT
☐ 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 _____
☐ CIVIL WORKS ☐ MILITARY
☐ OTHER *(Specify)* _____

f. TYPE OF CONTRACT
☐ CONSTRUCTION ☐ SERVICE
☐ A/E ☐ DREDGE
☐ OTHER *(Specify)* _____

g. HAZARDOUS/TOXIC WASTE ACTIVITY
☐ 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
PRIMARY _____ (CODE) #
SECONDARY _____ (CODE) #

f. NATURE OF ILLNESS/INJURY _____ (CODE) #

g. TYPE AND SOURCE OF INJURY/ILLNESS
TYPE _____ (CODE) #
SOURCE _____ (CODE) #

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
☐ PICKUP/VAN ☐ AUTOMOBILE
☐ TRUCK ☐ OTHER *(Specify)* _____

b. TYPE OF COLLISION
☐ SIDE SWIPE ☐ HEAD ON ☐ REAR END
☐ BROADSIDE ☐ ROLL OVER ☐ BACKING
☐ OTHER *(Specify)* _____

c. SEAT BELTS	USED	NOT USED	NOT AVAILABLE
(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	d. DATE *(Mo/Da/Yr)*	e. ORGANIZATION IDENTIFIER *(Div, Br, Sect)*	f. OFFICE SYMBOL
CORPS _____ CONTRACTOR _____			

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)*

GENERAL. Complete a separate report for each person who was injured, caused, or contributed to the accident (excluding uninjured personnel and witnesses). Use of this form for reporting USACE employee first-aid type injuries not submitted to the Office of Workers' Compensation Programs (OWCP) shall be at the discretion of the FOA commander. Please type or print legibly. Appropriate items shall be marked with an "X" in box(es). If additional space is needed, provide the information on a separate sheet and attach to the completed form. Ensure that these instructions are forwarded with the completed report to the designated management reviewers indicated in sections 18 and 17.

INSTRUCTIONS FOR SECTION 1 - ACCIDENT CLASSIFICATION
(Mark All Boxes That Are Applicable)

a. GOVERNMENT. Mark "CIVILIAN" box if accident involved government civilian employee; mark "MILITARY" box if accident involved U.S. military personnel.

(1) INJURY/ILLNESS/FATALITY - Mark if accident resulted in any government civilian employee injury, illness, or fatality that requires the submission of OWCP Forms CA-1 (injury), CA-2 (illness) or CA-6 (fatality) to OWCP; mark if accident resulted in military personnel lost-time or fatal injury or illness.

(2) PROPERTY DAMAGE - Mark the appropriate box if accident resulted in any damage of $1000 or more to government property (including motor vehicles).

(3) VEHICLE INVOLVED - Mark if accident involved a motor vehicle, regardless of whether "INJURY/ILLNESS/FATALITY" or "PROPERTY DAMAGE" are marked.

(4) DIVING ACTIVITY - Mark if the accident involved an in-house USACE diving activity.

b. CONTRACTOR.

(1) INJURY/ILLNESS/FATALITY - Mark if accident resulted in any contractor lost-time injury/illness or fatality.

(2) PROPERTY DAMAGE - Mark the appropriate box if accident resulted in any damage of $1000 or more to contractor property (including motor vehicles).

(3) VEHICLE INVOLVED - Mark if accident involved a motor vehicle, regardless of whether "INJURY/ILLNESS/FATALITY" or "PROPERTY DAMAGE" are marked.

(4) DIVING ACTIVITY - Mark if the accident involved a USACE Contractor diving activity.

c. PUBLIC.

(1) INJURY/ILLNESS/FATALITY - Mark if accident resulted in public fatality or permanent total disability. (The "OTHER" box will be marked when requested by the FOA to report an unusual non-fatal public accident that could result in claims against the government or as otherwise directed by the FOA Commander).

(2) VOID SPACE - Make no entry.

(3) VEHICLE INVOLVED - Mark if accident resulted in a fatality to a member of the public and involved a motor vehicle, regardless of whether "INJURY/ILLNESS/FATALITY" is marked.

(4) VOID SPACE - Make no entry.

INSTRUCTIONS FOR SECTION 2 - PERSONAL DATA

a. NAME - (MANDATORY FOR GOVERNMENT ACCIDENTS. OPTIONAL AT THE DISCRETION OF THE FOA COMMANDER FOR CONTRACTOR AND PUBLIC ACCIDENTS). Enter last name, first name, middle initial of person involved.

b. AGE - Enter age.

c. SEX - Mark appropriate box.

d. SOCIAL SECURITY NUMBER - (FOR GOVERNMENT PERSONNEL ONLY) Enter the social security number (or other personal identification number if no social security number issued).

e. GRADE - (FOR GOVERNMENT PERSONNEL ONLY) Enter pay grade. Example: 0-6; E-7; WG-6; WS-12; GS-11; etc.

f. JOB SERIES/TITLE - For government civilian employees enter the pay plan, full series number, and job title, e.g., GS-0810/Civil Engineer. For military personnel enter the primary military occupational specialty (PMOS), e.g., 15A30 or 11G50. For contractor employees enter the job title assigned to the injured person, e.g., carpenter, laborer, surveyor, etc.

g. DUTY STATUS - Mark the appropriate box.

(1) ON DUTY - Person was at duty station during duty hours or person was away from duty station during duty hours but on official business at time of the accident.

(2) TDY - Person was on official business, away from the duty station and with travel orders at time of accident. Line-of-duty investigation required.

(3) OFF DUTY - Person was not on official business at time of accident.

h. EMPLOYMENT STATUS - (FOR GOVERNMENT PERSONNEL ONLY) Mark the most appropriate box. If "OTHER" is marked, specify the employment status of the person.

INSTRUCTION FOR SECTION 3 - GENERAL INFORMATION

a. DATE OF ACCIDENT - Enter the month, day, and year of accident.

b. TIME OF ACCIDENT - Enter the local time of accident in military time. Example: 1430 hrs (not 2:30 p.m.).

c. EXACT LOCATION OF ACCIDENT - Enter facts needed to locate the accident scene, (installation/project name, building number, street, direction and distance from closest landmark, etc.).

d. CONTRACTOR NAME

(1) PRIME - Enter the exact name (title of firm) of the prime contractor.

(2) SUBCONTRACTOR - Enter the name of any subcontractor involved in the accident.

e. CONTRACT NUMBER - Mark the appropriate box to identify if contract is civil works, military, or other; if "OTHER" is marked, specify contract appropriation on line provided. Enter complete contract number of prime contract, e.g., DACW 09-85-C-0100.

f. TYPE OF CONTRACT - Mark appropriate box. A/E means architect/engineer. If "OTHER" is marked, specify type of contract on line provided.

g. **HAZARDOUS/TOXIC WASTE ACTIVITY (HTW) - Mark the box to identify the HTW activity being performed at the time of the accident. For Superfund, DERP, and Installation Restoration Program (IRP) HTW activities include accidents that occurred during inventory, predesign, design, and construction. For the purpose of accident reporting, DERP Formerly Used DoD Site (FUDS) activities and IRP activities will be treated seperately. For Civil Works O&M HTW activities mark the "OTHER" box.**

INSTRUCTIONS FOR SECTION 4 - CONSTRUCTION ACTIVITIES

a. CONSTRUCTION ACTIVITY - Select the most appropriate construction activity being performed at time of accident from the list below. Enter the activity name and place the corresponding code number identified in the box.

CONSTRUCTION ACTIVITY LIST

1. MOBILIZATION
2. SITE PREPARATION
3. EXCAVATION/TRENCHING
4. GRADING (EARTHWORK)
5. PIPING/UTILITIES
6. FOUNDATION
7. FORMING
8. CONCRETE PLACEMENT
9. STEEL ERECTION
10. ROOFING
11. FRAMING
12. MASONRY
13. CARPENTRY
14. ELECTRICAL
15. SCAFFOLDING/ACCESS
16. MECHANICAL
17. PAINTING
18. EQUIPMENT/MAINTENANCE
19. TUNNELING
20. WAREHOUSING/STORAGE
21. PAVING
22. FENCING
23. SIGNING
24. LANDSCAPING/IRRIGATION
25. INSULATION
26. DEMOLITION

b. TYPE OF CONSTRUCTION EQUIPMENT - Select the equipment involved in the accident from the list below. Enter the name and place the corresponding code number identified in the box. If equipment is not included below, use code 24, "OTHER", and write in specific type of equipment.

CONSTRUCTION EQUIPMENT

1. GRADER
2. DRAGLINE
3. CRANE (ON VESSEL/BARGE)
4. CRANE (TRACKED)
5. CRANE (RUBBER TIRE)
6. CRANE (VEHICLE MOUNTED)
7. CRANE (TOWER)
8. SHOVEL
9. SCRAPER
10. PUMP TRUCK (CONCRETE)
11. TRUCK (CONCRETE/TRANSIT MIXER)
12. DUMP TRUCK (HIGHWAY)
13. DUMP TRUCK (OFF HIGHWAY)
14. TRUCK (OTHER)
15. FORKLIFT
16. BACKHOE
17. FRONT-END LOADER
18. PILE DRIVER
19. TRACTOR (UTILITY)
20. MANLIFT
21. DOZER
22. DRILL RIG
23. COMPACTOR/VIBRATORY ROLLER
24. OTHER

INSTRUCTIONS FOR SECTION 5 - INJURY/ILLNESS INFORMATION

a. SEVERITY OF INJURY/ILLNESS - Reference para 2-10 of USACE Suppl 1 to AR 385-40 and enter code and description from list below.

NOI	NO INJURY
FAT	FATALITY
PTL	PERMANENT TOTAL DISABILITY
PPR	ERMANENT PARTIAL DISABILITY
LWD	LOST WORKDAY CASE INVOLVING DAYS AWAY FROM WORK
NLW	RECORDABLE CASE WITHOUT LOST WORKDAYS

b. ESTIMATED DAYS LOST - Enter the estimated number of workdays the person will lose from work.

c. ESTIMATED DAYS HOSPITALIZED - Enter the estimated number of workdays the person will be hospitalized.

d. ESTIMATED DAYS RESTRICTED DUTY - Enter the estimated number of workdays the person, as a result of the accident, will not be able to perform all of their regular duties.

e. BODY PART AFFECTED - Select the most appropriate primary and when applicable, secondary body part affected from the list below. Enter body part name on line and place the corresponding code letters identifying that body part in the box.

GENERAL BODY AREA	CODE	BODY PART NAME
ARM/WRIST	AB	ARM AND WRIST
	AS	ARM OR WRIST
TRUNK, EXTERNAL MUSCULATURE	B1	SINGLE BREAST
	B2	BOTH BREASTS
	B3	SINGLE TESTICLE
	B4	BOTH TESTICLES
	BA	ABDOMEN
	BC	CHEST
	BL	LOWER BACK
	BP	PENIS
	BS	SIDE
	BU	UPPER BACK
	BW	WAIST
	BZ	TRUNK OTHER
HEAD, INTERNAL	C1	SINGLE EAR INTERNAL
	C2	BOTH EARS INTERNAL
	C3	SINGLE EYE INTERNAL
	C4	BOTH EYES INTERNAL
	CB	BRAIN
	CC	CRANIAL BONES
	CD	TEETH
	CJ	JAW
	CL	THROAT, LARYNX
	CM	MOUTH
	CN	NOSE
	CR	THROAT, OTHER
	CT	TONGUE
	CZ	HEAD OTHER INTERNAL
ELBOW	EB	BOTH ELBOWS
	ES	SINGLE ELBOW
FINGER	F1	FIRST FINGER
	F2	BOTH FIRST FINGERS
	F3	SECOND FINGER
	F4	BOTH SECOND FINGERS
	F5	THIRD FINGER
	F6	BOTH THIRD FINGERS
	F7	FOURTH FINGER
	F8	BOTH FOURTH FINGERS
TOE	G1	GREAT TOE
	G2	BOTH GREAT TOES
	G3	TOE OTHER
	G4	TOES OTHER

GENERAL BODY AREA	CODE	BODY PART NAME
HEAD, EXTERNAL	H1	EYES EXTERNAL
	H2	BOTH EYES EXTERNAL
	H3	EAR EXTERNAL
	H4	BOTH EARS EXTERNAL
	HC	CHIN
	HF	FACE
	HK	NECK/THROAT
	HM	MOUTH/LIPS
	HN	NOSE
	HS	SCALP
KNEE	KB	BOTH KNEES
	KS	KNEE
LEG, HIP, ANKLE, BUTTOCK	LB	BOTH LEGS/HIPS/ ANKLES/BUTTOCKS
	LS	SINGLE LEG/HIP ANKLE/BUTTOCK
HAND	MB	BOTH HANDS
	MS	SINGLE HAND
FOOT	PB	BOTH FEET
	PS	SINGLE FOOT
TRUNK, BONES	R1	SINGLE COLLAR BONE
	R2	BOTH COLLAR BONES
	R3	SHOULDER BLADE
	R4	BOTH SHOULDER BLADES
	RB	RIB
	RS	STERNUM (BREAST BONE)
	RV	VERTEBRAE (SPINE; DISC)
	RZ	TRUNK BONES OTHER
SHOULDER	SB	BOTH SHOULDERS
	SS	SINGLE SHOULDER
THUMB	TB	BOTH THUMBS
	TS	SINGLE THUMB
TRUNK, INTERNAL ORGANS	V1	LUNG, SINGLE
	V2	LUNGS, BOTH
	V3	KIDNEY, SINGLE
	V4	KIDNEYS, BOTH
	VH	HEART
	VL	LIVER
	VR	REPRODUCTIVE ORGANS
	VS	STOMACH
	VV	INTESTINES
	VZ	TRUNK, INTERNAL; OTHER

f. NATURE OF INJURY/ILLNESS - Select the most appropriate nature of injury/illness from the list below. The nature of injury/illness shall correspond to the primary body part selected in 5e, above. Enter the nature of injury/illness name on the line and place the corresponding CODE letters in the box provided.

*** The injury or condition selected below must be caused by a specific incident or event which occurred during a single work day or shift.**

GENERAL NATURE CATEGORY	CODE	NATURE OF INJURY NAME
*TRAUMATIC INJURY OR DISABILITY	TA	AMPUTATION
	TB	BACK STRAIN
	TC	CONTUSION; BRUISE; ABRASION
	TD	DISLOCATION
	TF	FRACTURE
	TH	HERNIA
	TK	CONCUSSION
	TL	LACERATION, CUT
	TP	PUNCTURE
	TS	STRAIN, MULTIPLE
	TU	BURN, SCALD, SUNBURN
	TI	TRAUMATIC SKIN DISEASES/CONDITIONS INCLUDING DERMATITIS
	TR	TRAUMATIC RESPIRATORY DISEASE
	TQ	TRAUMATIC FOOD POISONING
	TW	TRAUMATIC TUBERCULOSIS
	TX	TRAUMATIC VIROLOGICAL/ INFECTIVE/PARASITIC DISEASE
	T1	TRAUMATIC CEREBRAL VASCULAR CONDITION/STROKE
	T2	TRAUMATIC HEARING LOSS
	T3	TRAUMATIC HEART CONDITION
	T4	TRAUMATIC MENTAL DISORDER, STRESS; NERVOUS CONDITION
	TB	TRAUMATIC INJURY - OTHER (EXCEPT DISEASE ILLNESS)

** A nontraumatic physiological harm or loss of capacity produced by systemic infection; continued or repeated stress or strain; exposure to toxins, poisons, fumes, etc.; or other continued and repeated exposures to conditions of the work environment over a long period of time. For practical purposes, an occupational illness/disease or disability is any reported condition which does not meet the definition of traumatic injury or disability as described above.

GENERAL NATURE CATEGORY	CODE	NATURE OF INJURY NAME
**NON-TRAUMATIC ILLNESS/DISEASE OR DISABILITY		
RESPIRATORY DISEASE	RA	ASBESTOSIS
	RB	BRONCHITIS
	RE	EMPHYSEMA
	RP	PNEUMOCONIOSIS
	RS	SILICOSIS
	R9	RESPIRATORY DISEASE OTHER
VIROLOGICAL, INFECTIVE & PARASITIC DISEASES	VB	BRUCELLOSIS
	VC	COCCIDIOMYCOSIS
	VF	FOOD POISONING
	VH	HEPATITIS
	VM	MALARIA
	VS	STAPHYLOCOCCUS
	VT	TUBERCULOSIS
	V9	VIROLOGICAL/INFECTIVE/ PARASITIC - OTHER
DISABILITY, OCCUPATIONAL	DA	ARTHRITIS, BURSITIS
	DB	BACK STRAIN, BACK SPRAIN
	DC	CEREBRAL VASCULAR CONDITION; STROKE

GENERAL NATURE CATEGORY	CODE	NATURE OF INJURY NAME	CODE
	DD	ENDEMIC DISEASE (OTHER THAN CODE TYPES R&S)	
	DE	EFFECT OF ENVIRONMENTAL CONDITION	
	DH	HEARING LOSS	0310
	DK	HEART CONDITION	0320
	DM	MENTAL DISORDER, EMOTIONAL STRESS, NERVOUS	0330
CONDITION			0410
	DR	RADIATION	0420
	DS	STRAIN, MULTIPLE	0430
	DU	ULCER	0440
	DV	OTHER VASCULAR CONDITIONS	
	DB	DISABILITY, OTHER	0510
SKIN DISEASE OR CONDITION	SB	BIOLOGICAL	0520
	SC	CHEMICAL	
	SS	DERMATITIS, UNCLASSIFIED	

g. TYPE AND SOURCE OF INJURY/ILLNESS (CAUSE) - Type and Source Codes are used to describe what caused the incident. The Type Code stands for an ACTION and the Source Code for an OBJECT or SUBSTANCE. Together, they form a brief description of how the incident occurred. Where there are two different sources, code the initiating source of the incident (see example 1, below). Examples:

(1) An employee tripped on carpet and struck his head on a desk.
TYPE: 210 (fell on same level) SOURCE: 0110 (walking/working surface).

NOTE: This example would NOT be coded 120 (struck against) and 0140 (furniture).

(2) A Park Ranger contracted dermatitis from contact with poison ivy/oak.
TYPE: 510 (contact) SOURCE: 0920 (plant)

(3) A lock and dam mechanic punctured his finger with a metal sliver while grinding a turbine blade.
TYPE: 410 (punctured by) SOURCE: 0830 (metal)

(4) An employee was driving a government vehicle when it was struck by another vehicle.
TYPE: 800 (traveling in) SOURCE: 0421 (government-owned vehicle, as driver)

NOTE: The Type Code 800, "Traveling In" is different from the other type codes in that its function is not to identify factors contributing to the injury or fatality, but rather to collect data on the type of vehicle the employee was operating or traveling in at the time of the incident.

Select the most appropriate TYPE and SOURCE identifier from the list below and enter the name on the line and the corresponding code in the appropriate box.

CODE	TYPE OF INJURY NAME	CODE
	STRUCK	0100
0110	STRUCK BY	0110
0111	STRUCK BY FALLING OBJECT	
0120	STRUCK AGAINST	0120
		0130
		0140
		0150
		0160
		0170
		0180
		0200
		0210
		0220
		0230
		0240
		0250
		0260
		0270
		0271
		0280
		0290
		0300
		0310
		0320
		0330
		0340

TYPE OF INJURY NAME	CODE
FELL, SLIPPED, TRIPPED	
FELL ON SAME LEVEL	0210
FELL ON DIFFERENT LEVEL	0220
SLIPPED, TRIPPED (NO FALL)	0230
CAUGHT	
CAUGHT ON	
CAUGHT IN	
CAUGHT BETWEEN	
PUNCTURED, LACERATED	
PUNCTURED BY	
CUT BY	
STUNG BY	
BITTEN BY	
CONTACTED	
CONTACTED WITH (INJURED PERSON MOVING)	
CONTACTED BY (OBJECT WAS MOVING)	
EXERTED	
LIFTED, STRAINED BY (SINGLE ACTION)	0610
STRESSED BY (REPEATED ACTION)	0620
EXPOSED	
INHALED	0710
INGESTED	0720
ABSORBED	0730
EXPOSED TO	0740
TRAVELING IN	0800

SOURCE OF INJURY NAME	CODE
BUILDING OR WORKING AREA	
WALKING/WORKING SURFACE (FLOOR, STREET, SIDEWALKS, ETC.)	
STAIRS, STEPS	
LADDER	
FURNITURE, FURNISHINGS, OFFICE EQUIPMENT	
BOILER, PRESSURE VESSEL	
EQUIPMENT LAYOUT (ERGONOMIC)	
WINDOWS, DOORS	
ELECTRICITY	
ENVIRONMENTAL CONDITION	
TEMPERATURE EXTREME (INDOOR)	
WEATHER (ICE, RAIN, HEAT, ETC.)	
FIRE, FLAME, SMOKE (NOT TOBACCO)	
NOISE	
RADIATION	
LIGHT	
VENTILATION	
TOBACCO SMOKE	
STRESS (EMOTIONAL)	
CONFINED SPACE	
MACHINE OR TOOL	
HAND TOOL (POWERED) SAW, GRINDER, ETC.)	
HAND TOOL (NONPOWERED)	
MECHANICAL POWER TRANSMISSION APPARATUS	
GUARD, SHIELD (FIXED, MOVEABLE, INTERLOCK)	

CODE	TYPE OF INJURY NAME
0350	VIDEO DISPLAY TERMINAL
0360	PUMP, COMPRESSOR, AIR PRESSURE TOOL
0370	HEATING EQUIPMENT
0380	WELDING EQUIPMENT
0400	VEHICLE
0411	AS DRIVER OF PRIVATELY OWNED/RENTAL VEHICLE
0412	AS PASSENGER OF PRIVATELY OWNED/RENTAL VEHICLE
0421	DRIVER OF GOVERNMENT VEHICLE
0422	PASSENGER OF GOVERNMENT VEHICLE
0430	COMMON CARRIER (AIRLINE, BUS, ETC.)
0440	AIRCRAFT (NOT COMMERCIAL)
0450	BOAT, SHIP, BARGE
0500	MATERIAL HANDLING EQUIPMENT
0510	EARTHMOVER (TRACTOR, BACKHOE, ETC.)
0520	CONVEYOR (FOR MATERIAL AND EQUIPMENT)
0530	ELEVATOR, ESCALATOR, PERSONNEL HOIST
0540	HOIST, SLING CHAIN, JACK
0550	CRANE
0551	FORKLIFT
0560	HANDTRUCK, DOLLY
0600	DUST, VAPOR, ETC.
0610	DUST (SILICA, COAL, ETC.)
0620	FIBERS
0621	ASBESTOS
0630	GASES
0631	CARBON MONOXIDE
0640	MIST, STEAM, VAPOR, FUME
0641	WELDING FUMES
0650	PARTICLES (UNIDENTIFIED)
0700	CHEMICAL, PLASTIC, ETC.
0711	DRY CHEMICAL - CORROSIVE
0712	DRY CHEMICAL - TOXIC
0713	DRY CHEMICAL - EXPLOSIVE
0716	DRY CHEMICAL FLAMMABLE
0721	LIQUID CHEMICAL - CORROSIVE
0722	LIQUID CHEMICAL - TOXIC
0723	LIQUID CHEMICAL - EXPLOSIVE
0724	LIQUID CHEMICAL - FLAMMABLE
0730	PLASTIC
0740	WATER
0750	MEDICINE
0800	INANIMATE OBJECT
0810	BOX, BARREL, ETC.
0820	PAPER
0830	METAL ITEM, MINERAL
0831	NEEDLE
0840	GLASS

CODE	SOURCE OF INJURY NAME
0850	SCRAP, TRASH
0860	WOOD
0870	FOOD
0880	CLOTHING, APPAREL, SHOES
0900	ANIMATE OBJECT
0911	DOG
0912	OTHER ANIMAL
0920	PLANT
0930	INSECT
0940	HUMAN (VIOLENCE)
0950	HUMAN (COMMUNICABLE DISEASE)
0960	BACTERIA, VIRUS (NOT HUMAN CONTACT)
1000	PERSONAL PROTECTIVE EQUIPMENT
1010	PROTECTIVE CLOTHING, SHOES, GLASSES, GOGGLES
1020	RESPIRATOR, MASK
1021	DIVING EQUIPMENT
1030	SAFETY BELT, HARNESS
1040	PARACHUTE

INSTRUCTIONS FOR SECTION 8 - PUBLIC FATALITY

a. ACTIVITY AT TIME OF ACCIDENT - Select the activity being performed at the time of the accident from the list below. Enter the activity name on the line and the corresponding number in the box. If the activity performed is not identified on the list, select from the most appropriate primary activity area (water related, non-water related or other activity), the code number for "Other", and write in the activity being performed at the time of the accident.

WATER RELATED RECREATION

1. Sailing
2. Boating-powered
3. Boating-unpowered
4. Water skiing
5. Fishing from boat
6. Fishing from bank dock or pier
7. Fishing while wading
8. Swimming/supervised area
9. Swimming/designated area
10. Swimming/other area
11. Underwater activities (skin diving, scuba, etc.)
12. Wading
13. Attempted rescue
14. Hunting from boat
15. Other

NON-WATER RELATED RECREATION

16. Hiking and walking
17. Climbing (general)
18. Camping/picnicking authorized area
19. Camping/picnicking unauthorized area
20. Guided tours
21. Hunting
22. Playground equipment
23. Sports/summer (baseball, football, etc.)
24. Sports/winter (skiing, sledding, snowmobiling etc.)
25. Cycling (bicycle, motorcycle, scooter)
26. Gliding
27. Parachuting
28. Other non-water related

OTHER ACTIVITIES

29. Unlawful acts (fights, riots, vandalism, etc.)
30. Food preparation/serving
31. Food consumption
32. Housekeeping
33. Sleeping
34. Pedestrian struck by vehicle
35. Pedestrian other acts
36. Suicide
37. "Other" activities

b. PERSONAL FLOTATION DEVICE USED - If fatality was water-related was the victim wearing a person flotation device? Mark the appropriate box.

INSTRUCTIONS FOR SECTION 7 - MOTOR VEHICLE ACCIDENT

a. TYPE OF VEHICLE - Mark appropriate box for each vehicle involved. If more than one vehicle of the same type is involved, mark both halves of the appropriate box. USACE vehicle(s) involved shall be marked in left half of appropriate box.

b. TYPE OF COLLISION - Mark appropriate box.

c. SEAT BELT - Mark appropriate box.

INSTRUCTIONS FOR SECTION 8 - PROPERTY/MATERIAL INVOLVED

a. NAME OF ITEM - Describe all property involved in accident. Property/material involved means material which is damaged or whose use or misuse contributed to the accident. Include the name, type, model; also include the National Stock Number (NSN) whenever applicable.

b. OWNERSHIP - Enter ownership for each item listed. (Enter one of the following: USACE; OTHER GOVERNMENT; CONTRACTOR; PRIVATE)

c. $ AMOUNT OF DAMAGE - Enter the total estimated dollar amount of damage (parts and labor), if any.

INSTRUCTIONS FOR SECTION 9 - VESSEL/ FLOATING PLANT ACCIDENT

a. TYPE OF VESSEL/FLOATING PLANT - Select the most appropriate vessel/floating plant from list below. Enter name and place corresponding number in box. If item is not listed below, enter item number for "OTHER" and write in specific type of vessel floating plant.

VESSEL/FLOATING PLANTS

1. ROW BOAT
2. SAIL BOAT
3. MOTOR BOAT
4. BARGE
5. DREDGE/HOPPER
6. DREDGE/SIDE CASTING
7. DREDGE/DIPPER
8. DREDGE/CLAMSHELL, BUCKET
9. DREDGE/PIPE LINE
10. DREDGE/DUST PAN
11. TUG BOAT
12. OTHER

b. COLLISION/MISHAP - Select from the list below the object(s) that contributed to the accident or were damaged in the accident.

COLLISION/MISHAP

1. COLLISION W/OTHER VESSEL
2. UPPER GUIDE WALL
3. UPPER LOCK GATES
4. LOCK WALL
5. LOWER LOCK GATES
6. LOWER GUIDE WALL
7. HAULAGE UNIT
8. BREAKING TOW
9. TOW BREAKING UP
10. SWEPT DOWN ON DAM
11. BUOY/DOLPHIN/CELL
12. WHARF OR DOCK
13. OTHER

INSTRUCTIONS FOR SECTION 10 - ACCIDENT DESCRIPTION

DESCRIBE ACCIDENT - Fully describe the accident. Give the sequence of events that describe what happened leading up to and including the accident. Fully identify personnel and equipment involved and their role(s) in the accident. Ensure that relationships between personnel and equipment are clearly specified. Continue on blank sheets if necessary and attach to this report.

INSTRUCTIONS FOR SECTION 11 - CAUSAL FACTORS

a. Review thoroughly. Answer each question by marking the appropriate block. If any answer is yes, explain in item 13 below. Consider, as a minimum, the following:

(1) DESIGN - Did inadequacies associated with the building or work site play a role? Would an improved design or layout of the equipment or facilities reduce the likelihood of similar accidents? Were the tools or other equipment designed and intended for the task at hand?

(2) INSPECTION/MAINTENANCE - Did inadequately or improperly maintained equipment, tools, workplace, etc. create or worsen any hazards that contributed to the accident? Would better equipment, facility, work site or work activity inspections have helped avoid the accident?

(3) PERSON'S PHYSICAL CONDITION - Do you feel that the accident would probably not have occurred if the employee was in "good" physical condition? If the person involved in the accident had been in better physical condition, would the accident have been less severe or avoided altogether? Was over exertion a factor?

(4) OPERATING PROCEDURES - Did a lack of or inadequacy within established operating procedures contribute to the accident? Did any aspect of the procedures introduce any hazard to, or increase the risk associated with the work process? Would establishment or improvement of operating procedures reduce the likelihood of similar accidents?

(5) JOB PRACTICES - Were any of the provisions of the Safety and Health Requirements Manual (EM 385-1-1) violated? Was the task being accomplished in a manner which was not in compliance with an established job hazard analysis or activity hazard analysis? Did any established job practice (including EM 385-1-1) fail to adequately address the task or work process? Would better job practices improve the safety of the task?

(6) HUMAN FACTORS - Was the person under undue stress (either internal or external to the job)? Did the task tend toward overloading the capabilities of the person, i.e., did the job require tracking and reacting to many external inputs such as displays, alarms, or signals? Did the arrangement of the workplace tend to interfere with efficient task performance? Did the task require reach, strength, endurance, agility, etc., at or beyond the capabilities of the employee? Was the work environment ill-adapted to the person? Did the person need more training, experience, or practice in doing the task? Was the person inadequately rested to perform safely?

(7) ENVIRONMENTAL FACTORS - Did any factors such as moisture, humidity, rain, snow, sleet, hail, ice, fog, cold, heat, sun, temperature changes, wind, tides, floods, currents, dust, mud, glare, pressure changes, lightning, etc., play a part in the accident?

(8) CHEMICAL AND PHYSICAL AGENT FACTORS - Did exposure to chemical agents (either single shift exposure or long-term exposure) such as dusts, fibers (asbestos, etc.), silica, gases (carbon monoxide, chlorine, etc.), mists, steam, vapors, fumes, smoke, other particulates, liquid or dry chemicals that are corrosive, toxic, explosive or flammable, byproducts of combustion or physical agents such as noise, ionizing radiation, non-ionizing radiation (UV radiation created during welding, etc.) contribute to the accident/incident?

(9) **OFFICE FACTORS** - Did the fact that the accident occurred in an office setting or to an office worker have a bearing on its cause? For example, office workers tend to have less experience and training in performing tasks such as lifting office furniture. Did physical hazards within the office environment contribute to the hazard?

(10) **SUPPORT FACTORS** - Was the person using an improper tool for the job? Was inadequate time available or utilized to safely accomplish the task? Were less than adequate personnel resources (in terms of employee skills, number of workers, and adequate supervision) available to get the job done properly? Was funding available, utilized, and adequate to provide proper tools, equipment, personnel, site preparation, etc.?

(11) **PERSONAL PROTECTIVE EQUIPMENT** - Did the person fail to use appropriate personal protective equipment (gloves, eye protection, hard-toed shoes, respirator, etc.) for the task or environment? Did protective equipment provided or worn fail to provide adequate protection from the hazard(s)? Did lack of or inadequate maintenance of protective gear contribute to the accident?

(12) **DRUGS/ALCOHOL** - Is there any reason to believe the person's mental or physical capabilities, judgment, etc., were impaired or altered by the use of drugs or alcohol? Consider the effects of prescription medicine and over the counter medications as well as illicit drug use. Consider the effect of drug or alcohol induced "hangovers".

b. **WRITTEN JOB/ACTIVITY HAZARD ANALYSIS** - Was a written Job/Activity Hazard Analysis completed for the task being performed at the time of the accident? Mark the appropriate box. If one was performed, attach a copy of the analysis to the report.

INSTRUCTIONS FOR SECTION 12 - TRAINING

a. **WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK?** - For the purpose of this section "trained" means the person has been provided the necessary information (either formal and/or on-the-job (OJT) training) to competently perform the activity/task in a safe and healthful manner.

b. **TYPE OF TRAINING** - Mark the appropriate box that best indicates the type of training: (classroom or on-the-job) that the injured person received before the accident happened.

c. **DATE OF MOST RECENT TRAINING** - Enter the month, day, and year of the last formal training completed that covered the activity task being performed at the time of the accident.

INSTRUCTIONS FOR SECTION 13 - CAUSES

a. **DIRECT CAUSES** - The direct cause is that single factor which most directly lead to the accident. See examples below.

b. **INDIRECT CAUSES** - Indirect causes are those factors which contributed to but did not directly initiate the occurrence of the accident.

Examples for section 13:

a. Employee was dismantling scaffold and fell 12 feet from unguarded opening.

> **Direct cause: failure to provide fall protection at elevation.**
> **Indirect causes: failure to enforce USACE safety requirements, improper training/motivation of employee (possibility that employee was not knowledgeable of USACE fall protection requirements or was lax in his attitude towards safety); failure to ensure provision of positive fall protection whenever elevated; failure to address fall protection during scaffold dismantling in phase hazard analysis.**

b. Private citizen had stopped his vehicle at intersection for red light when vehicle was struck in rear by USACE vehicle. (Note: USACE vehicle was in proper/safe working condition).

> **Direct cause:** failure of USACE driver to maintain control of and stop USACE vehicle within safe distance.
> **Indirect cause:** failure of employee to pay attention to driving (defensive driving).

INSTRUCTIONS FOR SECTION 14 - ACTION TO ELIMINATE CAUSE(S)

DESCRIPTION - Fully describe all the actions taken, anticipated, and recommended to eliminate the cause(s) and prevent reoccurrence of similar accidents/illnesses. Continue on blank sheets of paper if necessary to fully explain and attach to the completed report form.

INSTRUCTIONS FOR SECTION 15 - DATES FOR ACTION

a. **BEGIN DATE** - Enter the date when the corrective action(s) identified in section 14 will begin.

b. **COMPLETE DATE** - Enter the date when the corrective action(s) identified in section 14 will be completed.

c. **TITLE AND SIGNATURE** - Enter the title and signature of supervisor completing the accident report. For a GOVERNMENT employee accident/illness the immediate supervisor will complete and sign the report. For PUBLIC accidents the USACE Project Manager/Area Engineer responsible for the USACE property where the accident happened shall complete and sign the report. For CONTRACTOR accidents the Contractor's project manager shall complete and sign the report and provide to the USACE supervisor responsible for oversight of that contractor activity. This USACE supervisor shall also sign the report. Upon entering the information required in 15.d, 15.e and 15.f below, the responsible USACE supervisor shall forward the report for management review as indicated in section 16.

d. **DATE SIGNED** - Enter the month, day, and year that the report was signed by the responsible supervisor.

e. **ORGANIZATION NAME** - For GOVERNMENT employee accidents enter the USACE organization name (Division, Branch, Section, etc.) of the injured employee. For PUBLIC accidents enter the USACE organization name for the person identified in block 15.c. For CONTRACTOR accidents enter the USACE organization name for the USACE office responsible for providing contract administration oversight.

f. **OFFICE SYMBOL** - Enter the latest complete USACE Office Symbol for the USACE organization identified in block 15.e.

INSTRUCTIONS FOR SECTION 16 - MANAGEMENT REVIEW (1st)

1ST REVIEW - Each USACE FOA shall determine who will provide 1st management review. The responsible USACE supervisor in section 15.c shall forward the completed report to the USACE office designated as the 1st Reviewer by the FOA. Upon receipt, the Chief of the Office shall review the completed report, mark the appropriate box, provide substantive comments, sign, date, and forward to the FOA Staff Chief (2nd review) for review and comment.

INSTRUCTIONS FOR SECTION 17 - MANAGEMENT REVIEW (2nd)

2ND REVIEW - The FOA Staff Chief (i.e., FOA Chief of Construction, Operations, Engineering, Planning, etc.) shall mark the appropriate box, review the completed report, provide substantive comments, sign, date, and return to the FOA Safety and Occupational Health Office.

INSTRUCTIONS FOR SECTION 18 - SAFETY AND OCCUPATIONAL HEALTH REVIEW

3RD REVIEW - The FOA Safety and Occupational Health Office shall review the completed report, mark the appropriate box, ensure that any inadequacies, discrepancies, etc. are rectified by the responsible supervisor and management reviewers, provide substantive comments, sign, date and forward to the FOA Commander for review, comment, and signature.

INSTRUCTION FOR SECTION 19 - COMMAND APPROVAL

4TH REVIEW - The FOA Commander shall (to include the person designated Acting Commander in his absence) review the completed report, comment if required, sign, date, and forward the report to the FOA Safety and Occupational Health Office. Signature authority shall not be delegated.

USA Environmental, Inc.

ACCIDENT / ILLNESS / NEAR MISS REPORT

SECTION 1 – GENERAL INFORMATION			
Name: _____		SSN:_____	Log #:_____
D.O.B.: _____	Sex: _____	Age:_____	OSHA Recordable Incident: ☐ Yes ☐ No
Job Title: _____			
Date of Report: _____	Date of Incident: _____		Time of Incident: _____
Task/Operation Being Conducted: _____			
PPE Worn: _____			

SITE CONDITIONS AT TIME OF ACCIDENT / INCIDENT		
Temperature: Direction: Other:	Humidity: Cloud Cover:	Wind Speed: Precipitation:
Type of Incident:	☐ Personal Injury ☐ Motor Vehicle	☐ Personal Illness ☐ Property Damage ☐ Chemical Exposure ☐ Near Miss
If chemical exposure, what material(s) was(were) involved: _____ What was the nature of exposure (contact, inhalation, etc.): _____		
Other Individual(s) Involved: _____		

SECTION 2 – PERSONAL INJURY/ILLNESS INFORMATION
Nature/Type of Injury/Illness (laceration, strain, etc.): _____
Cause of Injury/Illness: _____
Body Part(s) Affected: Primary: _____ Secondary: _____
Injury/Illness Required: ☐ On Site/Clinic First Aid Treatment ☐ Emergency Room Treatment ☐ Hospitalization
Injury/Illness Resulted In: ☐ Loss of Work Time ☐ Limitation of Duties ☐ Fatality ☐ Other (Explain): _____
Status at Time of Report: ☐ Returned to Work: (Date: _____) ☐ Hospitalized: (Anticipated Stay: _____) ☐ Convalescing: (Anticipated Length of Convalescence:) ☐ Other: _____
On Site First Aid Treatment Given: _____
Off Site First Aid or Other Medical Treatment (attach documentation, including Physician statement): _____

ACCIDENT/ILLNESS/NEAR MISS REPORT (cont.)

SECTION 3 – MOTOR VEHICLE ACCIDENT

Type of Vehicle/Equipment	Type of Collision	Seat Belt Use
☐ Automobile/SUV ☐ Van/Truck ☐ MHE/EMM ☐ Other:	☐ Side Swipe ☐ Rear End ☐ Backing ☐ Head on ☐ Broadside ☐ Roll	Front Seat ☐ Yes ☐ No Back Seat ☐ Yes ☐ No

Property/Material/Items Involved

Name of Item:	Owner:	Damage Estimate:
_____	_____	$

Accident/Near Miss Description (Use additional paper if needed): _____

SECTION 4 – POST-ACCIDENT/INJURY/ILLNESS REVIEW

Has the Home Office been notified? ☐ Yes ☐ No If Yes, When? _____ By Whom? _____

Were operations conducted using approved USAE SOP or an APP/ SSHP?

☐ Yes Reference: _____

☐ No Explain: _____

SUXOS's Comments: _____

Employee Comments: _____

WITNESSES

Name	Organization	Phone Number
_____	_____	_____

Employee Signature: Date: _____

SUXOS Signature: Date:_____

Actions Completed by: _____ Date: _____

Corporate Review by: _____Date:_____

ACCIDENT/ILLNESS/NEAR MISS REPORT (cont.)

Additional Information (if needed):

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DAILY QUALITY CONTROL REPORT

Date:	**Contract #:**	**Task Order #:**
Site/Location:		
Weather:	**Temperature:**	**Rainfall:**

1. Preparatory Inspection:

Results:

2. QC Audits Performed:

a. Operations:

Results:

b. Safety:

Results:

c. Administrative:

Results:

d. Equipment:

Results:

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DAILY SITE REPORT

SECTION 1		GENERAL INFORMATION		
Project Name:		Customer(s) Name:		Report No.:
Contract No.:	TO No.:	Completion Date:	Location:	Date of Report:
SUXOS Name:		Telephone No.:		Email Address:
Site Manager's Name:		Telephone No.:		Email Address:
Customer POC Name:		Telephone No.:		Email Address:
Project Web Portal Address:				

SECTION 2				WEATHER	
Temp: High / Low		Precipitation / Humidity		Wind:	Work Impact / Remarks:

SECTION 3			USA ASSIGNED PERSONNEL		
Position:	No. Assigned:	No. Present:	Position:	No. Assigned:	No. Present:
Site Manager			UXOT II		
SUXOS			UXOT I		
UXOQCS					
UXOSO					
UXOT III					

SECTION 4			SUBCONTRACTOR ASSIGNED PERSONNEL		
Position:	No. Assigned:	No. Present:	Position:	No. Assigned:	No. Present:

SECTION 5			SUBCONTRACTOR / RENTAL HEAVY EQUIPMENT ONSITE	
Description:	Quantity:	Operational:	Owner:	Remarks:

SECTION 6			TASK(S) PERFORMED		
Task Performed:	Acres/Grids:	Transects:	Re-Acquire:	Digs:	Other:
Surface					
Subsurface					
DGM / GIS					
Devegetation					
Demolition					
Survey					
Support					

SECTION 7 WORK DETAILS

Acres/Grids:	Transects:	Re-Acquire:	Digs:	Remarks:

SECTION 8 SAFETY DATA

1) Were safety inspections held?	☐ Y ☐ N	**2)** Was HW found or recovered today?	☐ Y ☐ N
General ☐ Tailgate ☐ Task Specific ☐		Type:	
3) Were there any accidents?	☐ Y ☐ N	**4)** Was a "Competent Person" required?	☐ Y ☐ N
1st Aid ☐ Clinic ☐ Hospital ☐		Type:	
5) Were there any near misses?	☐ Y ☐ N	**6)** Was PPE up or down graded today?	☐ Y ☐ N
Brief Description:		Changed to:	

SECTION 9 QUALITY CONTROL DATA

1) Were QC inspections held?	☐ Y ☐ N	**2)** Was a QA submittal made today?	☐ Y ☐ N
Site ☐ MEC ☐ DGM ☐ Other ☐		Submitted by:	
3) Were there any failures?	☐ Y ☐ N	**4)** Was a Stop Work or CAR issued?	☐ Y ☐ N
Minor ☐ Major ☐ Critical ☐		Issued by:	
5) Were there any corrections?	☐ Y ☐ N	**6)** Was a Form 948 issued?	☐ Y ☐ N
Brief Description:		Issued for:	

SECTION 10 MPPEH / MDAS

No. of MPPEH items found.		Lbs. of MDAS recovered.	
No. of MPPEH items consolidated.		Lbs. of MDAS placed in a "sealed" container.	

SECTION 11 MEC / UXO SUMMARY

Type:	Quantity:	Live:	Practice:	Unknown:	Location:
Projectiles					
Grenades					
Rockets					
Bombs					
Mines					
Missiles					
Pyrotechnics					
ICM / Submunitions					

SECTION 12 DEMOLITION OPERATIONS

Location:	No. of Items Destroyed:	Remarks:

SECTION 13	DAILY COMMENTS	
CUSTOMER/REGULATORY INSTRUCTIONS ISSUED:		
SECTION 14	**SIGNATURE BLOCKS**	
Type or Print SUXOS Name:	Signature:	Date:
Type or Print Site Manager's Name:	Signature	Date:
CC to:		
Government Representative ☐	Project Manager ☐	Customer Representative ☐
Other – Specify:		

Note: Sections 2 through 13 above may have additional information found in inspection forms, preprinted forms, information sheets, or tabulated data sets (i. e., Sign-In / Sign-out Log, MEC Summary Log, Demolitions Records, QC Inspection Form, Safety Inspection Form). Attach additional information or continuation sheets to this report as needed.

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PREPARATORY, INITIAL, FOLLOW-UP QC SURVEILLANCE FORM

W912DY-04-D-0006, TO #0022, Culebra Environmental Baseline Survey MRSs 09 and 13

DEMOBILIZATION

TEAM INFORMATION		
Team:	**Location:**	**Date:**
Team Leader:		
Personnel Present:		
Phase of Inspection (Circle): ***Preparatory (P); Initial (I); Follow-Up (F)***		

CHECKLIST

Item	Ref.	Inspection Point	Yes	No	N/A	Comments
1	**WP Section 2.0**	Have all project support agreements been terminated?				Document deficiency and report to the SUXOS for resolution and follow-up to verify compliance
2	**WP Section 2.0**	Has all equipment and project files been packaged and shipped back to the corporate headquarters?				Same as above
3	**WP Section 2.0**	Have all leased/rented equipment been returned and taken off lease/rental?				Same as above
4	**WP Section 2.0**	Has a walkthrough of the project area been conducted to ensure all excavations have been backfilled and no equipment remains onsite?				Same as above

FINDINGS

Item	Comments

Conducted By: _____ **Reviewed By:** _____

USA Environmental, Inc.

HEAT STRESS ALERT – Field Monitoring and Alert Checklist

DATE: **SURVEYOR(S):**

I. AREA INFORMATION		
LOCATION:		
SOURCE:		
ENGINEERING CONTROLS:		
II. SURVEY INSTRUMENT INFORMATION		
INSTRUMENT:	MODEL:	SERIAL #:
FACTORY CALIBRATION DATE:	PRE-CAL: ☐ BY:	POST-CAL: ☐ BY:
III. SAMPLING INFORMATION AND RESULTS		
HAZARD: Heat Stress	UNITS: ☐ °F ☐ (°C) ☐ WBGT	CORRECTIONAL FACTOR:

See attached printout or record below.

TIME	WBGT-OUT (°F)	WB	DB	GL	COMMENTS

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HEAT STRESS MONITORING LOG

Date: **Site Name:** **Conditions:**

UXOSO: **Location:**

Name	Organization	Start Time	Pulse Rate	Time	Pulse Rate	Time	Pulse Rate	Time	Pulse Rate

Remarks:

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PREPARATORY, INITIAL, FOLLOW-UP QC SURVEILLANCE FORM

W912DY-04-D-0006, TO #0022, Culebra Environmental Baseline Survey MRSs 09 and 13

HYDROGRAPHIC SURVEY: MBS

TEAM INFORMATION		
Team:	**Location:**	**Date:**
Team Leader:		
Personnel Present:		
Phase of Inspection (Circle): ***Preparatory (P); Initial (I); Follow-Up (F)***		

CHECKLIST						
Item	**Ref.**	**Inspection Point**	**Yes**	**No**	**N/A**	**Comments**
1	**WP Section 3.3 .2.1**	Did team verify, at dockside that each component was working individually and that the survey control software was receiving data from the GPS?				Document deficiency and report to the SUXOS for resolution and follow-up for compliance
2	**WP Section 3.3 .2.1 & SOP SRV-013 1 Section 1**	Was the RTK-DGPS base station established on an established control point (certified by a PR PLS) located near the project site prior to the vessel leaving dock, and were all required position QC checks will be performed prior to conducting survey activities?				Same as above
3	**WP Section 3.3 .2.1**	Was a comprehensive MBS calibration conducted to calibrate the different components to measure the roll, pitch and yaw?				Same as above
4	**WP Section 3.3 .2.2.1**	Was the calibration test done, at a minimum, at the start and finish of a survey, or whenever the sounder was turned off, or conditions in the survey changed?				Same as above
5	**WP Section 3.3 .2.2.1**	Was a patch test conducted at the start of the survey or if				Same as above

CHECKLIST						
Item	**Ref.**	**Inspection Point**	**Yes**	**No**	**N/A**	**Comments**
		change in survey was made?				
6	**WP Section 3.3 .2.1**	Did the daily QC check include cross check lines at the end of the survey?				Same as above
7	**WP Section 3.3 .2.1**	Was tow speed less than or equal to 4 knots per hour for 90% of the survey time?				Same as above
8	**WP Section 3.3 .2.2.1**	During survey operations, were all correction sensor and multi-beam data tagged and logged with the data acquisition system?				Same as above
9	**WP Section 3.3 .2.2.1**	At the start of the survey, was the speed of sound in seawater determined by a sound velocimeter?				Same as above
10	**WP Section 3.3 .2.2.1**	Were sound velocity profile and tide corrections applied as needed during data collection?				Same as above
11	**WP Section 3.3 .2.2.1**	Did data logging begin at the start of each survey line and were periodic checks done to ensure the data was logging?				Same as above
12	**WP Section 3.3 .2.3.1**	Were tide and sound velocity corrections applied to the raw data?				Same as above
13	**WP Section 3.3 .2.3.1**	Was the data checked for outliers in both the multi-beam and positioning data in both profile and swath modes?				Same as above
14	**WP Section 3.3 .2.3.1**	Were these erroneous data points, if any, removed?				Same as above
15	**WP Section 3.3 .2.3.2**	Were survey results integrated into the GIS along with the SSS survey results?				Same as above

FINDINGS	
Item	**Comments**

Conducted By: _____ **Reviewed By:** _____

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PREPARATORY, INITIAL, FOLLOW-UP QC SURVEILLANCE FORM

W912DY-04-D-0006, TO #0022, Culebra Environmental Baseline Survey MRSs 09 and 13

HYDROGRAPHIC SURVEY: SSS

TEAM INFORMATION		
Team:	**Location:**	**Date:**
Team Leader:		
Personnel Present:		
Phase of Inspection (Circle): ***Preparatory (P); Initial (I); Follow-Up (F)***		

CHECKLIST						
Item	**Ref.**	**Inspection Point**	**Yes**	**No**	**N/A**	**Comments**
1	**WP Section 3.3 .2.1 & SOP SRV-006 1 Section 1.1**	Was the proper towfish towing point installed or configured on the vessel?				Document deficiency and report to the SUXOS for resolution and follow-up for compliance
2	**WP Section 3.3 .2.1 & SOP SRV-006 1 Section 2.2**	Did team verify, at dockside that each component was working individually and that the survey control software was receiving data from the GPS?				Same as above
3	**WP Section 3.3 .2.1 & SOP SRV-006 1 Section 2.1**	Was the RTK-DGPS base station established on an established control point (certified by a PR PLS) located near the project site prior to the vessel leaving dock, and were all required position QC checks will be performed prior to conducting survey activities?				Same as above
4	**WP Section 3.3 .2.1 & SOP SRV-006 1 Section 2.3**	Was a rub test conducted to ensure both transducers were functioning?				Same as above
5	**WP Section 3.3 .2.2.2 & SOP SRV-006**	Was the towfish deployed to the appropriate altitude prior to running survey lines				Same as above

CHECKLIST						
Item	**Ref.**	**Inspection Point**	**Yes**	**No**	**N/A**	**Comments**
	1 Section 2.4	(altitude above bottom should equal 10% of range)?				
6	**WP Section 3.3 .2.2.2**	Did towfish remain more than 5 vertical feet from coral and sea grass throughout deployment?				Same as above
7	**WP Section 3.3 .2.1**	Was tow speed less than or equal to 4 knots per hour for 90% of the survey time?				Same as above
8	**WP Section 3.3 .2.1 & SOP SRV-006 1 Section 2.6**	Was the sensor towed past (and a pass in the opposite direction) a known object to ensure the target was detected?				Same as above
9	**WP Section 3.3 .2.2.2 & SOP SRV-006 1 Section 3.2**	Did data logging begin at the start of each survey line and were periodic checks done to ensure the data was logging?				Same as above
10	**WP Section 3.3 .2.3.2**	Was each individual file bottom tracked to ensure accurate results?				Same as above
11	**WP Section 3.3 .2.3.2**	Was layback accuracy checked by reviewing the records of an isolated object, comparing its plotted location on overlapping lines acquired in opposite directions?				Same as above
12	**WP Section 3.3 .2.3.2**	Were survey results integrated into the GIS along with the multi-beam bathymetric survey results?				Same as above

FINDINGS	
Item	**Comments**

Conducted By: _____ **Reviewed By:** _____

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PREPARATORY, INITIAL, FOLLOW-UP QC SURVEILLANCE FORM

W912DY-04-D-0006, TO #0022, Culebra Environmental Baseline Survey MRSs 09 and 13

MOBILIZATION AND SITE TRAINING

TEAM INFORMATION		
Team:	**Location:**	**Date:**
Team Leader:		
Personnel Present:		
Phase of Inspection (Circle): ***Preparatory (P); Initial (I); Follow-Up (F)***		

CHECKLIST						
Item	**Ref.**	**Inspection Point**	**Yes**	**No**	**N/A**	**Comments**
1	**WP Sections 2.2.4 & 3.6.3**	Do all personnel meet the requirements and qualifications for the positions assigned or have waivers from the USAESCH?				Complete a Personnel Qualifications Form for each employee onsite to verify qualifications and training. Document and report any deficiencies to the SUXOS for resolution and follow-up for compliance
2	**WP Sections 2.2.4 & 3.6.3**	Are all personnel trained and certified as necessary to operate equipment and machinery?				Document deficiencies and report to the SUXOS for resolution and follow-up for compliance
3	**WP & APP**	Have all field personnel reviewed the Work Plan and Accident Prevention Plan?				Same as above
4	**APP**	Have all personnel signed the Employee Sign-off Forms for the Site Safety and Health Plan, the Certificate of PPE Training and all Activity Hazard Analyses Forms?				Same as above

CHECKLIST						
Item	**Ref.**	**Inspection Point**	**Yes**	**No**	**N/A**	**Comments**
5	**APP**	Are all personnel familiar with the MSDS and know where they are located?				Same as above
6	**WP Section 2.6 & Project Schedule**	Is equipment received on island as needed to support the project schedule?				Same as above
7	**WP Section 3.1.2**	Is all required equipment functional, properly calibrated and in compliance with contract specifications?				Same as above
8	**WP Section 2.2**	Has coordination been conducted with personnel on Culebra, FWS, DNER, PREQB, the U.S. Coast Guard, FAA and USAESCH?				Same as above
9	**WP Section 5 & Puerto Rico Explosives Law**	Has transportation support been coordinated prior to scheduling movement of hazardous cargo in accordance with dangerous cargo regulations?				Same as above

FINDINGS	
Item	**Comments**

Conducted By: _____ **Reviewed By:** _____

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PERSONNEL QUALIFICATION VERIFICATION FORM

NAME: _____ **POSITION** _____

CONTRACT:

REVIEW ITEMS		QUALIFICATIONS	VERIFIED BY/DATE
EXPERIENCE	REQUIRED:		
	ACTUAL:		
EDUCATION	REQUIRED:		
	ACTUAL:		
CERTIFICATIONS & QUALIFICATIONS	REQUIRED:		
	ACTUAL:		
TRAINING	REQUIRED:		
	ACTUAL:		
OTHER	REQUIRED:		
	ACTUAL:		

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PREPARATORY, INITIAL, FOLLOW-UP CHECKLIST and QC SURVEILLANCE

W912DY-04-D-0006, TO #0022, Culebra Environmental Baseline Survey MRSs 09 and 13

PROJECT REPORTING AND SUBMITTALS

TEAM INFORMATION		
Team:	**Location:**	**Date:**
Team Leader:		
Personnel Present:		
Phase of Inspection (Circle): ***Preparatory (P); Initial (I); Follow-Up (F)***		

CHECKLIST						
Item	**Ref.**	**Inspection Point**	**Yes**	**No**	**N/A**	**Comments**
1	**WP Section 2.5 and the PWS**	Are Project Status Reports prepared in accordance with DID MR-085 and include additional items required specifically by the PWS?				Document and report deficiency to the PM and follow-up for compliance
2	**WP Section 2.5 and the PWS**	Are records of telephone conversations, written correspondence concerning this Task Order and meeting minutes in accordance with DID MR-045 and MR-055 attached to the Project Status Report?				Same as above

FINDINGS	
Item	**Comments**

Conducted By: _____ **Reviewed By:** _____

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Nonconformance Report

☐ Self-perform	☐ Subcontract SC No.		NCR No.
Brief Description and Status:			
Requirement:			
Nonconforming Condition:			
Recommended Action:			
Identified by (name):			Date:
Corrective Action to be Taken:			
Action to Prevent Recurrence			
Project Manager Approval:	Name:	Signature:	Date:
Verification of Corrective Action:			
Verified by:	Date:	QA/QC Manager:	Date:

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USA Environmental, Inc.

SAFETY INSPECTION REPORT

Site / Location:	**Date:**
Type of Inspection: ☐ Daily ☐ Weekly ☐ Re-Inspection ☐ Other	
Type of Operation Inspected:	
Equipment Inspected (Specify if Safety or Operational in Nature):	
Comments:	
Deficiencies Found or Noted:	
Corrective Action:	
Re-Inspection Required: ☐ Yes ☐ No	**If Yes, Date of Re-Inspection:**

Signatures:

_____ _____

Site Safety Officer **SUXOS/Project Manager**

***Copy to Supervisor if Deficiencies or Corrective Action were found, noted, or deemed necessary.**

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SAFETY MEETING/TRAINING RECORD

Date: **Time:** ☐ **AM** ☐ **PM**

Location/Site:

1. Reason for Meeting/Training: (Check all that apply):			
☐	Daily Safety Meeting/Training	☐	Periodic Safety Meeting/Training
☐	Initial Site Safety Meeting/Training	☐	New Site Procedures
☐	New Task Briefing	☐	New Site Information
☐	Periodic Review of Site Information	☐	Other (Explain):

2. Personnel Attending Meeting/Training:		
Name	**Signature**	**Company**

3. Topics Covered (Check all that apply)			
☐	Site Safety Personnel	☐	Decontamination Procedures
☐	Site/Work Area Description	☐	Emergency Response Plan
☐	Site Characterization	☐	Hazard Communication
☐	Biological Hazard(s)	☐	On-Site Emergency
☐	Chemical Hazard(s)	☐	On-Site Injuries/Illnesses
☐	Physical Hazard(s)	☐	Evacuation Procedures
☐	Heat Stress	☐	Rally Point(s)
☐	Cold Stress	☐	Emergency Communication
☐	Site Control	☐	Directions to Medical Facility
☐	Work and Support Zones	☐	Drug and Alcohol Policies
☐	PPE	☐	Medical Monitoring Program
☐	Air monitoring	☐	Specific Task Training
☐	Safe Work Practices	☐	Confined Spaces
☐	Engineering Controls and Equipment	☐	Heavy Equipment
☐	Spill Containment Procedures	☐	Other: (Specify)
☐	Equipment Safety	☐	Other: (Specify)

4. Remarks:

5. Verification:

I certify that the personnel listed above on this record received the Information and/or Training described as indicated. Personnel not attending this meeting/training will receive said information/training prior to commencing their assigned duties.

_____ **Date:**

Site Safety Officer - Signature

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SITE VISITORS LOG

Project Location: _____ **Month of:** _____

Date	Name	Agency or Company	Purpose of Visit	Safety Briefing	Escort Required	Time In	Time Out	Remarks

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USA Environmental, Inc.

TAILGATE SAFETY BRIEFING

Date: **Location:**

Time: ☐ **AM** ☐ **PM** **Team #:**

1. Reason for Briefing:			
☐	Daily Safety Briefing	☐	New Site Procedure
☐	Initial Safety Briefing	☐	New Site Information
☐	New Task Briefing	☐	Review of Site Information
☐	Periodic Safety Meeting	☐	Other (Specify):

2. Personnel Attending:		
Name	Signature	Position

3. Briefing Given By:		
Name	Signature	Position

4. **Topics:** (Check All That Apply)			
☐	Site Safety Personnel	☐	Decontamination Procedures
☐	Site/Work Area Description	☐	Emergency Response/Equipment
☐	Physical Hazards	☐	On-Site Injuries/Illnesses
☐	Chemical/Biological Hazards	☐	Reporting Procedures
☐	Heat/Cold Stress	☐	Directions to Medical Facility
☐	Work/Support Zones	☐	Drug and Alcohol Policies
☐	PPE	☐	Medical Monitoring
☐	Safe Work Practices	☐	Evacuation/Egress Procedures
☐	Air Monitoring	☐	Communications
☐	Task Training	☐	Confined Spaces
☐	MEC Precautions	☐	Other:

5. Remarks:

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PREPARATORY, INITIAL, FOLLOW-UP QC SURVEILLANCE FORM

W912DY-04-D-0006, TO #0022, Culebra Environmental Baseline Survey MRSs 09 and 13

UNDERWATER VISUAL INVESTIGATION

TEAM INFORMATION		
Team:	**Location:**	**Date:**
Team Leader:		
Personnel Present:		
Phase of Inspection (Circle): ***Preparatory (P); Initial (I); Follow-Up (F)***		

CHECKLIST						
Item	**Ref.**	**Inspection Point**	**Yes**	**No**	**N/A**	**Comments**
1	**WP Section 3.5 & SOP DOPS-08**	Were pre-operations checks performed on the ROV, pole camera and related equipment?				Document deficiency and report to the SUXOS for resolution and follow-up for compliance
2	**WP Section 3.5 and SOP DOPS-08**	Were expanded surveys conducted on discovered MEC-like items using the ROV?				Same as above
3	**WP Section 3.5 SOP DOPS-08**	Were post-operations checks performed on the ROV, pole camera and related equipment?				Same as above

FINDINGS	
Item	**Comments**

Conducted By: _____ **Reviewed By:** _____

PREPARATORY, INITIAL, FOLLOW-UP QC SURVEILLANCE FORM

W912DY-04-D-0006, TO #0022, Culebra Environmental Baseline Survey MRSs 09 and 13

WORK & STAGING AREA PREPARATION

TEAM INFORMATION		
Team:	**Location:**	**Date:**
Team Leader:		
Personnel Present:		
Phase of Inspection (Circle): ***Preparatory (P); Initial (I); Follow-Up (F)***		

CHECKLIST						
Item	**Ref.**	**Inspection Point**	**Yes**	**No**	**N/A**	**Comments**
1	**WP Section 2.10**	Has coordination with support facilities been conducted?				Document and report deficiency to SUXOs for resolution, follow-up for compliance
2	**SSHP**	Are work zones, exclusion zones and team separation distances been established and briefed to site personnel?				Same as above
3	**SSHP**	Have break and rest areas been established in accordance with the reference?				Same as above
4	**SSHP**	Have toilet facilities been established in accordance with EM 385-1-1, Table 2-1?				Same as above

FINDINGS	
Item	**Comments**

Conducted By: _____ **Reviewed By:** _____

APPENDIX G. RESERVED

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APPENDIX H. RESUMES

This appendix contains resumes for the following USA personnel:

- Crownover, R.
- Lewis, J.
- Ralston, D.
- Skubin, B.
- Tucker, M.

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ROBERT D. CROWNOVER **CORPORATE SAFETY AND QC MANAGER**

Date Completed Basic EOD School: August 1978

OTHER PERTINENT TRAINING: HAZWOPER 40 HOUR, AUG 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	Site 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	Site 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 – Present	Corporate Safety & Health Manager/Quality Control Manager, USA Environmental, Inc., Oldsmar, FL. Responsible for the development and

implementation of USA's Safety and Quality Control programs and plans for all USA job sites to include: Pinecastle TCRA, Orlando, FL; Vieques, PR JN01; Iraq Mobile Teams; CWM and IPBC, Ft. Benning, GA; RI/FS Popoki, HI; RI/FS, Adak, AK; MEC Reconnaissance & Avoidance, Former Koon-Ni Range, Korea; CMC, Iraq; and EE/CA Camp Chaffee, AR. Reviews draft and final work plans for accuracy, completeness, and content. Interfaces with external agencies on safety, quality control and health issues at the corporate or job site levels, and performs project site inspections, audits and on-site safety and quality control support to ensure compliance with requirements and standards. Traveled to Iraq on several occasions during the Army Corps of Engineers' Captured Enemy Ammunition (CEA) and Coalition Munitions Clearance (CMC) Contracts to provide training, management and audits of its safety and quality control personnel for the USA mobile teams and depot operations.

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

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 databse 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.

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DOUGLAS D. RALSTON **PROGRAM/PROJECT MANAGER**

Date Completed Basic EOD School: August 1971

OTHER PERTINENT TRAINING: HAZWOPER 40 HOUR OCTOBER 1995; CURRENT 8 HOUR SUPERVISOR/REFRESHER.

MILITARY EOD ASSIGNMENTS:

Sep 71 - Feb 72	EOD Specialist, 53d Ord Det EOD, Vancouver, WA. Learned basic EOD Operations and how to be a team member. First Range clearance at Yakima Firing range.
Mar 72 - Apr 73	EOD Specialist; 510th Ord Det EOD, Northern Greece. Learned nuclear operations in this unit. PPE monitoring hotline for nuclear contamination and work on nuclear weapons.
Apr 73 - Mar 74	EOD Specialist; 142D Ord Det EOD, Ft McClellan, AL. Participated in "Peacetime" chemical disposal of all Agents when the Chemical Schools closed. Learned the trade conventional response & range work.
Mar 74 - Aug 78	EOD Supervisor; 547th Ord Det EODCT, Ft Gillem, GA. Staff position involving training of subordinate EOD units, funding, operations, and security. Participated in incident responses at Ft Bragg, NC and Ft McClellan, AL.
Aug 78 - Aug 81	EOD Supervisor; 13th Ord Det EOD, Ft. Gillem, GA; Responding to several hundred incidents as team leader. Taught classes for safety and was involved in production of the EOD Range Clearance movie.
Nov 81 - Aug 84	EOD Supervisor; 72d Ord Det EOD, Bremerhaven, Germany; Typical work in dark world of Northern Germany. Extensive work for 3 years at Grafenwoehr the largest training area in Germany.
Aug 84 - Aug 85	EOD Supervisor; 2d Ord Det EOD, Grafenwoehr, Germany; Responded to chemicals located at Grafenwoehr. Responsible within unit for over 400 EOD incidents and the destruction of 12,000 tons of DEMO 2 and small range work at Grafenwoehr.
Oct 85 - Aug 87	EOD Supervisor; 87th Ord Det EOD, San Francisco, CA; Detachment NCO; Supervised 18 personnel, directed and performed the EOD mission of 150 EOD incidents per year in Northern California along with range work at Ft. Ord & Camp Roberts.
Sep 87 - Aug 93	EOD Supervisor, Operations NCO E-8; 168th Ord Det EODCT, Mannheim, Germany; Written command directives on safety in EOD Opns involving ACRs and Range Clearances. Involved directly in EOD Operations; chemical, nuclear and conventional.
Aug 93 - Oct 94	EOD Supervisor, 17th Ord Det EOD, Ft. Campbell, KY; Detachment NCO supervised 27 personnel; performed EOD operations in TN and KY. Responded to incidents at FUDS in KY and directed small range clearance Opns at Ft. Campbell. RETIRED.

CIVILIAN UXO EXPERIENCE:

May 95 - Aug 95	UXO Supervisor, UXB International, Raritan Arsenal, NJ. In charge of a brush crew that cleared 31 acres of swamp and location of ordnance items: 37mm HE, adapter boosters, U.S. and French hand grenades.
Aug. 95 - Apr. 96	UXO Supervisor, CMS, Environmental, Inc., Fort Ord, CA. Team leader in charge of a brush crew that cleared 314 grids without any OE accidents. Also responsible for the location and identification of ordnance items

which included 22mm and 14.5mm subcaliber rounds, rockets, and mortars.

Apr. 96 - Aug. 96 Project Manager, CMS Environmental, Inc., George Air Force Base (AFB), Victorville, CA. Managed an ordnance remediation job site at George AFB. Successfully cleared three areas consisting of 318 100x100 feet grids, including a 40mm grenade range, with no lost time accidents. Managed a workforce of 14 UXO technicians. Responsible for a $490,000 programmed budget, including per diem and purchased and/or leases of supplies and equipment. Responsible for producing daily, weekly, and monthly reports and coordination with the BRAC office, Bureau of Prisons, and the Victorville Economic Development Agency. Safely completed all task order objectives two weeks ahead of schedule and under projected cost estimates. All work was accepted by the US Army Corps of Engineer's site representative on the first inspection.

Aug. 96 - Dec. 96 Project Manager, CMS Environmental, Inc., Camp Elliott, East Elliott, CA. Successfully completed an EE/CA project consisting of 101 sampling grids within a 3,200 acre FUDS site, ahead of schedule, under projected cost estimates, and with no lost time accidents. Managed a workforce of 14 UXO technicians, five laborers, and one clerk typist. Responsible for producing daily, weekly, and monthly reports.

Jan 97 – Jul 98 Project Manager, CMS Environmental, Inc., Fort Ord, CA. Managed an ordnance remediation project of 29.5 million dollars. The work involved the preparation of monthly Cost and Schedule Status Reports. During the performance of the contract no accidents occurred in the performance of work with explosives or vehicles. Participated in weekly and monthly meetings with the Corps of Engineers and the Installation to make decisions on the progress of the work and future sampling and removal actions this included public meetings to brief on the status of the contract.

Jul 98 – Dec 00 Project Manager, USA Environmental, Inc., Fort Ord, CA. Managed an ordnance remediation project of 29.5 million dollars. The work involved the preparation of monthly Cost and Schedule Status Reports. During the performance of the contract no accidents occurred in the performance of work with explosives or vehicles. Participated in weekly and monthly meetings with the Corps of Engineers and the Installation to make decisions on the progress of the work and future sampling and removal actions this included public meetings to brief on the status of the contract.

Jan 01 – Apr 04 Project Manager, USA Environmental, Inc., Tampa, FL. Responsible for the planning, scheduling, oversight and cost estimating of UXO support operations at the former Fort Ord, CA, Fort McClellan, AL, Benicia, CA, and Sioux Army Ammunition Depot, NE. Project Manager for the Frankford Arsenal EE/CA in Philadelphia, PA a small (110 acres) but complex EE/CA being performed in the City of Philadelphia and the States of Pennsylvania and New Jersey. Assisted USA Environmental Marketing in preparing responses to requests for proposal from US Army Corps of Engineers, AFCEE and NavFAC. Prepared and presented presentations on UXO operations at the former Fort Ord, California for the 2000 UXO Forum and the 2001 Louisville Corps of Engineers District Ordnance and Explosives Conference.

Apr 04 – Aug 04 Site Manager, USA Environmental, Inc. Overseas Operations, Captured Enemy Ammunition, Iraq. Managed former Iraqi Ammunition Supply Point including retrieval, receipt, inventory, storage, packaging, transport and disposal of captured Iraqi munitions. Duties included administrative oversight of all reports and finances; operational oversight of munitions,

	EOD, security, medical and logistics activities. Managed more than 120 personnel in all aspects of ASP operations.
Aug 04 – Oct 04	Operations Manager/Task Order Manager for Overseas Operations, USA Environmental, Inc., Mobile Teams Task Order, Iraq. Managed task order with multiple teams conducting clearance activities of Captured Enemy Ammunition (CEA) and UXO at various remote locations in Iraq in support of the CEA program.
Oct 04 – Mar 06	Project Manager for Overseas Operations, USA Environmental, Inc., Coalition Munitions Clearance (CMC), Iraq. Managed all facets of the CMC project including mobile teams, remote teams and depot operations for USA Environmental. Worked closely with representatives of the Corps of Engineers and other contractor management personnel as needed. Prepared and submitted final reports for the depots and mobile teams to the Army Corps of Engineers at the completion of the project.
Mar 06 - Present	Program/Project Manager, USA Environmental, Inc., Oldsmar, FL. Responsible for the planning, scheduling, oversight and cost estimating of UXO support operations for multiple projects to include Vieques, PR, Culebra, PR, Pinecastle TCRA, Orlando, FL, and Okinawa, Japan. Assists USA Environmental Marketing in preparing responses to requests for proposal from US Army Corps of Engineers, AFCEE and NavFAC. Knowledge of applicable federal, state, and local laws, regulations, and guidance.

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BRIAN SKUBIN **TECHNICAL OPERATIONS MANAGER**

Date Completed Basic EOD School: March 2003

OTHER PERTINENT TRAINING: B.S. ENGINEERING/MATH/SCIENCE, U.S. NAVAL ACADEMY, ANNAPOLIS, MD; 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. Responsible for the planning, scheduling, oversight and cost estimating of UXO support operations for multiple projects to include Ft Benning, GA; Farallon de Medinilla, Marianas Island; Aberdeen Proving Ground, MD; Columbus AFB, MS; Vieques Puerto Rico; Miami River Dredging, FL; Rock Island Arsenal, IL; and Louisiana Army Ammunition Plant, LA. Additional responsibility includes planning, training and management of all underwater UXO operations for USA to include diving personnel and remotely operated vehicles (ROVs).

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MATTHEW TUCKER **PROJECT MANAGER**
B.S. ENGINEERING GEOLOGY, UNIVERSITY OF TENNESSEE
OTHER PERTINENT TRAINING: HAZWOPER 40 HOUR JUL 09; CURRENT 8 HOUR REFRESHER; PROFESSIONAL GEOLOGIST (PG), TN LICENSE 00005219

Jan 99 – May 07 **Engineer/Project Manager**, City of Chattanooga, Chattanooga, TN – Public Works Department. Performed and/or managed in-house and out-sourced design-build activities. Conducted activities involved in planning, concepts, engineering design, and specifications involved with roadway, streetscape, sanitary sewer, storm sewer, environmental, municipal solid waste facilities, buildings, facilities, and site projects ranging from $2 to $10 million in value. Oversight and support in the development of engineered systems (i.e., pavement construction materials, erosion control, geotechnical engineering; infrastructure management systems, etc.). Procurement and technical oversight of professional consulting services. Procurement, coordination and oversight of contract bidding (general contractor and/or subcontractors) and awarding processes. Contract administration, scheduling management, coordination of progress meetings, and quality assurance of construction projects. Coordinated and/or oversaw work coordination with utility companies and/or other city departments/divisions. Technical expertise for implementation and support of engineering projects and/or systems within technical specialties noted above.

May 07 – Nov 07 **Construction Project Manager,** Dillard Construction, Inc., Dayton, TN. Project management of build-build projects for the following types of building construction: commercial warehouse/distribution centers ($5-20 million); industrial and pharmaceutical manufacturing facilities ($10-30 million); residential-commercial mixed use developments ($5-25 million); residential developments ($1-5 million); infrastructure and site developments ($2-$15 million). Involved in preconstruction management and construction management. Preconstruction activities included but were not limited to: design coordination, construction document QA-QC reviews, building preliminary project schedules, obtaining building and environmental permits, creating/reviewing project cost estimates and bids, providing value engineering alternatives, bid coordination and proposal evaluation and negotiating contract agreements. Construction activities included but were not limited to: maintaining positive working relationships with clients/subcontractors, project budgeting and document tracking, subcontractor coordination, project scheduling, establishing job site management organization and job site procedures, and carrying out project close-out procedures.

Dec 07 – Jul 09 **Sr. Transportation Planning Coordinator,** North Georgia Regional Development Center, Dalton, GA. Program management of transportation planning services for the Dalton-Whitfield County metropolitan planning organization (MPO). Major duties included, but were not limited to: developing and administrating unified planning work program for the MPO; monitoring and administering FHWA/FTA and GDOT service contracts; providing preliminary transportation engineering and construction cost estimates for the roadway improvement plan; maintaining and processing amendments made to the adopted long range transportation plan (LRTP) and transportation improvement program (TIP); serving as a technical advisor for three standing MPO committees; serving on the Whitfield county comprehensive planning technical advisory committee; conducting facility needs assessments and corridor studies; preparing and reviewing quarterly and annual progress reports; conducting public involvement meetings and presentations; and overseeing GPS/GIS data collection activities.

Dec 05 – Jul 09 **Project/Construction Management,** Tucker Consulting, Chattanooga, TN. Self-employed consultant providing coordination and management services to multi-party groups involved in the following types of projects: federal and state superfund sites (RCRA, CERCLA, etc.); closing and decommissioning of major industrial and commercial facilities; DOD/UXO decommissioning projects (VAAP, Chattanooga, TN); state-mandated site remediation; voluntary site remediation to allow for property sale or redevelopment (brownfields); and non-environmental site development. Services provided to clients included: Phase I/Phase II reviews; coordination of multi-site auditing, assessment and remediation programs; regulatory agency negotiation support; peer review and assessment of technical reports, plans and specifications; value-engineering/constructability reviews; remedial strategy development (CERCLA); waste stream recycling programs; cost estimating/evaluation/reserve analysis; development of consultant/contractor work scopes; management of services procurement (RFP, bidding/selection, contracting); oversight of remedial construction/construction management; file reviews/environmental executive summaries; and operation and maintenance of remedial systems.

Jul 09 – Present **Project Manager,** USA Environmental, Inc., Oldsmar, FL. Responsible for the planning, scheduling, technical guidance, quality assurance, project coordination and oversight, and cost estimating and management of munitions response operations for multiple projects, including various RI/FSs and RAs at Camp Lejeune, NC; an RI/FS effort at Sierra Army Depot, CA; a RI/FS at Milan Army Ammunition Plant; and UXO support at Rock Island, IL; provides CERCLA, RCRA and other regulatory guidance.

APPENDIX I. RESERVED

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APPENDIX J. SCHEDULE

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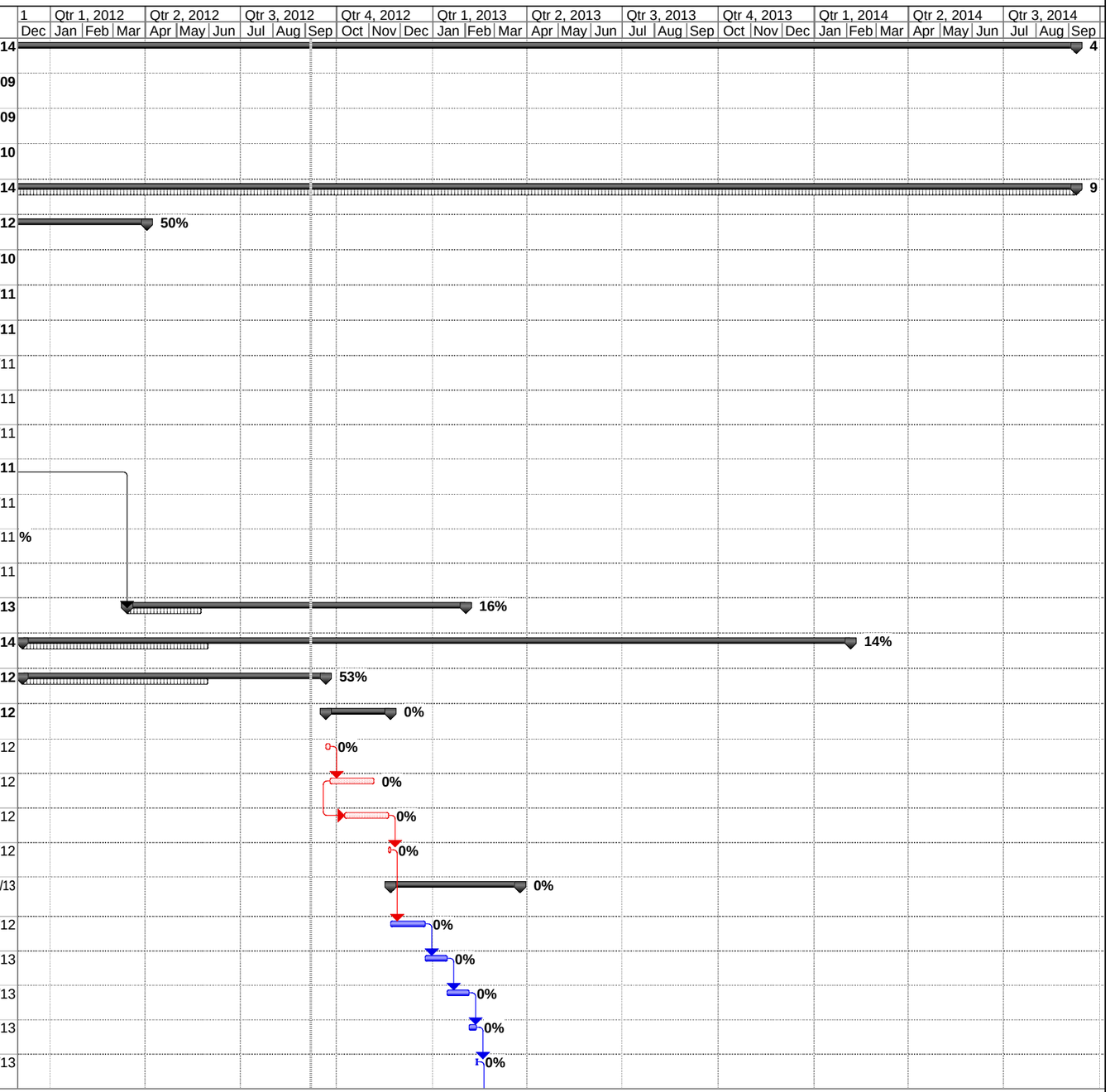
Culebra RI/FS Project Schedule (4D6-22)

ID	Task Name	Duration	Start	Finish
1	**Culebra RI/FS (4D6-22)**	**1312 days?**	**Mon 8/31/09**	**Mon 9/8/14**
2	**Task Order Award**	**70 days**	**Mon 9/14/09**	**Fri 12/18/09**
7	**Technical Project Planning Meeting 1**	**11 days**	**Mon 8/31/09**	**Mon 9/14/09**
11	**TPP Memorandum**	**99 days**	**Tue 10/6/09**	**Fri 2/19/10**
16	**Draft and Draft Final Work Plan (WP)**	**1300 days**	**Wed 9/16/09**	**Mon 9/8/14**
23	**Public Involvement Plan (PIP)**	**647 days**	**Mon 10/12/09**	**Mon 4/2/12**
29	**Technical Project Planning Meeting 2**	**9 days**	**Mon 9/13/10**	**Thu 9/23/10**
32	**Technical Project Planning Meeting 3**	**34 days?**	**Mon 1/17/11**	**Thu 3/3/11**
35	**Final WP**	**10 days**	**Fri 4/15/11**	**Thu 4/28/11**
38	Receipt of Notice to Proceed (NTP)	1 day	Fri 4/29/11	Fri 4/29/11
39	Receipt of NTP for Turtle Monitoring	1 day	Mon 1/24/11	Mon 1/24/11
40	Turtle Monitoring	150 days	Tue 1/25/11	Fri 8/19/11
41	**RI/FS Field Activities**	**110 days**	**Thu 5/5/11**	**Tue 10/4/11**
72	Environmental Sampling	10 days	Mon 9/26/11	Fri 10/7/11
73	Electronic Laboratory Data Submittal	1 day	Wed 11/2/11	Wed 11/2/11
74	Analytical Data Submittal for QA	1 day	Wed 10/26/11	Wed 10/26/11
75	**RI/FS (Land Portions Only)**	**232 days**	**Thu 3/15/12**	**Fri 2/1/13**
109	**Expanded U/W Investigation (MRS 13 and MRS 09)**	**566 days**	**Tue 12/6/11**	**Tue 2/4/14**
110	**Phase I Work Plan Revision (Basline Survey Report [BSR])**	**208 days**	**Tue 12/6/11**	**Thu 9/20/12**
131	**Expanded RI/FS U/W Field Work- Phases Ia & Ib (BSR)**	**44 days**	**Fri 9/21/12**	**Wed 11/21/12**
132	Mobilization	2 days	Fri 9/21/12	Mon 9/24/12
133	Phase I - Sidescan Sonar/ Bathymetry Survey	30 days	Tue 9/25/12	Mon 11/5/12
134	Phase II - Underwater Visual Survey	30 days	Tue 10/9/12	Mon 11/19/12
135	Demobilization	2 days	Tue 11/20/12	Wed 11/21/12
136	Baseline Survey Report (BSR)	88 days	Thu 11/22/12	Mon 3/25/13
137	Draft Baseline Survey Report	23 days	Thu 11/22/12	Mon 12/24/12
138	Government Review Period	15 days	Tue 12/25/12	Mon 1/14/13
139	CX Review Period	15 days	Tue 1/15/13	Mon 2/4/13
140	Response to Comments and Revision	5 days	Tue 2/5/13	Mon 2/11/13
141	Draft Final Baseline Survey Report	1 day	Tue 2/12/13	Tue 2/12/13

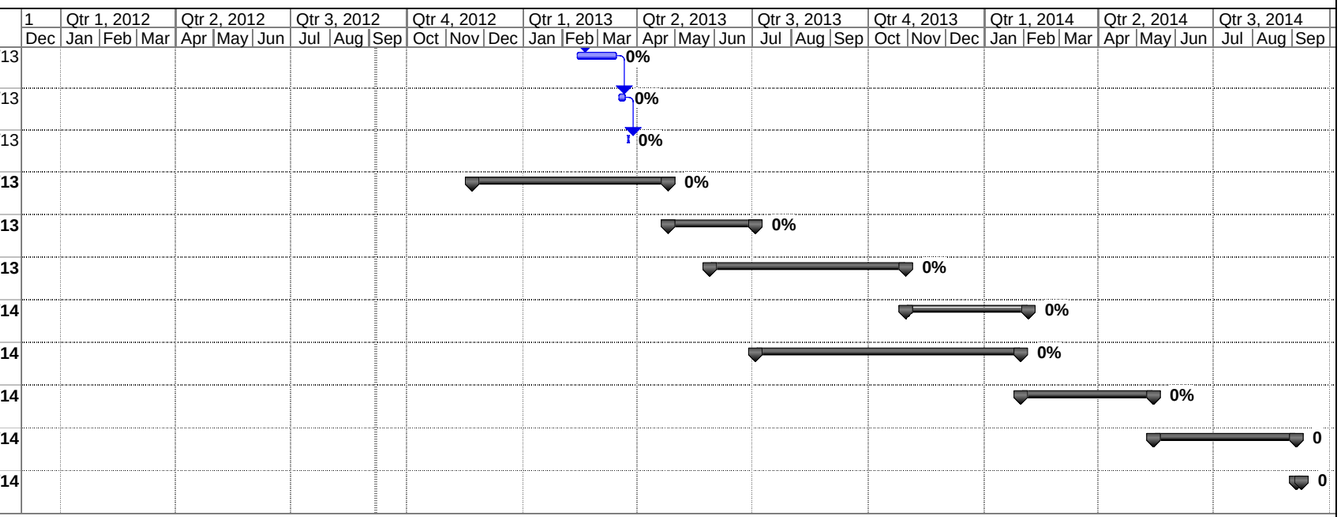


Project: Culebra RI/FS (4D6-22)
Revision Date: Thu 9/6/12

Critical		Task		Baseline		Milestone		Project Summary		Deadline	
Critical Split		Split		Baseline Split		Summary Progress		External Tasks			
Critical Progress		Task Progress		Baseline Milestone		Summary		External Milestone			

Culebra RI/FS Project Schedule (4D6-22)

ID	Task Name	Duration	Start	Finish
142	Regulator Review Period	23 days	Wed 2/13/13	Fri 3/15/13
143	Response to Comments and Revision	5 days	Mon 3/18/13	Fri 3/22/13
144	Final Baseline Survey Report	1 day	Mon 3/25/13	Mon 3/25/13
145	**Phase II Work Plan (U/W Geophysical Survey)**	**111 days**	**Thu 11/22/12**	**Thu 4/25/13**
157	**U/W Field Work- Phase II- U/W Geophysical Survey**	**49 days**	**Fri 4/26/13**	**Wed 7/3/13**
165	**Phase III Work Plan (U/W Intrusive Investigations)**	**111 days**	**Wed 5/29/13**	**Wed 10/30/13**
177	**U/W Field Work- Phase III- Intrusive Investigation**	**69 days**	**Thu 10/31/13**	**Tue 2/4/14**
184	**U/W RI/FS Reports**	**150 days**	**Thu 7/4/13**	**Wed 1/29/14**
200	**Proposed Plan**	**75 days**	**Thu 1/30/14**	**Wed 5/14/14**
210	**Decision Document (DD)**	**81 days**	**Thu 5/15/14**	**Thu 9/4/14**
222	**Administrative Record**	**2 days**	**Fri 9/5/14**	**Mon 9/8/14**



Project: Culebra RI/FS (4D6-22)
Revision Date: Thu 9/6/12

Critical		Task		Baseline		Milestone		Project Summary		Deadline	
Critical Split		Split		Baseline Split		Summary Progress		External Tasks	
Critical Progress		Task Progress		Baseline Milestone		Summary		External Milestone	

APPENDIX K. STANDARD OPERATING PROCEDURES (SOPS)

This appendix contains the following SOPs related to the RI/FS project at the Culebra Island Site:

- DSOP-08, Remotely Operated Vehicle Operations
- HSP-01, Accident Reporting
- HSP-23, Weather Emergencies
- OPS-11, Hand and Power Tool Operation
- OPS-19, Site Rules and Prohibited Practices
- OPS-23, Leased and Rental Vehicles
- OPS-25, Field Procedure Document Change Protocol
- SOP-SRV-006, Side Scan Sonar Surveys
- SOP-SRV-013, Multibeam Hydrographic/Bathymetric Surveys.

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STANDARD OPERATING PROCEDURE
DSOP-08: UNDERWATER REMOTELY OPERATED VEHICLE OPERATIONS

1.0 PURPOSE

This Standard Operating Procedure (SOP) will be used to provide the minimum procedures and safety and health requirements applicable to the conduct of underwater Remotely Operated Vehicle (ROV) operations on sites contaminated with unexploded ordnance (UXO) or munitions and explosives of concern (MEC). This specific SOP will highlight procedures and requirements applicable to most underwater MEC operations where utilization of an ROV is planned.

2.0 SCOPE

This SOP applies to all USA Environmental, Inc. (USA) site personnel, including contractor and subcontractor personnel, involved in the conduct of underwater ROV operations on a UXO/MEC contaminated site. This SOP is not intended to contain all of the requirements needed to ensure complete compliance, and should be used in conjunction with approved project plans and applicable referenced regulations.

3.0 EQUIPMENT DESCRIPTION

The ROV unit identified for USA underwater operations is the VideoRay PRO 3 XE GTO. This standard ROV unit contains a multiple thrust propulsion system, high-intensity halogen lights, and high-resolution forward/rear cameras

The following additional components can also be utilized with the system:

- Smart Tether navigation and positioning system
- Detachable 900-kHz multibeam sonar.

Maneuvering the ROV is accomplished through use of a control console situated with the operator. The console also contains a display screen for viewing real time video images of the underwater environment. The console allows activation of a series of options, including depth control functions, magnetic heading and depth display, and video recording. The recorded video can be viewed following completion of

underwater operations, and still images can be captured and inserted into associated reports and documents.

Optional sonar images can also be displayed on the console screen, and can be viewed concurrently with video images.

The operational depth range for the VideoRay System extends from 1 to 400 feet (ft), depending on the tether type and length. The system can be deployed while operating from a small boat or land based location, and is powered from a standard 110-volt receptacle, a small gasoline generator, or a 12-Volt vehicle/marine battery with 12VDC to 110VAC power inverter.

4.0 GENERAL OPERATIONAL AND SAFETY PROCEDURE

All personnel, including contractor and subcontractor personnel, involved in ROV operations on UXO/MEC-contaminated sites will be familiar with the potential safety and health hazards associated with the conduct of underwater ROV operations, and with the work practices and control techniques used to reduce or eliminate these hazards.

The VideoRay ROV User Manual and Operations Checklist accompanying this SOP will be utilized for safe and operate the ROV, and the following general procedures are provided to ensure the safe and effective completion of underwater ROV operations:

- Unless otherwise planned and authorized, no physical contact with UXO/MEC will be made during ROV operations
- As required, utilize chase boats, marker buoys, U.S. Coast Guard assets, and local law enforcement agencies to establish and maintain water surface and underwater exclusion areas while conducting ROV operations
- Ensure that electrical safety procedures are closely followed given the power source utilized. These procedures include properly grounded generators, cover/shielding of battery terminals, and protecting electrical outlets from water intrusion. Electrical cords associated with the system should be suspended above the floor/boat deck in order to avoid contact with standing water.
- Generators will only be operated in well ventilated spaces. Spill containment procedures will be followed when refueling generators.

More specific operating and safety procedures will be dependant on the operating location and requirements.

5.0 SPECIAL REQUIREMENTS FOR UNDERWATER ROV OPERATIONS

The presence of sensitive marine habitats or protected marine species may exist in the area where ROV operations are intended. It is imperative to be aware of applicable regulations regarding sensitive marine habits, and comply with all guidelines. Refer to specific, site related information outlined in the associated work plans or provided by other guidance documents.

6.0 REFERENCES

Applicable sections and paragraphs in the documents listed below will be used as references for the conduct of ROV Operations:

- USA Corporate Safety and Health Program
- Basic Safety Concepts and Considerations for Ordnance and Explosives Operations, EP 385-1-95a
- USACE EM 385-1-1, Safety and Health Requirements Manual
- VideoRay PRO 3 XE GTO User's Manual and Operations Checklist

VideoRay Operating Checklists

Make sure the power switch is set to "Off" before plugging in or unplugging any connections!

Make sure all connections are securely fastened to avoid loss of control or loss of your VideoRay!

Pre-Dive Checklist

- ❑ Visually inspect the vehicle, especially the thruster shaft seals for signs of leaking, low oil or contamination, and the desiccant pack in the rear of the main housing for signs of moisture.
- ❑ Visually inspect the tether for nicks or other signs of damage.
- ❑ Connect all cables and ensure that the tether connectors are screwed together to avoid separation and loss of the VideoRay.
- ❑ Power up the VideoRay by engaging the main **Power** switch to ***On***.

  CAUTION *Do not operate the thrusters for more than 20 seconds when the VideoRay is out of the water. Prolonged operation in a dry environment will result in damage to motor shaft seals.*
- ❑ Ensure that the propellers are free of tangles and check the propeller guards for damage and / or misalignment. Displace the joystick in all directions to test the port and starboard thrusters.
- ❑ Using the **Depth Control** knob, rotate it to test the vertical thruster. Return the knob to the neutral (centered) position.

  CAUTION *Do not operate the lights for more than 60 seconds when the VideoRay is out of the water. Doing so may cause overheating and damage the unit.*
- ❑ Verify that the lights are working by turning the **Lights** knob toward ***Bright***, and then returning the knob to the ***Dim*** position.
- ❑ Check the camera **Tilt** and **Focus** functions and video display operation. If you are using a recording device, check that it is operational. If equipped, check the rear facing camera and lights.
- ❑ Check any other additional accessories according to the specific procedures for each accessory.
- ❑ Ballast the vehicle according to the conditions and make sure the ballast is secure.
- ❑ Check the dive area for potential hazards prior to launching the VideoRay and alert others in the area when you are ready to launch.

Post-Dive Checklist

- ❑ Power down the system by engaging the main **Power** switch to ***Off***.
- ❑ Make sure the VideoRay is securely on-board, unplugging any connections.
- ❑ Visually inspect the VideoRay to ensure that no damage has occurred.
- ❑ Visually check through the ports to ensure that no water has entered the pressure housings.
- ❑ Check that the propeller shafts have not been fouled with material such as fishing line, string, seaweed, or other debris.
- ❑ Thoroughly rinse the vehicle with fresh water prior to being stored away. Be sure to rinse and drain the pressure sensor cavity under the float block (if equipped).
- ❑ Inspect the tether for cuts, nicks and / or kinks in the outer shell. Store the tether properly for the next use.
- ❑ Store all components securely.

For convenience and operational efficiency, use a wipe off marker to complete each checklist.

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VideoRay

PRO 3 XE GTO

REMOTELY OPERATED PROFESSIONAL SUBMERSIBLE

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1 INTRODUCTION

1.1 ABOUT THIS MANUAL

The purpose of this manual is to provide information only. It is subject to change without notice and does not represent a commitment on the part of VideoRay, or its agents.

1.2 ABOUT YOUR VIDEORAY

Prior to shipment, your VideoRay Submersible was tested and found to comply with factory standards.

The serial number of the VideoRay is labeled on the hull under the float block, and inside the hull (visible through the rear dome). The serial number of the controller is engraved on a plate that is attached to the front of the Controller case. Please provide your system serial number(s) whenever corresponding with us.

1.3 FRIENDLY ADVICE

"Flying" the VideoRay can be somewhat addictive. If you are operating VideoRay and have an important appointment later in the day, we strongly recommend you set an alarm clock or arrange to have a friend remind you at the appointed time!

2 GENERAL INFORMATION

2.1 DESCRIPTION

VideoRay is a submersible, Remotely Operated Vehicle (ROV) designed to take advantage of its portability and size. Set up and vehicle control are simple and intuitive, enabling VideoRay to be easily carried, deployed, and operated by one person. VideoRay can go anywhere, powered by conventional AC, or a battery pack and inverter. Operation of the VideoRay is quickly mastered after only a few practice "flights." Connection to a video monitor provides the operator with a view of everything the VideoRay sees.

VideoRay carries no batteries; it is completely powered and controlled from the surface through a small diameter tether.

For operational safety, the joystick control, vehicle and tether carry a maximum voltage of 48 Volts DC.

2.2 OPERATING ENVIRONMENT

VideoRay ROV

Medium:	Fresh or Salt Water
Operating Temperature:	32-122º F (0-50ºC)

VideoRay Integrated Control Box (ICB)

Caution: While the VideoRay ROV is designed to be operated in water, the Integrated Control Box is splash-resistant and should not be subject to excessive water spray or rain when opened. The Integrated Control Box case is watertight only when closed.

VideoRay is equipped with a universal power supply. The input voltage range is 100-240Volts AC, 50-60 Hz. A standard computer power cable is used, and in general, the controller may use any standard AC electrical source in Europe or North America. An optional adapter may be required for use in some countries.

VideoRay can be powered from a battery using an AC inverter. VideoRay recommends at least a 600 Watt inverter. Sometimes the quality of the inverter can affect the operation of VideoRay. Some inexpensive inverters do not produce a true sine wave AC output. Instead they produce a 'chopped' or 'simulated' sine wave that can produce a lot of electrical noise. A poor quality inverter may produce enough noise to interfere with operation and/or video quality of VideoRay.

2.3 SPECIFICATIONS

VideoRay is equipped with a forward facing color camera, two lights, two horizontal thrusters and one vertical thruster. A rear black and white camera and rear lights are also included in the Pro III.

Options for the VideoRay Pro III include a manipulator, sonar system positioning system, radiation sensor and more. (See Section 10 on Accessories for more information). Additional options are being added on a regular basis, please check http://www.videoray.com or your VideoRay dealer for the latest information.

Depth Rating	152 m (500 feet)
Depth Gauge	Selectable meters or feet
	Resolution = 0.1 units (meters or feet)
Dimensions	35.5 cm (14 inches) long
	22.5 cm (8-7/8 inches) wide
	22.9 cm (9 inches) high
Weight	3.6 kg (8 lb)
Operating Voltage	100-240 Volts AC controller supply voltage
Internal Voltage	48 Volts DC maximum
Lights	2 - 20 Watts (1 port, 1 starboard)
Front Camera Viewing Angle	+/- 90º
Front Camera Tilt Angle	+/- 75º Pitch (vertical rotation)
Front Camera Focus	From the face of the housing dome to infinity
Rear Camera Tilt / Focus	Fixed
Video Display Monitor	127mm (5 inch) LCD
Tether	76 m (250 feet) Neutrally Buoyant is standard
	Custom length, neutral or negative buoyancy is available
	Minimum bend diameter = approximately 8 cm (3 inches)
Speed	0 – 4 knots

3 SAFETY FIRST!

The following safety tips may prevent injury to you as the operator and those around you, or damage to the VideoRay submersible.

3.1 USE COMMON SENSE

1) Read the safety and operating instructions before operating the VideoRay.
2) Heed all warnings printed on the system components and in the manual.
3) Retain this manual and other safety and operating instructions for future reference.
4) Be aware of and alert to potential hazards in and around water, including weather conditions, and follow standard water safety practices.

3.2 ELECTRICAL AND VIDEORAY SAFETY

1) Electricity and Water don't mix! Use caution with all power supply cables and do not handle them while you are in contact with water or allow them to come into contact with water. The VideoRay submersible, the tether and approved accessories are the only items that can be safely placed in water.
2) Do not use any system that contains broken or ruptured insulation, frayed wires or loose connections. Repair such conditions before resuming operations.
3) Protect the Integrated Control Box from splashes and immersion in water when open. The controller is sealed when closed, and splash resistant when open.
4) Always plug the system into a grounded receptacle.
5) There are no user serviceable parts inside the Integrated Control Box. Only qualified technicians or VideoRay personnel should perform electrical servicing.
6) Do not subject the VideoRay to impact.
7) Never operate the lights for more than 60 seconds out of water. Never operate the thrusters for more than 20 seconds out of water. Your VideoRay is designed for submerged operation and requires water to cool the lights and thrusters.
8) Do not stress or kink the tether or bend it tighter than the minimum bend diameter, which is about 3 inches. Do not allow the tether to be deployed over sharp edges or rough surfaces.

3.3 PERSONAL SAFETY

Be aware of the safety of those around you!

1) Beware of swimmers or boaters. The VideoRay and tether can pose a hazard to swimmers, divers, and small craft, as well as persons in and around the operating area. Obtain the acknowledgment of those around you prior to launch. Make sure everyone within VideoRay's range of operation is aware the vehicle is being deployed.
2) Keep your operating area neat and free of accident causing clutter.
3) Keep fingers and objects clear of the thruster propellers.

4 GETTING FAMILIAR WITH YOUR VIDEORAY

4.1 UNPACKING YOUR VIDEORAY

Your VideoRay Remotely Operated Video Inspection Submersible is packaged and shipped in two rugged Pelican Diver Cases. These cases have O-rings and are sealed against water when closed. The smaller case integrates the power supply, controller, and optional screen and or recording device. The larger wheeled case contains the VideoRay ROV, tether and if purchased, the optional Tether Deployment system.

Upon receiving your VideoRay, check the containers and contents for any damage that may have occurred during transport.

4.2 INSPECTING YOUR VIDEORAY

In the shipping crates you should find these components:

1) Fully assembled VideoRay ROV with tether
2) Integrated Power Supply / Controller
3) Maintenance Tools and Spare Parts Kit
4) Video Monitor (mounted in Controller case cover)
5) This Owner's Manual and related reference cards
6) Any optional accessories you purchased

Should any of these components be missing or damaged, please notify the selling agency.

4.3 PREPARING TO OPERATE YOUR VIDEORAY

Operating your VideoRay controller is like being in the driver's seat of your car. The joystick and switches are used to control your VideoRay ROV, similar to the way you use the steering wheel, pedals and dashboard knobs to control your car's operation. The controller's LCD display provides feedback like your dashboard gauges do, and the Video monitor displays what you might see through the "windshield." Additionally, a video overlay allows some settings to be superimposed over the video image to allow heads-up control and navigation.

Before setting up and operating your VideoRay, we recommend that you read all safety precautions in Section 3. The fundamentals of operation can be found in Section 5. Detailed descriptions of all of the features and functions can be found in Section 6. Section 7 provides advanced handling instructions and tips. Sections 8 and 9 cover maintenance and troubleshooting, and Section 10 describes optional accessories.

Take a moment now to familiarize yourself with the VideoRay ROV, the controller's layout and the feel of the controls. Proper operation, maintenance and safe handling of your VideoRay will provide you with successful dive operations and extended serviceability.

5 YOUR FIRST DIVE

Your VideoRay ROV has been designed with ease of use in mind. This section covers only the most basic aspects of operating your VideoRay. It will walk you through the steps required to make your first dive. Section 6 contains a complete reference to all of the features and functions of your VideoRay.

Note: If the Safety Instructions in Section 3 have not been read, it is recommended you do so before operating your VideoRay.

5.1 DIVE CONDITIONS

Your first dive should be made in conditions that are suitable for learning. The following conditions are optimal:

- Good weather and low wind speed
- Clear water
- Slow water current
- No obstructions above or below the surface

While VideoRay can be used in less than optimal conditions, including some rather extreme conditions, it is best to gain some experience before attempting such challenges. If the conditions are too adverse, it may be wise to postpone your dive or find a more suitable dive location.

Until you feel comfortable operating your VideoRay, you should try to operate it within a close range.

5.2 SETTING UP YOUR VIDEORAY

The following procedures outline the steps required to prepare the VideoRay for operation.

1) Open the Power Supply / Controller box and make sure the Main Power switch is set to the "Off" position.
2) Unpack the VideoRay and tether from the second container. Be careful not to kink the tether. See Section 7.2 for proper tether handling techniques and cautions. A Tether Deployment System (TDS) is an available option that greatly simplifies tether management and reduces the possibility of tether damage from mishandling.
3) Connect the surface end of the tether directly to the controller. Connect the VideoRay ROV end of the tether to the VideoRay ROV. The connectors are different and cannot be accidentally reversed.
4) Using the supplied video cable, connect a video monitor to the Video Out connector. A monitor with a ground prong on its power cord is recommended. (The Integrated Control Box allows an optional color video display to be installed in the cover.)
5) Plug the power cord into an appropriate Alternating Current (AC) power source.
6) You may need to adjust the ballast depending upon dive conditions and the activities you intend to perform. See Section 7.5 for more information on adjusting the ballast.

Once the system is connected together, a Pre-Dive Inspection should be made.

5.3 PRE-DIVE INSPECTION

A Pre-dive check should to be carried out prior to every dive.

1) Visually inspect the vehicle to ensure that the propellers are free of tangles and that the vehicle is in operational condition. Check the propeller guards for damage and / or misalignment.
2) Check the tether for scrapes, nicks or other visible damage.
3) Ensure that all fasteners and the ballast are in place and secure.
4) Ensure that all cables are properly connected and the tether connectors are screwed together tightly to avoid separation and loss of the VideoRay ROV.
5) Power up the system by engaging the Main Power switch to the "On" position.
6) Move the joystick in all directions to test the port and starboard thrusters.

   CAUTION! Do not operate the thrusters for more that 20 seconds when the VideoRay ROV is out of the water. Prolonged operation in a dry environment will result in damage to motor shaft seals.
7) Using the Depth Control knob, rotate it to test the vertical thruster. Return the knob to the neutral position.
8) Verify that both lights are working by turning the light knob toward "Bright", and then returning the knob to the "Dim" position.

   CAUTION! Do not operate the lights for more than 60 seconds when the VideoRay ROV is out of the water. Doing so may cause overheating and damage the unit.
9) Test the camera tilt and focus functions. The Tilt and Focus switches are spring-loaded momentary contact type switches and will return to the neutral position when pressure is released. All switches, except the Main Power switch, work this way.
10) Check the camera and monitor operation. If you are using a VCR, check that the recording and playback functions are operational. Check the rear facing camera operation and rear lights.
11) Check any other additional accessories according to the specific procedures for each accessory.
12) If you are not ready to launch the VideoRay, power down the system until launch time.

5.4 LAUNCHING THE VIDEORAY

CAUTION! Be certain that the tether connectors are securely connected and tightly screwed together to avoid separation and loss of the VideoRay ROV.

1) Power up the VideoRay.
2) The tether should be neatly coiled and made ready to deploy. It must be free of tangles, knots, and other obstructions.
3) Inform swimmers, divers, boaters and others in the area that you are about to deploy the VideoRay and that a tether that will be in the water as well.
4) Avoid dropping or throwing the VideoRay into the water. Rather, use the tether to lower the VideoRay to the water surface. This method will prevent potential of impact of the VideoRay against the pier or vessel from which you are launching.

5.5 MANEUVERING THE VIDEORAY

VideoRay is relatively easy to fly... and fun! Initially, a new operator should spend a few minutes controlling the VideoRay within sight near the surface in order to become familiar with VideoRay's reaction to its controls.

Flying the VideoRay in open water is not difficult and is quickly mastered. Operating the VideoRay in and around obstacles such as boats, pilings, and anchor lines will require a little more practice. In these conditions, it is advisable to go slow and consider the possible effects of any maneuvers.

Basic VideoRay operating instructions:

1) The operation of VideoRay is intuitive and simple. The joystick controls variable speed forward and reverse thrust. Push the joystick forward to move VideoRay forward. Pull the joystick back to back up.

2) Steering VideoRay is accomplished by moving the joystick left or right. Additionally, the joystick rotates (third axis control) to enhance control capabilities, but it is not necessary to use these capabilities on your first dive. See Section 6.2.3 for more details about the third axis control.

3) The Depth Control knob on the left-hand side of the controller controls the vertical thruster. Rotating the knob from the center detent position controls the rate of dive or ascent. Rotating the knob toward "Down" increases the depth. Rotating the knob toward "Up" causes the VideoRay to move toward the surface. VideoRay should be ballasted to always float upwards slowly, so continuous downward thrust is necessary to dive or to maintain a constant depth. When using Automatic Depth Control, the default mode, the controller will maintain a constant depth for you. See Section 6.2.2 for more information about using Auto Depth Control and manual depth control.

   Note: Inadequate ballast will cause VideoRay to float high in the water. When this happens the vertical thruster may not be sufficiently submerged to provide adequate downward thrust, and a rather impressive "water fountain" effect will result. Add more weight to the ballast if this is a problem. See Section 7.5 for tips on proper adjusting the ballast.

4) The front camera may be tilted up or down by engaging the Tilt "Up" / "Down" switch in the desired direction. Releasing the switch causes the camera to hold its orientation.

5) To focus the front camera, engage the Focus 'In' / 'Out' switch in the desired direction until the optimal focus is achieved. Releasing the switch causes the camera to hold its focus.

6) The intensity of the lights may be adjusted by turning the Lights knob.

Relax and enjoy your dive. Whatever you do, DON'T PANIC.... In the event of a problem, or if the tether appears to have become snagged on an obstacle, the best course of action is to stop and calmly assess the situation. A way out may present itself. Should you experience any problems, see Sections 7 and 9 for tips and troubleshooting.

5.6 RETRIEVING THE VIDEORAY

1) Ensure the tether is free from obstacles on which it may become caught or entangled in the water.

2) Navigate the VideoRay to a retrieval area where the water surface is clear of obstacles.

3) Power down the VideoRay by switching off the main power supply.

4) Retrieve the VideoRay by pulling it out of the water by its tether. Care should be taken to coil the tether properly (see Section 7.2) and avoid collisions between VideoRay and the pier or boat hull.

5) Once the VideoRay is retrieved, perform a Post-Dive Inspection as described below.

5.7 POST-DIVE INSPECTION

A Post-Dive inspection should be carried out after every dive.

1) Make sure the VideoRay is securely on-board.
2) Power Down the system.
3) Unplug the connections.
4) The vehicle should be visually inspected following each dive to ensure that no mechanical damage has occurred.
5) Visually check through the ports to ensure that no water has entered the pressure housings.
6) Check that the propeller shafts have not been fouled with material such as fishing line, string, seaweed, or other debris.
7) **If VideoRay has been used in salt water, thoroughly rinse the vehicle with fresh water prior to being stored away. Turn the vehicle upside down while rinsing to let water drain from the pressure sensor cavity under the float block.**
8) Inspect the tether for cuts, nicks and / or kinks in the outer shell. Store the tether properly for the next use.
9) Store all components securely.

6 VIDEORAY CONTROLLER FEATURES AND FUNCTIONS

6.1 CONNECTORS

6.1.1 TETHER CONNECTION

This connector is used to couple the Controller to the VideoRay ROV using the supplied tether.

6.1.2 VIDEO OUT

This composite video out connector is connected to the integrated video display monitor. Alternatively, it can be connected to a user supplied video monitor or VCR for displaying and/or recording images captured by the VideoRay ROV onboard camera. The signal format complies with either NTSC or PAL as specified when your system was ordered.

6.1.3 100 - 240 VAC 50-60 Hz

This is the power source feed for the Controller's power. For maximum portability, the VideoRay can be run from several common power sources. The AC power cord plugs into any standard outlet supplying 100 through 240 Volts AC. An external battery using an inverter may also be used to power the VideoRay.

6.1.4 RS-232 AUX

This DB-9 style connector provides an RS-232 interface as well as other auxiliary connections for accessories.

6.2 CONTROLS

6.2.1 MAIN POWER (On | Off)

This switch activates the controller. It should remain in the "Off" position when not using your VideoRay or when the system is unattended.

6.2.2 AUXILIARY (On | Off)

This switch is used to change between various Controller modes.

- Momentarily engaging it to "On" cycles Joystick Third Axis Control functions (Section 6.2.3).
- Momentarily engaging it to "Off" toggles Automatic Depth Control on and off (Section 6.2.5).

6.2.3 JOYSTICK (Forward | Left | Right | Reverse)

The joystick controls variable speed forward and reverse thrust. Push the joystick forward to move VideoRay forward. Pull the joystick back to back up. Steering VideoRay is accomplished by moving the joystick left or right. Additionally, the joystick rotates (third axis control) to enhance control capabilities.

Joystick Third Axis Control
The VideoRay joystick incorporates an additional operating technique that greatly increases the user's ability to control the VideoRay. The joystick has a "Third Axis" of operation. In addition to moving both forward and back (first axis) and side to side (second axis,) the knob will rotate either clockwise or counterclockwise (third axis).

A unique and extremely valuable characteristic of the VideoRay is the "user selectable" mode of the third axis control. The third axis mode can be set for any one of the following functions:

1) No Function – In this mode, the third axis does not perform any function. This is the default mode when the VideoRay is powered on.
2) Depth Control Mode - rotating the joystick clockwise causes the VideoRay to dive, rotating counterclockwise causes it to rise. The rate of depth change is proportional to the amount the knob is rotated. In this mode, the joystick knob takes the place of the Depth Control knob, although the Depth Control knob does not return to center with a spring the way the joystick does.
3) Camera Tilt Mode - rotating the knob counterclockwise tilts the camera up, clockwise tilts it down. This takes the place of the Tilt switch, and is therefore not proportional. In other words, rotating the joystick more will not cause the camera to tilt faster.
4) Lights Mode - rotating the knob counterclockwise decreases the brightness of the lights, rotating it clockwise increases the brightness. The amount the knob is rotated determines the rate of change - when centered the brightness level is held constant.
5) Manipulator Mode - rotating the knob counterclockwise opens the manipulator, rotating it clockwise closes the manipulator.

Momentarily engage the Auxiliary switch to "On" to change the mode of the third axis. The mode cycles from "No Function" through the four additional functions in the order they are listed above. The newly selected third axis mode is briefly superimposed on the video display after switching functions.

Note: When the third axis mode is active, the corresponding control switch or knob for that function is disabled.

6.2.4 DEPTH CONTROL (Up | Hold | Down)

A Depth Control knob on the left-hand side of the controller controls the vertical thruster. Rotating the knob from the center detent position controls the rate of dive or ascent. Rotating the knob toward "Down" increases the depth. Rotating the knob toward "Up" causes the VideoRay to move toward the surface. VideoRay should be ballasted to always float upwards, so continuous downward thrust is necessary to dive or to maintain a constant depth. When using Automatic Depth Control, the controller will maintain a constant depth for you. Auto Depth Control is by default set to "Off" when the VideoRay Pro III is powered up.

Automatic Depth Control (Auto-Depth)
When Auto-Depth is on and the Depth Control knob is centered on "Hold," the vertical thruster will attempt to maintain a constant depth. Rotating the Depth Control knob away from the center position will cause the VideoRay to rise or dive. Centering the knob again will then maintain the new depth. There may be some "bounce" or overshoot after adjusting the depth when Auto-Depth is activated. Usually, waiting a few seconds is all that is needed for the new depth to stabilize.

To activate or disable the Auto-Depth function, momentarily engage the Auxiliary switch to the "Off" position. The newly selected on or off state of the Auto-Depth will be briefly superimposed on the video display after toggling the Auxiliary switch. With Auto-Depth off, the Depth Control knob directly and proportionally controls the amount of vertical thruster "up" or "down" power. When the knob is centered, there will be no thrust and the VideoRay will rise or sink depending up on the ballast setting and the presence of any vertical water currents.

6.2.5 CAMERA (Front | Rear)

This switch selects between the front and rear camera. Only one camera may be monitored at any time. When selecting the camera, light control will automatically switch between the forward and rear lights as appropriate. When the rear camera is selected, the VideoRay horizontal thruster control circuit is reversed allowing the VideoRay to be driven backward "normally." This helps to make navigation more intuitive when monitoring the rear camera.

6.2.6 TILT (Down | Up)

The front camera may be tilted up and down by engaging the Tilt "Up" / "Down" switch in the desired direction. Releasing the switch causes the camera to hold its orientation. The rear camera is fixed and cannot be tilted.

6.2.7 FOCUS (Out | In)

To focus the front camera, engage the Focus 'In' / 'Out' switch in the desired direction until the optimal focus is achieved. Releasing the switch causes the camera to hold its focus. The rear camera uses a fixed focus lens that cannot be changed.

6.2.8 LIGHTS (Dim | Bright)

The Lights knob controls the brightness of VideoRay's on-board lights. When rotated to the "Dim" position, the lights may not go out, but glow slightly. Do not set the lights to "Bright" for more than 20 seconds when the VideoRay is out of the water.

6.2.9 MODE (Calibrate | Set)

This switch is used for several purposes. First, it cycles through the Video Overlay modes. The Video Overlay superimposes information over the video image from the camera. Any attached video recording device also records the Video Overlay. Each time the Mode switch is momentarily engaged to "Set," the overlay mode cycles to the next Video Overlay display. The sequence is as follows:

1) No Overlay
2) Date and Time
3) Depth and Compass Heading
4) Date and Time and Depth and Heading

The Mode switch is also used to select the Depth Display Units (Section 6.3.3). The units can be displayed in either feet of meters. By engaging the switch to "Set" while powering up the system, the units displayed will toggle between feet and meters. VideoRay will "remember" the last units used and continue to power up in that mode until changed by the operator.

Finally, the Mode switch is used to calibrate the Compass and Depth Gauge (Section 8.7).

6.2.10 DISPLAY CONTRAST (- | +)

This knob controls the LCD Display contrast. The LCD Display is discussed in the next section.

6.2.11 GRIPPER (Close |Open)

This switch closes or opens the optional gripper.

6.3 LCD DISPLAY

The LCD Display is used to provide feedback to the operator. Display information includes depth, units of depth, heading, a 24 hour clock and run-time clock. The LCD also provides messages for configuration and calibration operations. The LCD display contrast is adjustable for easy viewing under varying light conditions.

6.3.1 CLOCK

VideoRay is equipped with a 24 hour real time clock. The date and time can be set using the steps provided in Section 8.7.

6.3.2 RUN-TIME HOUR METER

The VideoRay controller keeps track of the total number of hours the VideoRay has been powered up. Whenever the VideoRay is powered up, the meter continues from the reading when it was last turned off. The Run-Time meter cannot be reset.

6.3.3 DEPTH GAUGE

Depth is displayed in feet or meters by the digital readout on the LCD display. To toggle the display units, engage the Mode switch to "Set" while powering up the system (See Section 6.2.9). Depth calibration of the pressure sensor is set at the factory for fresh water. See Section 8.7 for instructions on calibrating the Pressure Sensor.

6.3.4 COMPASS

VideoRay is equipped with an internal compass to aid in navigation. The compass rose is presented on the LCD display and is marked with North, South, East, and West directions. The compass is calibrated at the factory, but can be re-calibrated as needed. See Section 8.7 for instructions on calibrating the Compass.

6.4 MONITOR CONTROL

6.4.1 POWER

The monitor powers up automatically when the controller is turned on. The monitor Power button can be used to turn off the video display while the controller is on. Pressing the Power button again will turn the monitor on.

6.4.2 SYSTEM

The System button on the monitor is used to determine the video format (NTSC or PAL). Normally, the format will be set at the factory and should not need to be changed. If the monitor is not displaying the video image properly, this button might have been accidentally bumped. In this case, you can restore the correct display format by pressing the System button.

6.4.3 Additional non-labeled buttons on the display monitor

The four additional buttons on the monitor that are not labeled have no function and may be ignored.

7 "BEST" PRACTICES AND DIVING TIPS

7.1 NAVIGATION

Navigation of a submersible is very different from navigation on land. The largest difference is that VideoRay operates in three dimensions, rather than the familiar two. Below are some tips for navigating with VideoRay in its native environment.

1) The submerged operation and navigation of VideoRay is accomplished by what is commonly referred to as "dead reckoning". This involves the observation and subsequent recognition of landmarks as viewed on your Video Monitor. The compass rose will help you keep track of direction.

2) When operating in areas containing obstructions or obstacles that could snag or foul the tether, the operator should endeavor to remember the route taken to get to any one position. Not only will this information be helpful on the return trip, it will be extremely valuable in the event the tether does become snagged or fouled!

3) In the event obstructions are encountered, or you become lost or disoriented with respect to VideoRay's position, always remember that the safest way back is to follow the tether. VideoRay Pro III includes as an option a Positioning System that can be used to continuously monitor the position of the VideoRay.

7.2 HANDLING THE TETHER

The tether should be considered the most important part of the VideoRay system. It feeds power and control signals to the vehicle and returns data from the sensors. If the tether becomes damaged from improper use, poor handling or an accident, the vehicle may become crippled or inoperable. For maximum tether life and reliability, VideoRay Pro III includes the Tether Deployment System (TDS). When used properly, the TDS can eliminate many of the complications of tether management. The following tether handling tips are provided:

1) Never step on the tether. Trampling the tether underfoot may crush conductors and coax cables, leading to premature failure. Trampling is also abrasive to the tether jacket. Remember, this is a multi-conductor tether, not at electrical extension cord.

2) Never allow a truck, passenger vehicle, or boat to drive over the tether. This will do more concentrated and immediate damage than trampling.

3) Do not allow the tether to be deployed over a sharp edge. This could cause a kink, cut or excessive wear.

4) Do not bend the tether beyond its minimum bend diameter. Most tethers have a minimum bend diameter of three to four inches. If the tether is bent beyond this diameter on pulleys or around corners, wire fatigue will be accelerated. For a general rule of thumb, do not bend the tether any tighter than what would fit around a typical soda pop can.

5) Never kink the tether. A fully bent back kink causes local but permanent deformation in the tether. This can be serious because accelerated wire fatigue is subsequently concentrated at the kink location. Such a kink may also be severe enough to instantly break any coax cables in the tether.

6) Avoid snap loading the tether. This situation may easily occur when a slack tether is reeled onto a motorized spool. Loads may peak at a very high value when the tether snaps taunt. Another dangerous situation for snap loading is a tethered submersible vehicle operated from a pitching ship.

When not using the Tether Deployment System, there are a few proper and many improper ways to wind and unwind a tether. If improper tether handling techniques are used the tether may become tangled, which ultimately leads to kinking, trampling underfoot, and other tether damage. Following are some suggestions for keeping the tether tidy and ready for deployment at any time.

1) The preferred tether storage and deployment method is to use the optional Tether Deployment System.

2) When deploying the tether, a person should be available to tend the unwinding coils to prevent kinks.

7.3 AVOIDING TANGLES

As mentioned above, it is always a good idea to consider where the tether lies as VideoRay moves through the water or along the bottom. The following tips may assist in dealing with and / or avoiding tether problems:

1) Don't feed out unnecessary tether. When flying VideoRay back along its tether, haul in the slack line to avoid leaving a loop behind the vehicle.
2) Avoid weaving in and around fixed objects like pilings, rocks, and anchors. When operating in possibly fouled areas, it is advisable to remain on the surface until VideoRay is approximately above your intended dive objective.

7.4 FREEING A SNAGGED TETHER

1) Do not try to rip a snagged tether free! In the event VideoRay's tether becomes snagged, treat the situation as a challenge rather than a disaster. Fly the VideoRay along the tether to determine the location of the snag. If the problem area can be located visually using the vehicle, appropriate corrective action can be taken.
2) If the problem area cannot be located using VideoRay's camera, try pulling gently on the tether. Turn the vehicle power off and pull from different angles and directions if possible.
3) In the event the tether cannot be otherwise freed, it may be necessary to have a diver retrieve it manually. In that event, turn off the system power and unplug it from its power source.

7.5 BALLAST SETUP

Depending upon the water conditions, the VideoRay ballast must be adjusted for proper operation. The following instructions are provided to properly set up the ballast. The ballast should be adjusted so the VideoRay ROV has slight positive buoyancy. Should the VideoRay rise rapidly, or the vertical thruster create a fountain spray of water when near the surface, more ballast must be added. Should the VideoRay sink, some ballast must be removed. Salt water density is greater than that of fresh water. Additional ballast must be added to the VideoRay ROV when using it in salt water.

7.6 INCREASING THRUSTER POWER

In some situations it may be advantageous to have more thruster power available, particularly when working in currents. There are several steps that can be performed to increase thruster power.

1) To gain more thrust, first remove the grills from the rear of the thruster guards.
2) Second, to gain even additional thrust, remove the thruster guards themselves.

Note: Removing the thruster guards may increase chances of fouling the propellers and should not be attempted in conditions of heavy debris or seaweed.

Additional thruster power can be achieved by minimizing the power consumption of the lights. To maximize the power available to the thrusters, operate the lights at the lowest possible setting that still allows adequate visibility.

7.7 LOSS OF THRUSTER POWER

1) Should VideoRay suddenly become unresponsive in a particular direction, it is possible that one of the thrusters may have lost power. The most common cause of thruster power loss is a fouled propeller. This often is the result of organic or synthetic material becoming tangled in a propeller and subsequently wrapped tightly around the propeller shaft.
2) VideoRay's thrusters are designed to operate at their rated speed for extended periods of time. However, should a propeller become jammed, the motor may burn out if power is continually applied. Power should be turned off, and the vehicle retrieved and inspected. Remove any debris and test the thruster for proper operation. Note that the guards on the VideoRay are specifically designed for rapid and easy removal.

3) If VideoRay's thrusters are not fouled and still do not run, try resetting the VideoRay computer by switching the power supply off, waiting ten seconds, and switching it back on again.

4) Servicing may be necessary if the propeller and shaft are clear and rotate freely, yet the thruster does not respond to its controls.

7.8 FOGGED VIEW PORT AND/ OR LIGHT LENSES

Atmospheric conditions may result in some humidity being present inside VideoRay's pressure housings. This may cause condensation to form on the camera view port and/or light lenses. VideoRay includes a silica gel desiccant package with color-coding. Normally blue, when the stripe on the package is pink, it should be replaced. When performing any maintenance that requires the housing to be open, it should be done in the driest atmospheric conditions possible.

8 VIDEORAY MAINTENANCE

8.1 CLEANING VIDEORAY

1) Always unplug the system from the power source before cleaning.
2) Do not use liquid or aerosol cleaners on the system control box and power supply. Use a damp cloth for cleaning.
3) Disconnect the power before attempting to clear fouled propellers.
4) After use in salt water or chemical solutions, thoroughly rinse VideoRay with fresh water before storing.
5) For general cleaning of VideoRay, use a mild detergent.

8.2 MECHANICAL SERVICING

8.2.1 PRECAUTIONS

DISCONNECT THE SYSTEM POWER AND VEHICLE TETHER BEFORE COMMENCING ANY MAINTENANCE AND/OR REPAIRS!

1) If you are unfamiliar with O-Ring seals, read Section 8.3 "Caring For O-Rings" before attempting to open any sealed compartment or replace any O-Rings.
2) Sealed components are designed to be tight fitting. Be gentle when opening them. Forcing a component open or closed may damage it permanently. Do not use metal tools to pry open sealed parts!
3) Many VideoRay components are anodized aluminum and will be damaged by contact with steel. If components do not come apart with bare hands or "soft" tools, check to ensure that all fasteners have been removed.

8.2.2 REQUIRED TOOLS

The tool kit provided with VideoRay includes all tools necessary for VideoRay maintenance. A list of tools and spare parts is found in Section 12.

8.3 CARING FOR SEALS AND O-RINGS

VideoRay recommends the use of Dow Corning #4 Silicon Grease, as a lubricant for O-rings used as seals. Other lubricants can lead to deterioration and failure of the O-rings and components. DO NOT USE OTHER LUBRICANTS.

8.3.1 INSPECTION

O-rings wear out over time. Inspect all O-rings whenever a sealed assembly is apart. "Healthy" O-rings are soft, flexible and have not been pinched or nicked. Should an O-ring appear brittle, or have apparent cracks, nicks, or evidence of being pinched or permanently compressed, it will require replacement. Sealing surfaces should also be inspected while an assembly is apart. The surfaces should be examined to determine that they are free of dirt, nicks, scratches, or damage, which may result in seal failure once reassembled.

8.3.2 RULE OF THUMB

WHEN IN DOUBT, THROW IT OUT! Generally, when compared to the equipment they are protecting, O-rings are very inexpensive. Should an incorrectly sized or damaged O-ring be installed, the result can be very bad. If there is any doubt as to the suitability or condition of an O-ring it should be replaced.

8.3.3 CARE AND STORAGE

O-rings should be stored in clean plastic bags to protect them from dust when not in use. Avoid prolonged storage in direct sunlight as this may result in deterioration of the O-ring material. Stored O-rings should be sorted with regard to type and size with that information noted on the storage bag. Use of an incorrect O-ring can result in an ineffective seal.

8.3.4 HANDLING SEALED COMPONENTS

O-rings and other components with sealing surfaces should never be handled with dirty or gritty hands. A small amount of dirt trapped next to an O-ring will cause leakage, which could result in serious damage to the equipment the O-rings are intended to protect. The most common situation is a single strand of hair or lint, so care should be taken to ensure a clean work area. Should an O-ring or sealing surface become dirty, wash it with mild soap and water, and then rinse it with clean water. Avoid scratching the surfaces of O-rings and the components that contact them. Do not use sharp objects such as a knife or screwdriver to pry apart sealed assemblies or remove O-rings. Serious damage to the O-ring or the seat may result. When components require storage with the sealing surfaces exposed, they should be stored in a clean, dry location for protection.

8.4 SERVICING THE LIGHTS

8.4.1 REPLACING A LIGHT BULB

CAUTION! The Light Bulb may be very hot.

1) New bulbs should not be handled with bare fingers. Oils and acids from hands and fingers can affect the bulb and result in shortened operating life. Protect the bulb with paper towel or a clean cloth during handling.
2) Open the light housing by carefully unscrewing the light dome. Using a clean rag, grasp the light bulb and pull it from its socket.
3) Insert the replacement bulb and reassemble the light dome, making sure all O-rings are properly installed and seated.

8.5 PROPELLER REMOVAL AND REPLACEMENT

8.5.1 HORIZONTAL PROPELLER

Note: The horizontal thrusters are counter rotating and if the propellers are removed, they must be reinstalled on the proper shaft. When installed properly, the top blade of the propeller will curve toward the hull when viewed from the rear. The easiest way to ensure that the propellers are installed correctly is to remove and replace only one at a time.

1) The horizontal propellers are held in place on smooth shafts using a collet similar to a drill bit. To remove a propeller, loosen the 7/16 inch propeller locking nut. You do not need to remove the nut completely. The propeller should slide freely off of the shaft. If the propeller does not slide off, tap the nut with a wrench or similar tool while pulling the propeller to the rear.
2) To replace the propeller, first ensure the correct one is being installed, and slide the propeller onto the shaft. Then tighten the locking nut.

8.5.2 VERTICAL PROPELLER REMOVAL

1) Remove the flotation block by unscrewing the retaining bolt.
2) The propeller can be removed by first loosening the propeller locking nut (use 7mm wrench), and then unscrewing the propeller from the propeller shaft.
3) Propeller replacement is accomplished by reversing this process. Care must be taken to maintain a 1/32" to 3/64" clearance between the propeller locking nut and the seal spacer to prevent jamming.

Note: Use a piece of rubber (kitchen jar lid opener works great) or rag to help remove a stuck nozzle or propeller

8.6 CARTRIDGE SEAL INSPECTION AND REPLACEMENT

Your VideoRay has been equipped with our new, patent-pending cartridge design. This means that the seals that prevent water from entering the submersible through the motor shafts can be replaced rapidly and without tools. It also means that you can visually check for impending seal failure easily.

There are two "Bal Seals" on the shaft of each of the three thrusters on a VideoRay. Between these two seals is a oil chamber. The cartridge is constructed of machined acrylic and brass, and contains the two seals and the oil.

To change the cartridges:

1) Remove the propeller using the instructions in the previous section.
2) For the vertical thruster only, remove nut and the single nylon washer.
3) Grasp the cartridge seal and gently pull it out twisting it if necessary. There is a nylon washer recessed in the outer side of the seal. Be careful not to lose this washer and replace it when installing a new cartridge.
4) Make sure the cartridge seal cavity and O-ring are clean before installing a new cartridge.
5) Install a new cartridge, and make sure the inner nylon washer is installed and for the vertical motor, the second nylon washer.

Note: If the end seal pops out during install, carefully replace it with the spring facing out.

We recommend that you check for the presence of water in the oil bath every 10-20 hours of usage. This interval should be on the shorter end if you use your VideoRay in deeper water – in excess of 60 feet or 20 meters – for extended periods. If there is water in the oil, the cartridge should be replaced within the next 10-20 hours.

8.6.1 OPENING VIDEORAY'S MAIN HOUSING

Note: To perform this operation, it is necessary to remove the Skid System first by un-screwing the 4 retaining screws.

1) Prior to and that a clean, dry work area is available.
2) Remove opening the main housing, it is important to ensure that VideoRay is clean and dry, the flotation block by removing the screw.
3) Remove the main housing tie-rods by first loosening, then removing the tie-rod acorn nuts and regular nuts at the rear that serve as jam nuts. The acorn nuts at the front are permanently Loctited on and can be used to rotate the rod with a socket driver. Next, pull the tie-rods from their guide holes in the front and rear main port retainers. Remove the main port retaining rings.
4) Both the front and rear main port domes are sealed with O-rings and, while some resistance may be encountered due to a slight internal vacuum, they can be removed by carefully pulling them out of the main housing. The domes have tabs on them to facilitate dome removal. You can use the tool kit nut driver or other blunt tool to apply pressure on these tabs to remove the domes. Do not pry the domes off with a screwdriver as this can damage the domes and the seal surface.
5) A hair dryer may be used to aid in removal of the domes by warming the VideoRay housing and creating a positive interior pressure.

8.6.2 REASSEMBLY OF MAIN HOUSING

1) Once the internal components have been properly re-installed in the main housing, the main ports can be replaced. Care should be taken to ensure the ports are clean and dry and that the O-rings have been cleaned and lubricated prior to installation. Refer to Section 8.3, Caring for Seals and O-Rings.

2) The tie-rods do not provide a means of sealing the main ports to the main housing. The O-ring seals on the main ports that, in normal operation, are held in place by external pressure ensure the watertight integrity of the main housing. The tie-rods are provided as a security measure, to prevent the main ports from "popping out" in the event of a sudden over pressure inside the housing.

3) Re-assembly is accomplished by carefully fitting the main ports into the main housing and re-installing the port retaining rings tie-rods, retaining nuts and washers.

Important: Avoid damage to the acrylic main ports. Do not over-tighten the tie-rod nuts.

8.7 CALIBRATION

Ensure that the Joystick and Depth Control knob are both in the neutral position before powering up the VideoRay. This is critical, because their "zero" positions are calibrated when power is applied.

The additional VideoRay features that can set or calibrated include the date and time, the compass, and the pressure sensor (which is used for determining depth). These features were calibrated at the factory and should not require resetting. However, if maintenance work or electronics replacement should necessitate recalibration, set your unit into calibration mode by turning it on while engaging the Mode switch to the "Calibrate" position.

8.7.1 SETTING the DATE and TIME

Set the date and time by entering the calibration mode.

1) Turn the VideoRay off.

2) Turn the Video Ray on while engaging the Mode switch to "Calibrate."

3) Release the Mode switch.

4) The date and time are now shown on the display. Use the Auxiliary switch to adjust the values ("On" to increase, "Off" to decrease), and engage the Mode switch to "Set" to store the new value and move on to the next item.

5) To exit calibration mode, simply turn off the VideoRay. The new settings will be saved. Wait at least 5 seconds before turning the VideoRay back on. Or, to continue on to calibrate the pressure sensor and/or compass, momentarily engage the Mode switch to "Calibrate," and follow the steps below.

8.7.2 CALIBRATING the PRESSURE SENSOR

This calibration is necessary when the pressure sensor is changed, or when a new control box is mated to a submersible. This task requires an air pressure of 50 PSI (Pounds per Square Inch) be applied to the pressure sensor. The easiest way to accomplish this is to use a calibrated air source and a rubber-tipped air gun. If you are setting the date and time or are calibrating the compass and do not need to reset the pressure sensor, BE CERTAIN TO SKIP THIS PROCEDURE, so as not to disable the pressure sensor. Skip the pressure sensor calibration by either turning the VideoRay off, or momentarily engaging the Mode switch to "Calibrate" two times after setting the date and time.

1) Turn the VideoRay off.

2) Turn the VideoRay on while engaging the Mode switch to "Calibrate."

3) Release the Mode switch.

4) To enter the pressure sensor calibration mode, you must complete the steps to set the date and time. You do not need to change the date and time, but must scroll through the date and time settings (with or without changing them) in order to reach the pressure sensor calibration mode.

5) Once you have set the date and time and have entered the pressure sensor calibration mode, you have two choices. You can either calibrate the pressure sensor, or you can bypass this procedure. You might want to bypass this procedure if all you need to do is set the date and time or calibrate the compass. To bypass this procedure, momentarily engage the Mode switch to "Calibrate," which will activate the compass calibration mode, or, turn the system off to bypass this mode and the compass calibration mode.

6) To calibrate the pressure sensor, follow the on-screen instructions and apply the first pressure to the pressure sensor. This pressure may vary between units depending on options.

7) Momentarily engage the Auxiliary switch to "Off."

8) Apply the second pressure to the pressure sensor.

9) Momentarily engage the Auxiliary switch to "On."

10) To exit the calibration mode, simply turn the VideoRay off. Wait at least 5 seconds before turning the VideoRay back on. Or, to continue on to calibrate the compass, momentarily engage the Mode switch to "Calibrate," and follow the steps below.

8.7.3 CALIBRATING the COMPASS

Large metal objects such as steel buildings and ship's hulls, or other magnetic sources such as electric motors can all affect the reading of a magnetic compass. This calibration is designed to account for external effects on the inboard compass and should be done in an environment that best approximates the conditions in which the VideoRay will be used. To calibrate the compass:

1) Determine NORTH, and lay out lines for North, West, South, and East on a flat surface. It is important that VideoRay be level in order to obtain an accurate calibration.

2) Turn the VideoRay off.

3) Turn the VideoRay on while engaging the Mode switch to "Calibrate."

4) Release the Mode switch.

5) To enter the compass calibration mode, you must complete the steps to set the date and time and either calibrate the pressure sensor or bypass the pressure sensor calibration.

6) Once you have set the date and time and have calibrated the pressure sensor (or bypassed the pressure sensor calibration), you are ready to calibrate the compass.

7) To calibrate the compass, follow the on-screen instructions and aim the front of the VideoRay NORTH. Momentarily engage the Auxiliary switch to "Of" to set this direction.

8) Continue the procedure by aiming the front of the VideoRay EAST and momentarily engaging the Auxiliary switch to "On."

9) Aim SOUTH, and momentarily engage the Auxiliary switch to "Off,"

10) Finally, aim WEST and momentarily engage the Auxiliary switch to "On."

11) To exit calibration mode, momentarily engage the Mode switch to "Calibrate," or turn the VideoRay off. Turning off the VideoRay may be done at any time during calibration without loss. Any settings entered during calibration will be retained. Wait at least 5 seconds before turning the VideoRay back on.

12) Rotate the vehicle to test the compass calibration.

9 FIELD SERVICING

9.1 TROUBLE SHOOTING

The following is a brief diagnostic aid intended to assist the user in determining the nature of problems encountered during the operation of VideoRay.

1) Check to see that the electrical outlet is live.
2) Ensure all power switches are turned on.
3) Check all the cables for proper connection.
4) Check the main fuse in the power supply. (Disconnect power before checking)
5) Check the tether and connectors for damage.

9.1.1 LIGHTS DO NOT WORK

1) Check for power to the vehicle.
2) Check to see if the bulbs have burned out.

9.1.2 LOSS OF THRUST OR MANEUVERABILITY

1) Ensure the propellers and shafts are clear of debris.
2) Ensure the propellers are securely installed.
3) Check to see if the tether is snagged.
4) Check the thrusters to ensure they function properly with VideoRay out of the water.

9.1.3 VIDEO MONITOR DOES NOT SHOW PICTURE

1) Ensure the Video Monitor is plugged into a live electrical outlet.
2) Check all the video connections.
3) Check to see the VideoRay is turned on.
4) Try a different monitor.

9.1.4 POOR PICTURE QUALITY

1) Check for proper cable connections.
2) Check the condition of the connectors. In our experience, poor video cables and video connectors cause many video failures.
3) Check for tether damage.
4) Ensure that the view port on VideoRay is clean and free of condensation.
5) Try a different monitor.

9.2 ORDERING PARTS

Spare and / or replacement parts are available for your VideoRay Submersible. They can be ordered directly from the VideoRay web site:

http://www.videoray.com

If you do not have Internet access, the following contact information may be used.

VideoRay LLC
580 Wall Street
Phoenixville, PA 19460
Telephone (610) 458-3000
Facsimile (610) 458-3010

For Customer Service by Internet, E-mail: support@videoray.com

When ordering parts, please include the serial number of your VideoRay Submersible; the part description and identification number; and the quantity required.

Some sub-assemblies of the VideoRay Submersible are not field-serviceable and will need to be returned to the factory if they malfunction. All returned items must be sent prepaid to VideoRay at the above address.

9.3 WARRANTY REPAIRS

The warranty conditions are specified in Appendix A. In the event any conditions of the manufacturer's warranty have been breached, the warranty may be considered void.

10 ACCESSORIES

10.1 GENERAL INFORMATION ABOUT ACCESSORIES

VideoRay is the delivery platform for a variety of instrumentation. Whether it is a Dissolved Oxygen meter for the aquaculture industry, a Conductivity Potential gauge for the marine construction industry, sonar system, positioning system or other mission-specific instruments, VideoRay effectively transports and operates the instrument at the underwater job site. Please contact VideoRay (http://videoray.com) or your local VideoRay dealer or for assistance in equipping your system to meet your needs. Some of the common accessories are listed below.

10.2 INTEGRATED CONTROL BOX (ICB) with 15-inch monitor

Useful for all in one control, video, and viewing, this crisp, unique 15-inch monitor is built into the Integrated Control Box. With a bigger viewing area than the previous screen, the images from the VideoRay camera eye are larger than life and give you more confidence as you navigate. The monitor works in three different modes. You choose the mode that works best for your project requirements.

Full Screen Video shows images from the VideoRay's front or rear camera eye. At 15-inches, the monitor is easy on the eyes and provides significantly more viewing area to see underwater surroundings.

Full Screen Computer Display shows computer data from accessories, such as sonar, magnetometer, or other gathering devices. Switch between Full Screen Video and Full Screen Computer Display to keep tabs on video and accessory readings.

Full Screen Computer Display with Inset Video (Picture in Picture.) displays readings from a sonar or positioning system on the full screen along with video from the VideoRay camera eye in the smaller inset window. This is invaluable feature for search and recovery operations.

Specifications

PANEL
Type a-si TFT /TN Size 15" Pixel Pitch (mm) 0.297 Brightness (cd/m2)
200 Contrast Ratio 300:1 Viewing Angle 120/110 degrees Computer Interface

FREQUENCY
Horizontal Rate (Analog) 30-70 Vertical Rate 56-85 Bandwidth 100

RESOLUTION
Maximum (Analog) 1024x768 Native 1024x768

COLOR
Maximum 16.2M

SIGNAL INPUT
Input Video Signal Analog RGB
Video Level: Analog
Analog:0.7VP-P Input Connectors 15pin D-sub, RCA connector

PLUG & PLAY DDC
DDC 1/2B

POWER CONSUMPTION
On/Working 52 Watts (Max)

10.3 TETHER DEPLOYMENT SYSTEM (TDS) (Included with the Pro III)

Designed for rapid delivery and fast recoil, the Tether Deployment System simplifies tether management and reduces the chances for damaging the tether. The hand-powered reel inside the Pelican 1620 case easily pays out and takes up the tether, keeping your work area neat and safe. Use the TDS to save time and effort and lower the incidence of tether damage. Just reel in the tether, snap the case shut, and you're ready to move.

10.4 IMAGING SCANNING SONAR SYSTEM

For low-visibility environments and precision searches, imaging sonar is essential for identifying and navigating inspection locations. Whether on a search and rescue mission or scoping out wreck locations, scanning sonar is invaluable. The VideoRay sub is guided by sonar to targets until it is close enough to visually identify them, making search and recovery possible in turbid waters. The sonar features a very small transducer to image targets from the viewpoint of VideoRay and captures data digitally on a laptop computer for easy playback. The sonar fits atop the VideoRay Pro III submersible's float block for unobstructed viewing of the area. The sonar system is neutrally buoyant and streamlined for a minimal effect on the hydrodynamics of the submersible. The sonar data feeds directly through the tether to the surface unit. A separate laptop running Windows 95/98/Me/NT/2000/XP Operating System is required for gathering data. For specifications, see www.videoray.com.

10.5 SHORT BASELINE ACOUSTIC NAVIGATION SYSTEM

Underwater work demands reliable positioning. While GPS navigation has been adapted as a standard throughout the marine industry, GPS signals only penetrate a few millimeters below the surface. To truly know your position, the Star Short baseline (SBL) positioning system acoustic navigation can be used. You'll be a more adventurous and confident ROV pilot because the SBL shows the location of the submersible in relation to acoustic transducers, using the acoustical transponder and depth gauge mounted aboard the submersible. The location of the VideoRay is identified through simple time/distance/triangulation. The system can be integrated with GPS for absolute positioning. Use in combination with the sonar to know where the ROV is, where it is going, and where to swim to targets of interest. The system requires a laptop running Windows 95/98/Me/NT/2000/XP Operating System. For specifications, see www.videoray.com.

10.6 EXTENSION TETHERS

No mission is impossible when you mix and match lengths and types of the VideoRay's tether to reach an underwater destination. VideoRay Pro III systems come standard with 76 m (250 feet) of neutrally buoyant tether, and now you can choose from several combinations of neutrally buoyant or negatively buoyant tether lengths to suit the job at hand. The detachable tethers encourage easier transport and handling as they accommodate specific depths. Modular lengths of neutrally- and positively- buoyant tether can be mixed and matched by simply locking in new sections. Snap on the short tether for a potable water tank inspection. Then switch in seconds to the extended tether for a deepwater application. Use the negatively buoyant tether to reach operational depths, and switch to the neutrally buoyant tether for more maneuvering.

10.7 MANIPULATOR

Find and retrieve items with a manipulator that handily attaches to the VideoRay submersible. From the control box, open and close the jaws to a two-inch distance to retrieve items in confined or hazardous locations. The VideoRay's camera eye focuses in on the manipulator to provide a close view of the operation. The mechanics of the manipulator also provide a platform for several other attachments.

Specifications

10 in./25 cm length

1 in./2.5 cm width

2 in./5 cm Max Jaw Opening

Weight in air: 9 oz./250 g

Closing Force: 5 lb.

Travel time: 8 seconds

11 VIDEORAY TOOLS & SPARE PARTS KIT

QTY	TOOLS / SPARES
1	Tool Box
1	10 in 1 Screw/Socket Driver
1	Open-end 7mm & 8mm Wrench
1	3/16" Hex Wrench
1	3/32" Hex Wrench
1	Silicone Grease Packet
2	12V/20W Halogen Bulbs
1 each	Thruster Propellers (100mm) L & R
1	Thruster Propeller (vertical)
1	Spare Cartridge Seal
O-RING PACKAGE	
3	#011 (Tilt Drive)
3	#014 (Seal Cartridge)
1	#020 (Vertical Thruster Cone)
1	#022 (Focus Pulley)
2	#031 (Horizontal Thruster Cone)
5	#112 (Thruster Tube Spacer, Depth Sensor)
3	#114 (Termination Block, Depth Sensor)
1	#118 (Vertical Thruster Spacer)
4	#122 (Horizontal Thruster Spacer)
2	#133 (Thruster Motor Bracket)
4	#135 (Light Mount, Thruster Cones)
2	#152 (Main Port)
2	#154 (Main PortRing)
2	#224 (Light Port, Light Mount)
STAINLESS STEEL HARDWARE	
1	#¼-20 x 5/8" Socket Cap Screw
1	#¼ x 5/8" Flat Washer
2	#M4 Hex Nut
10	#6 Flat Washer
4	# 8-32 x 1/2" Pan Head Phillips Screw
2	# 4-40 x 1/2" Pan Head Phillips Screw
4	#4-40 x 3/8" Pan Head Phillips Screw
3	#6 Lock Washer
2	#8-32 Nut
2	#8 Lock Washer
4	#8 Flat Washer
2	#6-32 Acorn Nut
3	#6-32 Nyloc Nut
2	#6-32 x 1/2" Phillips Screw

12 APPENDIX A – LIMITED WARRANTY

LIMITED WARRANTY POLICY

VideoRay will repair or replace, at its expense and at its option, any system or component, subject to the limitations and / or exclusions specified herein, which in normal use has proven to be defective in workmanship or material provided that, within one (1) year of the purchase date, the original purchaser returns the product prepaid, accompanied by proof of purchase, from a sales agent authorized by VideoRay, and provides VideoRay with reasonable opportunity to verify the alleged defect by inspection.

Warranty Limitations And/Or Exclusions:

1. This warranty does not apply to light bulbs.
2. Any separate product purchased from, but not manufactured by, VideoRay is sold with only such warranties as are made by the manufacturer therein. VideoRay only warrants that it has title thereto, free of all liens or encumbrances.
3. This warranty does not apply to units that are damaged by connection to improperly wired AC receptacles.
4. Tethers, view ports and other components subject to wear through abrasion are warranted to be free from defects in material and workmanship for a period of ninety (90) days from the date of shipment to the original purchaser.
5. Any damage caused by failure to observe proper packing or to observe instructions for operation and maintenance as contained in the Instruction Manual furnished with the equipment, by accident in transit or elsewhere, will not be covered by the warranty.
6. Repairs are warranted for 90 days.

VideoRay may require that certain components may be returned, prepaid, to an authorized repair station for inspection and repair or replacement.

VideoRay will not be responsible for any asserted defect which has resulted from Acts of God, normal wear, misuse, abuse, improper configuration, repair, or alteration made, or specifically authorized by, anyone other than a representative of VideoRay authorized to do so. The giving of, or failure to give, any advice or recommendation by VideoRay shall not constitute any warranty by, or impose any liability on VideoRay.

The foregoing constitutes the sole and exclusive remedy of the purchaser and the exclusive liability of VideoRay and is in lieu of any and all other warranties, express, implied or statutory as to merchantability, fitness for purpose sold, description, quality productiveness, or any other matter. Under no circumstances shall VideoRay be liable for special, incidental or consequential damages, or for delay in performance of this warranty.

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STANDARD OPERATING PROCEDURE
HSP-01 – ACCIDENT REPORTING

1.0 BACKGROUND

Accident forms are used to document and record injuries, illnesses, and damage to equipment that occur on USA Environmental, Inc. (USA) project sites. Injuries, illnesses, and damaged equipment meeting the reporting requirements of Federal, State, and contractual directives will be submitted in a complete and timely manner per the reporting instructions, directives, and policies.

2.0 SCOPE

This Standard Operating Procedure (SOP) contains information for completing, submitting, and tracking Accident Reporting Forms. It may also require the addition of policies and publications relevant to updating, correcting, or changing information pertaining to accidents and investigations. It is incumbent upon all designated personnel who are responsible for completing, signing, submitting, or tracking Accident Reporting Forms and to familiarize themselves with this SOP and its accompanying documents, and to periodically review the material in an effort to remain current with procedures.

3.0 OPERATIONS

USA employees who work on project sites are required to immediately report all accidents, injuries, illnesses, and damaged equipment to their Supervisor and/or Safety personnel. Corrective action is to be taken to eliminate or mitigate the potential for hazardous or dangerous conditions on the project site, which may result in accidents, injuries, illnesses, or damaged equipment. Documentation is a key element in operations.

4.0 RESPONSIBILITIES

The following personnel, by position, are responsible for the completion, review, signing, and submitting of Accident Reporting Forms:

- USA Unexploded Ordnance Safety Officer (UXOSO)/Site Safety and Health Officer (SSHO): responsible for compiling and submitting the initial form(s) in accordance with form instructions and guidance. Making the initial notification of reportable accidents to the USA Corporate Office and performing an investigation into the accident.
- USA Occupational Safety Manager (OSM): responsible for reviewing, completing, signing, and sending the accident form(s) with attachments to the USA Corporate Office in Oldsmar, FL. Following up on the notification made from the project site and ensuring updated information is received and personnel are medically tracked to completion.
- USA Corporate Safety and Health Manager: responsible for the corporate implementation and enforcement of the USA Safety Program and for reviewing and signing the accident from(s) for submittal. Follows up notification from the project site and tracks personnel medically when the USA Occupational Safety Manager is not available.
- USA Project Manager: responsible for implementation of policies and procedures. May be required to perform in the capacity of the Site Manager in his/her absence for reviewing, completing, signing, and submitting accident form(s).
- Human Resources Administrator: responsible for the mailing (FedEx) and tracking of the form(s) to the appropriate agencies or personnel. Generating copies of required documents. Other duties as assigned by the USA Human Resources Director.

- USA Corporate Office: responsible for reviewing and physically submitting the form(s) and attachments to the Workers Compensation Insurance Carrier. Confirming to program and project personnel that receipt and submission has been completed.

5.0 REPORTING REQUIREMENTS AND PROCESS

The following reporting requirements will be observed when preparing, signing, and submitting Accident Reporting Form(s):

- Only the authorized USA forms will be submitted. For an example, see the attached blank copy of the Accident Investigation Report located in the Accident Prevention Plan/Site Safety and Health Plan.
- Signature blocks will be signed by safety personnel or designated representative.
- Activity Hazards Analysis (AHA) Sheet(s) will be submitted with the Accident Reporting Form. Tasks that do not have an AHA at the time of the accident will have them generated for approval.

Upon completion of the Accident Reporting Form, attachment of the AHA, as applicable, and any other supporting documents (statements, photographs, drawings) the packet will be sent by FedEx to the USA Corporate Office in Oldsmar, FL, addressed to the Corporate Safety and Health Manager. There, it will be placed into the appropriate reporting system.

Projects requiring Accident Reporting Forms from sources other than USA will follow those specific requirements as directed. Forms, instructions, and reporting requirements will be supplied on a project by project basis.

6.0 SUMMARY

This SOP is designed for USA personnel who have the responsibility of preparing, signing, and submitting Accident Reporting Forms for work related injuries, illnesses, damaged equipment, and accidents meeting the reporting requirements and guidance provided by Federal, State, and company directives and policies. The information contained within this SOP is not all inclusive, it requires the responsible personnel to follow the referenced material and submit the Accident Reporting Forms in a timely manner.

7.0 REFERENCES

- Occupational Safety and Health Administration
- U.S. Army Corps of Engineers, Engineer Manual 385-1-1
- USA Corporate Safety and Health Program

STANDARD OPERATING PROCEDURE
HSP-23 – WEATHER EMERGENCIES

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide the minimum safety and health requirements, procedures, and practices applicable to the conduct of operations during weather emergencies. These procedures outline the rules, guidance, policies, and general information that will be used during operations.

2.0 SCOPE

This SOP applies to all site personnel, to include contractor and subcontractor personnel, who are involved in operations in the exclusion zone (EZ), contamination reduction zone (CRZ), and support zone (SZ). The procedures outlined here are required to help ensure the safety and health of all site personnel. This SOP is not intended to contain all requirements needed to ensure that every weather emergency is covered but to ensure a range of knowledge and information is available so informed decision making takes place. Consult the documents listed in Section 3.0 of this SOP for reference material.

3.0 REFERENCES

The following references were used to contribute information contained within this SOP and develop requirements that apply to the conduct of operations associated with this project. In the event that other hazards are identified outside the scope of this SOP, review and implementation of additional SOPs and references may be needed:

- OSHA General Industry Standard 29 CFR, Part 1910.120.
- USACE Engineer Manual 385-1-1.
- USA Safety and Health Program.
- National Weather Service.
- American Red Cross.

4.0 RESPONSIBILITIES
4.1 OCCUPATIONAL SAFETY MANAGER (OSM)

The OSM will be responsible for ensuring the availability of the resources needed to implement this SOP, and will also ensure that this SOP is incorporated into plans, procedures, and training for sites where this SOP is to be implemented.

4.2 SENIOR UXO SUPERVISOR

The Senior UXO Supervisor (SUXOS) will ensure that this SOP is implemented by all operations during weather emergencies. The SUXOS will also ensure that relevant sections of this SOP are discussed in the tailgate safety briefings, and that information related to its daily implementation is documented in the Site Operational Log.

4.3 UXO TECHNICIAN III (UXOTIII)

The UXOT III will be responsible for the field implementation of this SOP and the safety and health requirements outlined in Section 5.0 of this SOP. In the absence of a SUXOS, the UXOT III will be responsible for implementing the SUXOS's responsibilities outlined in Paragraph4.2.

4.4 UXO SAFETY OFFICER/SITE SAFETY AND HEALTH OFFICER (UXOSO/SSHO)

The UXO Safety Officer (UXOSO)/Site Safety and Health Officer (SSHO) will be responsible for ensuring that the safety and health hazards and control techniques associated with this SOP are discussed during the initial site hazard training and the daily tailgate safety briefings. The UXOSO/SSHO will also be responsible for daily inspection of site operations and conditions to ensure their initial and continued compliance with applicable SOPs and other guidelines.

5.0 PROCEDURE

All site personnel, including contractor and subcontractor personnel, involved in any site operation will be familiar with the contents of this SOP. Since the safety and health of all site personnel, the environment, and the general population is of paramount importance, all personnel will be expected to follow the procedures at all times. Violation of these procedures, or those imposed by the UXOSO/SSHO, may lead to personal injury or property damage, and may be grounds for positive disciplinary action.

5.1 INFORMATION REQUIREMENTS

5.1.1 Information Requirements for the Site

Daily weather conditions will be a part of the daily briefing. Many people incur injuries or are killed as a result of misinformation and/or inappropriate behavior during severe weather. During severe weather project personnel will seek shelter in an appropriate location (e.g., building or vehicle).

Generally speaking, identify and seek shelter that is appropriate for the type of severe weather you are encountering. Proper shelter will always include sound structure and remove you from the elements.

When available, pay attention to weather warning devices such as the National Oceanic & Atmospheric Administration (NOAA) weather radio, commercial radio, and/or credible weather detection systems; however, do not let this information override good common sense.

Remember: The individual is ultimately responsible for his/her personal safety and has the right to take appropriate action when threatened by severe weather.

The information listed below will be followed at all times by on-site personnel conducting operations in any location of the site:

- The Accident Prevention Plan (APP)/Site Safety and Health Plan (SSHP), Corporate Safety and Health Program, and all other required safety and health guidelines will be met at all times.
- All necessary, and feasible, precautions will be taken to prevent injury to personnel.
- Potentially harmful situations will be immediately reported to the UXOSO/SSHO.
- All personal injuries, no matter how minor, will be reported to the UXOSO/SSHO.
- Buddy system procedures will be enforced during all site operations.
- The number of personnel in the SZ or EZ will be the minimum number necessary to perform work tasks in a safe and efficient manner.

- Site personnel will check in with the UXOSO/SSHO prior to leaving the site, and again upon returning to the site.
- Site visitors are to be escorted by UXO-qualified personnel at all times, and site operations will cease if non-UXO-qualified personnel enter an area where UXO operations are being conducted.
- Site personnel will remain aware of site conditions at all times and will alert the UXOSO/SSHO to any changes that could pose additional hazards.

5.1.2 Information Requirements for Thunderstorms

Thunderstorms affect relatively small areas when compared with hurricanes and winter storms. The typical thunderstorm is only 15 miles in diameter; however, despite their small size, ALL thunderstorms are dangerous! Thunderstorms last an average of 30 minutes. Of the estimated 100,000 thunderstorms that occur each year in the United States, about 10 percent are classified as severe.

No place is absolutely safe from severe weather; however, some places are safer than others. The information listed below will be briefed to on-site personnel conducting operations at the project site.

Before Lightning Strikes:

- Keep an eye on the sky. Look for darkening skies, flashes of light, or increasing wind. Listen for the sound of thunder.
- If you can hear thunder, you are close enough to the storm to be struck by lightning. Go to safe shelter immediately.
- Listen to NOAA Weather Radio or commercial radio for the latest weather forecasts and storm information.

When a Storm Approaches:

- Find shelter in a building or car. Large enclosed structures (substantially constructed buildings) tend to be much safer than smaller or open structures. In general, fully enclosed metal vehicles such as cars, trucks, buses, vans, etc. with the windows rolled up provide good shelter from many weather conditions.
- The risk for lightning injury depends on whether the structure incorporates lightning protection, construction materials used, and the size of the structure.
- Avoid being in or near high places, open fields, isolated trees, rain or picnic shelters, communications towers, flagpoles, light poles, bleachers (metal or wood), metal fences, water (lakes, streams, rivers, etc.).
- 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, plumbing, etc., if lightning is a factor.

After the Storm Passes:

- Stay away from storm-damaged areas.
- Listen to the radio for information and instructions.
- Do not resume work until the “all clear” has been given by the UXOSO/SSHO.

If Someone is Struck by Lightning:

- Initiate the site EMS response system.
- Render First Aid and CPR, as necessary.

5.1.3 Information Requirements for Tornados

Although tornadoes occur in many parts of the world, they are found most frequently in the United States. In an average year, 1,200 tornadoes cause 70 fatalities and 1,500 injuries nationwide.

Tornadoes can occur at any time of the year. Tornadoes have occurred in every state, but they are most frequent east of the Rocky Mountains during the spring and summer months. In the southern states, peak tornado occurrence is March through May.

The information listed below will be briefed to on-site personnel conducting operations at the project site:

When Tornado Producing Storms are in the Area:

- Ensure all site personnel are briefed on the location(s) of tornado shelters.
- Keep an eye on the sky. Look for darkening skies, flashes of light, or increasing wind.
- Listen to NOAA Weather Radio or commercial radio for the latest weather forecasts and storm information concerning tornado watches and warnings.
- When weather conditions are such that a tornado is likely, prepare to move to safety.
- If a tornado is sighted or warning is given, move to the nearest shelter as quickly as possible.

During a Tornado:

- Remain in the shelter.
- Do not open doors or windows.
- Stay within the strongest portion of the shelter.

After the Tornado Passes:

- Stay away from damaged areas.
- Listen to the radio for information and instructions.
- Re-enter buildings with extreme caution.
- Be alert to fire hazards such as broken electrical wires or damaged electrical equipment, gas or oil leaks, and downed power lines.
- Report broken utilities to the appropriate authorities.
- Do not resume work until the “all clear” has been given by the UXOSO/SSHO.

If Someone is Injured:

- Initiate the site EMS response system.
- Render First Aid and CPR as necessary.

5.1.4 Information Requirements for Floods

When a Storm Approaches:

- Keep an eye on the sky. Look for darkening skies, flashes of light, or increasing wind. Listen for the sound of thunder.
- Listen to NOAA Weather Radio or commercial radio for the latest weather forecasts and storm information concerning flood watches and warnings.
- Move out of and away from low lying areas that may flood.
- If you are in a flood zone, move to higher ground away from rivers, streams, creeks, and storm drains.
- Find shelter in a building. Large enclosed structures (substantially constructed buildings) tend to be much safer than smaller or open structures.

During a Flood

- Remain in the shelter.
- Do not open doors or windows.
- Do not drive around warning barricades.
- Do not attempt to drive or wade through flooded areas.
- Stay away from storm-damaged areas.
- Listen to the radio for information and instructions.
- If your vehicle stalls in rapidly rising waters, abandon it immediately and climb to higher ground.
- Do not resume work until the “all clear” has been given by the UXOSO/SSHO.

If Someone is Injured:

- Initiate the site EMS response system.
- Render First Aid and CPR as necessary.

5.1.5 Information Requirements for Hurricanes

Although hurricanes (a type of tropical cyclone) may occur in many parts of the world, they are generally products of the tropical ocean. Hurricane season in the Atlantic starts on 1 June and officially extends through November.

Tropical Cyclones are classified as follows:

- Tropical Depression (sustained winds of 38 mph or less)
- Tropical Storm (sustained winds of 39-73 mph)
- Hurricane (sustained winds of 74 mph or greater)

The information listed below will be briefed to on-site personnel conducting operations at the project site.

When weather formations produce a Tropical Depression, Tropical Storm, or Hurricane (hereafter referred to as a storm) in the area:

- Ensure all site personnel are briefed on the location of storm shelters.
- Be prepared for evacuation of the work site.
- Have a personal bag/backpack/suitcase, etc., ready at the first indication of an approaching storm.
- Review working conditions of emergency equipment.
- Review (if available) the community safety plans.
- Allow enough time to accomplish preparation activities.
- Listen to NOAA Weather Radio or commercial radio for the latest weather forecasts and storm information concerning watches and warnings.
- When weather conditions are such that a storm is likely to strike, prepare to take shelter.

During a Storm:

- Remain in the shelter.
- Listen to NOAA Weather Radio or commercial radio for the latest weather forecasts and storm information concerning watches and warnings.
- Follow instructions issued by authorities.
- Do not open doors or windows.
- Stay away from windows and doors.
- Close all interior doors.
- If in a multi-story building, go to the upper levels.
- Stay within the strongest portion of the shelter.

After the Storm Passes:

- Stay away from damaged areas.
- Listen to the radio for information and instructions.
- Re-enter buildings with extreme caution.
- Be alert to hazards such as broken electrical wires or damaged electrical equipment, gas or oil leaks, downed power lines, deep pools of standing water, or fast-moving water.
- Report broken utilities to the appropriate authorities.
- Do not cook or drink tap water until informed by authorities it is safe to do so.
- Do not resume work until the all clear has been given by the proper authority.

If Someone is Injured:

- Initiate the site EMS response system.
- Render First Aid and CPR as necessary.

5.2 SAFETY AND PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS

Site personnel will at all times comply with safety precautions, safe work practices, and PPE requirements detailed in the APP/SSHP for the project. The continued wearing of PPE may be appropriate during weather emergencies. The use of work clothing, gloves, safety glasses, and boots can help in reducing injury during severe weather conditions.

STANDARD OPERATING PROCEDURE – OPS-11
HAND AND POWER TOOL OPERATION

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide all USA Environmental, Inc. (USAE) employees and subcontractors with the minimum safety and health requirements and procedures applicable to the conduct of operations involving the use of power and hand tools.

2.0 SCOPE

This SOP applies to all site personnel, to include contractor and subcontractor personnel, involved in the conduct of operations that require the use of power and hand tools. This SOP is not intended to contain all the requirements needed to ensure regulatory compliance. Consult the documents listed in Section 5.0 of this SOP for additional compliance issues.

3.0 RESPONSIBILITIES

3.1 PROJECT MANAGER

The Project Manager (PM) shall be responsible for ensuring the availability of the resources needed to implement this SOP, and shall also ensure that this SOP is incorporated into plans, procedures, and training for sites where this SOP is to be implemented.

3.2 SENIOR UXO SUPERVISOR

The Senior Unexploded Ordnance Supervisor (SUXOS) will ensure that this SOP is trained and implemented for power and hand tool operations. The SUXOS will also ensure that relevant sections of this SOP are discussed in the tailgate safety briefings, and that information related to its daily implementation is documented in the Site Daily Operational Log.

3.3 UXO TECHNICIAN III

The UXO Technician III (UXOTIII) shall be responsible for the field implementation of this SOP and for implementing the safety and health requirements outlined in section 4.0 of this SOP. In the absence of a SUXOS, the UXOTIII shall be responsible for implementing the SUXOS'S responsibilities.

3.4 UXO SAFETY OFFICER

The UXO Safety Officer (UXOSO) will be responsible for ensuring that the safety and health hazards and control techniques associated with this SOP are discussed during the initial site hazard training and the daily tailgate safety briefings. The UXOSO will also be responsible for daily inspection of site operations and conditions to ensure their initial and continued compliance with this SOP and other regulatory guidelines.

4.0 PROCEDURE

All personnel, including contractor and subcontractor personnel, involved in power and hand tool operations shall be familiar with the potential safety and health hazards associated with their usage, and with the work practices and control techniques to be used to reduce or eliminate those hazards.

4.1 SAFETY AND HEALTH OPERATIONAL CONTROL TECHNIQUES

4.1.1 POWER TOOLS

Power tools have great capability for inflicting serious injury upon personnel, if they are not used and maintained properly. To control the hazards associated with power tool operation, the safe work practices listed below shall be observed when using power tools:

- Operation of power tools shall be conducted by authorized personnel familiar with the tool, its operation, and the manufacturer's recommended safety precautions.
- Power tools shall be inspected prior to use, and defective equipment shall be removed from service until repaired.
- Power tools designed to accommodate guards shall have such guards properly in place.
- Loose fitting clothing or long hair shall not be permitted around moving parts.
- Hands, feet, and other appendages shall be kept away from all moving parts.
- Maintenance and/or adjustments to equipment shall not be conducted while it is in operation or connected to a power source.
- An adequate operating area shall be provided, allowing sufficient clearance for operation.
- Good housekeeping practices shall be followed at all times.

4.1.2 HAND TOOLS

Use of improper or defective tools can contribute significantly to the occurrence of accidents on site. Therefore, the work practices listed below shall be observed when using hand tools:

- Hand tools shall be inspected for defects prior to each use.
- Defective hand tools shall be removed from service and repaired or properly discarded.
- Tools shall 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 shall be worn to increase gripping ability and/or if cut, laceration, or puncture hazards exist during the use of the tool.
- Safety glasses or a face shield shall be used, if the use of tools presents an eye/face hazard.
- Do not use makeshift tools or other improper tools.
- When working overhead, tools shall be secured to prevent them from falling.
- Use non-sparking tools in the presence of explosive vapors, gases, or residue.
- If hand tools become contaminated, they must be properly decontaminated, bagged, marked, and held for disposition by the UXOSO.
- Tools used in the exclusion zone that have porous surfaces, such as wooden or rubber coated handles, shall be discarded as contaminated upon termination of site activities, unless testing can prove the absence of contamination.

4.2 SAFETY AND PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIREMENTS

In accordance with the personal protective equipment (PPE) SOP, the following safety measures and PPE shall be used in preventing or reducing exposures associated with power and hand tool operations. These requirements will be implemented, unless superseded by specific requirements stated in the Site Safety and Health Plan (SSHP).

- Hard hat and safety boots shall be worn when working with power or hand tools.
- Safety glasses with side shields shall be worn at all times when operating, servicing, or working around hand or power tools.
- Hearing protection shall be worn if hand/power tool operation has the potential for noise exposures greater than 85 dBA Time Weighted Average.
- Leather, or other protective, gloves shall be worn when using hand/power tools.
- Protective face shields shall be worn for all operations that have the potential for generating flying fragments, objects, chips, particles, or similar.

5.0 REFERENCES

The following Occupational Safety and Health Administration (OSHA) standards and U.S. Army Corps of Engineers (USACE) requirements directly apply to the conduct of operations associated with this SOP. In the event that other hazards are associated with the conduct of this SOP, consultation of other SOPs and regulatory references may be needed:

- OSHA Construction Standard 29 CFR, Part 1910, Subpart O
- OSHA General Industry Standard 29 CFR, Part 1926, Subpart I
- USACE Engineer Manual 385-1-1, Section 13

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STANDARD OPERATING PROCEDURE – OPS-19
SITE RULES AND PROHIBITED PRACTICES

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide the minimum safety and health requirements, procedures, and site standing orders applicable to the conduct of operations on site. These standing orders outline the rules, which will be strictly enforced during all on-site activities.

2.0 SCOPE

This SOP applies to all site personnel, to include contractor and subcontractor personnel, who are involved in operations in the exclusion, contamination reduction, and support zones (EZ, CRZ, and SZ, respectively). The rules and prohibited practices outlined here are required to help ensure the safety and health of all site personnel, the environment, and the general public. This SOP is not intended to contain all requirements needed to ensure regulatory compliance. Consult the documents listed in Section 3.0 of this SOP for additional compliance issues.

3.0 REGULATORY REFERENCES

The following Occupational Safety and Health Administration (OSHA) standards and U.S. Army Corps of Engineers (USACE) requirements directly apply to the conduct of operations associated with this SOP. In the event that other hazards are associated with the conduct of this SOP, consultation of other SOPs and regulatory references may be needed:

- OSHA Construction Industry Standard 29 CFR, Part 1926.65
- OSHA General Industry Standard 29 CFR, Part 1910.120
- USACE Engineer Manual 385-1-1, Section 28

4.0 RESPONSIBILITIES
4.1 OCCUPATIONAL SAFETY MANAGER

The Occupational Safety Manager (OSM) shall be responsible for ensuring the availability of the resources needed to implement this SOP, and shall also ensure that this SOP is incorporated into plans, procedures, and training for sites where this SOP is to be implemented.

4.2 SENIOR UXO SUPERVISOR

The Senior UXO Supervisor (SUXOS) will ensure that this SOP is implemented in all operations. The SUXOS will also ensure that relevant sections of this SOP are discussed in the tailgate safety briefings, and that information related to its daily implementation is documented in the Site Operational Log.

4.3 UXO TECHNICIAN III

The UXO Technician III (UXOTIII) shall be responsible for the field implementation of this SOP and for implementing the safety and health requirements outlined in Section 5.0 of this SOP. In the absence of a SUXOS, the UXOTIII shall be responsible for implementing the SUXOS's responsibilities outlined in Paragraph 4.2.

4.4 UXO SAFETY OFFICER/SITE SAFETY AND HEALTH OFFICER

The UXO Safety Officer (UXOSO)/Site Safety and Health Officer (SSHO) will be responsible for ensuring that the safety and health hazards and control techniques associated with this SOP are discussed during the initial site hazard training and the daily tailgate safety briefings. The UXOSO/SSHO will also be responsible for daily inspection of site operations and conditions to ensure their initial and continued compliance with this SOP and other regulatory guidelines.

5.0 PROCEDURE

All site personnel, including contractor and subcontractor personnel, involved in any site operation shall be familiar with the rules and prohibited practices listed in this SOP. The items outlined in the standing orders listed below are considered to be the minimum rules and prohibited practices which will be enforced onsite. This list may be expanded by the UXOSO/SSHO, based upon site conditions and characteristics. Since the safety and health of all site personnel, the environment, and the general population is of paramount importance, all personnel will be expected to follow the standing orders at all times. Violation of these standing orders, or those imposed by the UXOSO/SSHO, may lead to personal injury or property damage, and may be grounds for positive disciplinary action.

5.1 SITE STANDING ORDERS

5.1.1 GENERAL STANDING ORDERS FOR THE SITE

The standing orders listed below shall be followed at all times by on-site personnel conducting operations in any location of the site:

- The Accident Prevention Plan (APP)/Site Safety and Health Plan (SSHP), Corporate Safety and Health Program, and all other required safety and health guidelines will be met at all times.
- All necessary, and feasible, precautions will be taken to prevent injury to personnel.
- Potentially harmful situations will be immediately reported to the UXOSO/SSHO.
- Spillage and splashing of hazardous materials will be prevented to the extent possible, and spills of hazardous materials will be reported to the UXOSO/SSHO.
- Good housekeeping shall be practiced by keeping the work area neat, clean, and orderly.
- All personal injuries, no matter how minor, will be reported to the UXOSO/SSHO.
- Site equipment shall be maintained in good working order, and defective equipment shall be reported to the UXOSO/SSHO.
- Personnel shall properly inspect, use, and maintain personal protective equipment (PPE) as required by the SHSP and applicable SOPs.
- Running and horseplay are prohibited in all areas of the site, at all times.
- Tobacco product use, eating, and drinking will be allowed only in designated areas while personnel are performing operations within a work zone. The designated break area will, in most cases, be determined by the UXOTIII. Personnel will conduct personal hygiene (i.e., cleaning of hands and face) prior to taking a break in the designated area.
- If site hazards include the potential for airborne or physical contact with chemical contaminants, personnel will refrain from eating, drinking, using tobacco, applying cosmetics, or any other hand-to-face activity while they are in the area of chemical contamination. This requirement will hold true at all times unless procedures are specified in the SSHP which allow for the taking of breaks in the work zone or for using back-mounted hydration packs.
- Ignition of flammable materials in any work zone is prohibited, unless directed otherwise by the UXOSO/SSHO.
- Buddy system procedures shall be enforced during all site operations.
- The number of personnel in the SZ, CRZ, or EZ shall be the minimum number necessary to perform work tasks in a safe and efficient manner.

- Site personnel shall check in with the UXOSO/SSHO prior to leaving the site, and again upon returning to the site.
- Site personnel will report to the UXOSO/SSHO any medical conditions or medications which could affect their ability to perform operations safely.
- Site visitors are to be escorted by UXO-qualified personnel at all times, and site operations will cease if non-UXO-qualified personnel enter an area where UXO operations are being conducted.
- Site personnel shall perform only those tasks that they are trained and qualified to perform.
- Site personnel shall remain aware of site conditions at all times and shall alert the UXOSO/SSHO to any changes which could pose additional hazards.

5.1.2 STANDING ORDERS FOR THE CRZ

The standing orders listed below shall be followed at all times by on-site personnel conducting operations in the CRZ:

- No tobacco product use, eating, drinking, application of cosmetics, or other hand-to-face activities are allowed in this area, unless specifically provided for in the SHSP.
- No matches or lighters in this zone.
- Personnel will check in and out at the access control point upon entrance to or exit from this zone.
- Personnel handling potentially contaminated items shall wear appropriate PPE.
- Entry and exit from this zone will be through designated corridors only.
- Only "Buddies" will enter/exit through this zone, no one passes through this zone alone, unless directed by the UXOSO/SSHO, and then only when line of sight can be maintained.
- Hands and face shall be thoroughly washed upon leaving this zone.
- **Remember**: "The Contamination Stops Here". Do your best to keep it that way.

5.1.3 STANDING ORDERS FOR THE EZ

The standing orders listed below shall be followed at all times by on-site personnel conducting operations in the EZ:

- No tobacco product use, eating, drinking, application of cosmetics, or other hand-to-face activities are allowed in this area unless otherwise directed by the UXOSO/SSHO. The exception to this rule may be the use of hydration backpacks.
- No matches or lighters in this zone, unless otherwise directed by the UXOSO/SSHO.
- Personnel will check in/out at the access control point upon entrance to or exit from this zone.
- Personnel will always have their buddy with them in this zone, and follow the buddy system procedures.
- No personnel are allowed in this area without appropriate PPE, as specified by the SHSP.
- Personnel will remain alert to site conditions, and report any changes or unusual occurrences to the UXOSO/SSHO.
- Personnel will avoid contact with contaminated or potentially contaminated surfaces.
- Whenever possible, personnel will not walk through puddles, mud, or any discolored ground surface.
- Personnel will not kneel on the ground or lean, sit, or place equipment on drums, containers, potentially contaminated vehicles, or the ground, unless the potentially contaminated surface has been covered with plastic.
- Visual or verbal contact shall be maintained between the site personnel and the Command Post at all times.
- **Remember**: Site Safety and Health is Everyone's Responsibility. Do your part.

5.2 USE OF MODIFIED WORK SCHEDULES TO CONTROL EXPOSURES

Except as outlined in the Heat and Cold Stress SOPs, modification of work schedules is not considered an acceptable method to control personnel exposure to chemical or physical hazards. Any and all other feasible and effective means of controlling the degree and level of exposure, to include the use of personal protective equipment, will be developed and used prior to using modified work schedules as a means of control. Only in extreme cases where no other feasible, effective control method is available will work schedules be modified to reduce exposures. In the event that modified work schedules must be used, the procedures for monitoring the respective hazard and modifying personnel work schedules will be clearly outlined in the monitoring section of the SHSP.

5.3 SAFETY AND PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS

Site personnel will at all times comply with safety precautions, safe work practices, and PPE requirements detailed in the SSHP for each task. Deviation from assigned safety precautions, practices, and PPE will be allowed only after approval by the UXOSO/SSHO and the CSHM or Occupational Safety Manager.

STANDARD OPERATING PROCEDURE
OPS-23 – LEASED AND RENTAL VEHICLES

1.0 GENERAL

The following USA policies and/or procedures will be used by personnel utilizing leased or rental vehicles for project purposes in accordance with USA's Drug Free Work Place Policy. Personnel are reminded to obey and observe all applicable Federal, state, and local traffic laws, regulations, or guidance, as well as contractual restrictions and requirements imposed by the leasing or rental company.

Rental vehicles are to be used for the purpose of transporting project personnel and equipment to and from work locations and other authorized locations or facilities. The use of rental vehicles during non-working hours for personal use is a privilege, not a right, which may be withdrawn by the project contracting authority or USA management. Assigned vehicle operators (see attached form) will follow the requirements of this SOP on Leased and Rental Vehicles.

The driver of any rental vehicle may be liable for damages in the event that vehicle damage is incurred during working or non-working hours and it is determined that the driver has not complied with this SOP.

All vehicles will have a copy of this SOP, Vehicle Inspection Forms, Accident/Incident Report forms, a list of project contact phone numbers, and a disposable camera as well as all safety-related equipment (fire extinguisher, first aid kit, etc.).

1.1 REFERENCES

Information contained in this document was obtained from the below-listed references:

- USA Safety and Health Program (SHP)
- Applicable sections of DOT, 49 CFR Parts 100 to 199, Transportation
- Vehicle owners manual
- Leasing/Rental agreement
- Administrative SOP
- USA Drug Free Workplace Policy.

1.2 REQUIREMENTS

Personnel assigned project vehicles must be listed on the Authorized Drivers List and be legally permitted to operate the assigned vehicle. Personnel assigned project vehicles are responsible for maintaining positive control of keys. Personnel not assigned project vehicles may not use a vehicle unless specifically authorized by the Project Manager (and then only for the authorized personal related activities as described in Section 2.1). The Project Manager may delegate this authority to the Site Manager/SUXOS under special circumstances.

Personnel utilizing leased or rental vehicles will comply with the following:

- Only properly licensed personnel will operate vehicles.
- Operators will obey and observe all applicable traffic laws.
- Operators will be familiar with the vehicle in use.
- Operators will observe the cautions and warnings located in the owner's manual.
- Operators will be familiar with accident reporting procedures.

- Operators will perform daily inspections of vehicles.
- Operators will report all unsafe or defective conditions found.
- Unsafe conditions will be corrected prior to vehicle use.
- Vehicles will be maintained in a clean and serviceable condition.
- Rental/lease contractual requirements will be followed.

2.0 PROCEDURES

The procedures below are to be followed by personnel receiving, using, and returning leased or rental vehicles.

- Receiving – Personnel responsible for receiving leased or rental vehicles are to ensure that:
  - Vehicle documentation is accurate and complete, with proper signatures.
  - Contract documents accurately reflect mileage, fuel level, and overall vehicle condition, including any exterior or interior damage.
  - Operators are properly licensed.
  - Vehicle is clean and in a serviceable condition.
  - Vehicle has all required safety/spare equipment.
  - Owner's/operator's manual is on hand.
  - Copy of lease or rental contract is in vehicle.
  - An inspection of the vehicle is performed prior to acceptance. All damage is noted on the rental contract inspection sheet and a copy of it is obtained. When renting work vehicles, photos are taken of all damage present on the vehicle upon delivery.
  - The "Lower Option" vehicle is used, if available (e.g., vinyl instead of cloth or leather interior).
- Use – Personnel responsible for the use of leased or rental vehicles are to ensure that they:
  - Are properly licensed.
  - Obey and observe all applicable traffic laws.
  - Always use seatbelts.
  - Observe safe operating procedures.
  - Do not allow unauthorized use of the vehicle.
  - Maintain the vehicle in a clean and serviceable condition.
  - Report all unsafe or defective conditions.
  - Do not operate an unsafe vehicle.
  - Report all accidents immediately.
  - Follow all rental/lease contractual requirements.
  - Perform daily/weekly inspections and document these inspections on the Weekly Vehicle Inspection Sheet.
  - Maintain added safety equipment (i.e., fire extinguishers and first aid kits).
  - Purchase (at company expense) materials to assist in keeping the vehicle clean.

- Purchase (at company expense) inexpensive floor mats and/or seat covers, if necessary.
- Utilize "Wash Racks" (at company expense) if high pressure washing is necessary.
- Wipe down and sweep out the interior of the vehicle, as needed.
- Do not use vehicle off road, unless necessary, and then only during working hours.
- Do not overload the vehicle.
- Use/maintain the vehicle in a manner that reflects favorably upon the personnel, the project, and USA.
- Prohibit the use of tobacco products in project vehicles by all occupants at all times.
- Do not use cell phones while operating project vehicles.
- Decrease speed when adverse weather conditions are present.
- Obey Stop, Yield, Parking, and other traffic regulating signage.
- Drinking alcohol and driving leased or rental vehicles is strictly prohibited. Personnel taking "over the counter" medications or prescription medications are prohibited from operating project vehicles until the effects of the medication(s) are known not to inhibit the individual's driving abilities.

- Turn-In – Personnel responsible for the turn-in of leased or rental vehicles are to ensure that:
  - The vehicle is **cleaned**, inside and out, prior to turn-in (should be in "as good or better than when received" condition).
  - The vehicle is inspected and results are recorded. Take photographs of all damage to the vehicle.
  - All documentation is accurate and complete, with proper signatures.
  - Any discrepancies are corrected or reported prior to departure.
  - All rental/lease contractual requirements have been met.
  - Copies of all documentation are received.
  - Copies of all documentation are forwarded to USA's corporate office.
  - Damage requiring claims forms have been initiated and USA's corporate office has been notified.
  - Points of contact for all parties involved in a claim are listed.

2.1 AFTER HOURS FOR PERSONAL USE OF VEHICLES

The use of project vehicles after normal working hours will be limited to the following:

- Travel to and from food stores
- Travel to and from laundry facilities
- Travel to and from restaurants
- Travel to and from medical facilities
- Other locations as authorized by the Project Manager

The off-duty use of project leased vehicles will be authorized under the following conditions:

- Off-duty use must be authorized by the Project Manager on an individual basis utilizing the enclosed Vehicle Liability Form, and a copy of this form must be in the vehicle. The Project Manager may delegate this authority to the Site Manager/SUXOS under special circumstances. After-hours use of project vehicles will be restricted to use by personnel traveling by commercial transportation to the project site.
- Project personnel will receive this SOP upon arrival at the job site. Those who wish to utilize project vehicles for personal use after normal working hours must fully complete and sign the enclosed Vehicle Liability Form; those not wishing to use the vehicle for personal use must indicate this on the form and sign and date it. All forms are to be returned to Human Resources.
- Failure to provide the completed and signed Vehicle Liability Form will be cause for denying the employee use of project vehicles.
- Vehicle used during the week will be parked for the evening at the employee's quarters not later than 1900 hours local time, and is not to be driven again until regular work time the following morning. (Note: On sites with extended work hours and/or remote locations, the 1900 hours restriction may be extended with the approval of the Project Manager.)
- Car pooling for trips to the store, dinner, etc. is encouraged.
- For weekend usage, operators will complete a vehicle inspection form, record the mileage when receiving the vehicle, and return it on Monday with a full tank of fuel and cleaned inside and out. Weekend use will be limited to 50 miles, and the vehicle must be parked for the evening at the employee's quarters no later than 1900 hours local time on Friday, Saturday and Sunday. The employee may resume driving the vehicle at 0700 hours on Saturday and Sunday and regular work time on Monday morning. Any exceptions to this rule must have prior approval of the Project Manager. Under no circumstances will vehicles be used for "sightseeing" or travel to other metropolitan areas.
- Project vehicles will not be used to transport non-project personnel.
- Off-duty vehicle users will comply with the guidance elsewhere in this SOP.

2.2 DAMAGE/ACCIDENT REPORTING

Should an employee become involved in an accident while operating a project vehicle or should the vehicle sustain damage while in the possession of the employee, the operator will:

- Immediately notify his/her Team Leader, the UXOSO, SUXOS, or Site Manager of any accident involving another vehicle or personnel injuries.
- Complete an Accident/Near Miss Report Form.
- Further document the accident by photographing the accident scene and damage incurred to the vehicle(s).
- Submit to a blood alcohol content (BAC) test within 2 to 4 hours after the accident. The driver will be driven to the test site by the Team Leader, UXOSO, SUXOS or Site Manager if impairment is suspected.

Site management personnel will report all accidents and incidents in accordance with the procedures outlined in the project Accident Prevention Plan (APP). The Project Manager is to be immediately notified of any accident involving serious injury to the driver or other parties.

2.3 SUMMARY

The procedures contained within this SOP are not all inclusive. Personnel are reminded to comply with the referenced material. To eliminate, reduce, and mitigate the risks to the vehicle operator, vehicle

passengers and the surrounding populace, good, safe driving skills and habits are essential to an accident-free project.

AUTHORIZED DRIVERS LIST
USA ENVIRONMENTAL, INC

Project Site/Location:

Date Vehicle Assigned:	Name of Person Vehicle Assigned To:	Drivers License State, Number and Expiration Date:	Type Vehicle Assigned and Identifying Number: (i.e. license plate number)	Signature of Assigned USA Employee:	Signature of Senior USA Employee Assigning Vehicle:

USA Environmental, Inc.
Vehicle Liability Form

USA Environmental, Inc., requires you to complete this form if you are flying to the job site and wish to drive a company-leased vehicle after work hours for personal use. USA Environmental, Inc., will acquire a Motor Vehicle Report (MVR) from the state where your license is issued and may revoke driving privileges based on report results.

If you do not intend to drive a company-leased vehicle after work hours for personal use, please print your name, check the box below and sign and date the form.

Employees will be given a copy of, and are expected to adhere to, the company's Standard Operating Procedures (SOP) for Leased Vehicles. Employees who damage a vehicle while in non-compliance of the SOP may be liable for all damages incurred. USA Environmental, Inc., reserves the right to deduct these costs from your pay, as permitted by applicable state law.

Negligent use of company-leased vehicles may also result in disciplinary action, up to and including termination.

☐ I **do** intend to drive a company-leased vehicle for personal use. The following is my personal information:

Employee Name: _____

Address: _____

City/State/Zip _____

Job Site: _____

Driver's License State: _____

Driver's License Number: _____

Expiration Date: _____

☐ I do **not** intend to drive a company-leased vehicle for personal use.

My signature below verifies that I have received a copy of the SOP for Leased Vehicles.

_____ _____

Signature Date

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OPS-25 STANDARD OPERATING PROCEDURE
FIELD PROCEDURE DOCUMENT CHANGE PROTOCOL

1.0 PURPOSE

The purpose of this SOP is to ensure that all changes to field procedures are properly vetted by the proper personnel at USA Environmental, Inc. (USA) and approved by the Contracting Officer prior to implementation. These procedures will ensure proper scoping, safety, and procedural integrity in the field environment. Changes to regulations, references, directives, policies, or contracts may require a change to or revision of the previously issued document. All documents will be reviewed by authorized appropriate personnel for review and approval prior to change and implementation.

2.0 SCOPE

This Field Procedure Document Change Protocol Standard Operating Procedure (SOP) applies to all site personnel, to include contractor and subcontractor personnel, and all operations involved on each individual project site.

3.0 RESPONSIBILITIES
3.1 FIELD PERSONNEL

Field personnel (to include site supervisors) are responsible for forwarding any request for change/revision to an existing document using the procedures outlined within this SOP. Under no circumstance (with the sole exception of immediate safety concerns) should a change/revision be incorporated until it has been reviewed and approved by authorized USA personnel and the appropriate Contracting Officer or his/her representative as needed.

3.2 PROJECT QUALITY MANAGER

The Project Quality Manager (PQCM) is responsible for determining the validity of the change/revision recommendation and, if deemed valid, forwarding the recommendation expeditiously within the USA organizational chain to those personnel responsible for review and approvals.

3.3 PROJECT MANAGER

The Project Manager (PM) is responsible for the overall project management of all operations at USA project sites that the PM manages. The PM sets the tone for procedural integrity at each site. As such, the PM is responsible for ensuring that procedures specified by the Statement of Work (SOW), Work Plan (WP), and accepted SOPs and supporting documents are strictly adhered to throughout the project. However, projects are always dynamic processes and thus changes and/or revisions can and will be identified throughout its duration. It is the responsibility of the PM to ensure that any change/revision to an already agreed upon procedure is processed and authorized prior to implementation.

3.4 PROGRAM QUALITY MANAGER

The Program Quality Control Manager (PQCM) is responsible for the continuous improvement of all processes within his/her program to include the management of specific projects. To accomplish this, the PQCM will be responsible for the following:

- Becoming thoroughly familiar with the procedures of all projects under his/her cognizance.

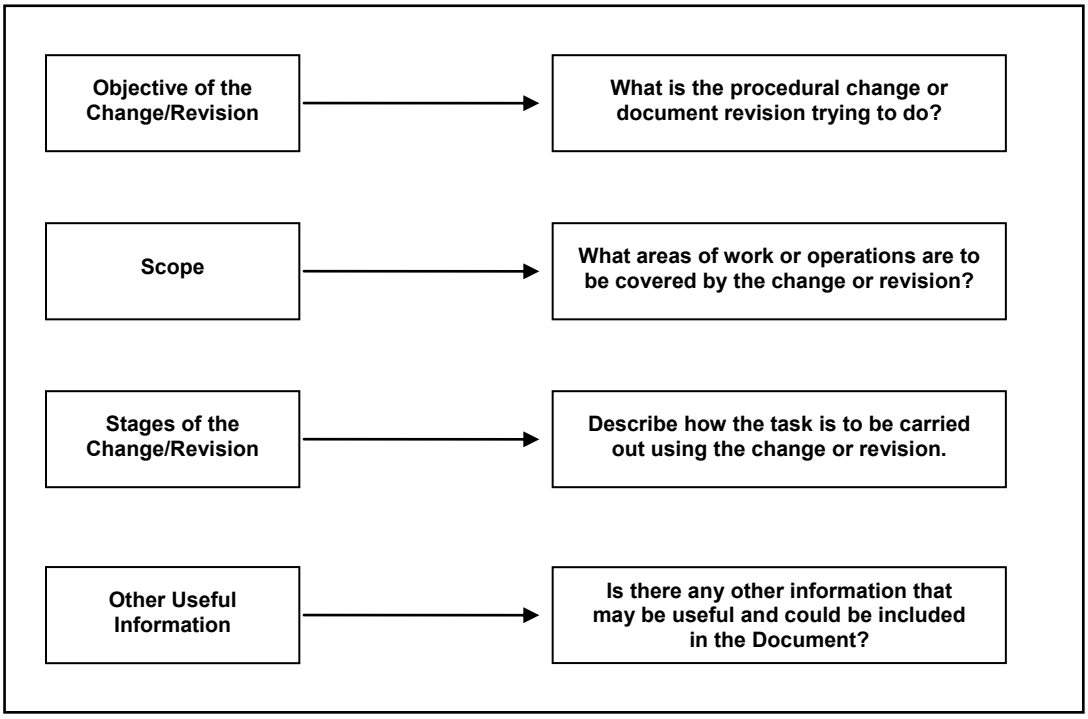
- Observing periodically project management on-site.
- Reviewing procedural change recommendations from field crews and/or project managers.
- Recommending authorization for specific changes/improvements to field operations to the Program Manager.

3.5 PROGRAM MANAGER

The Program Manager will be the final arbiter of the validity for the recommendation within the USA organizational chain. If deemed valid, the PM will contact the Contracting Officer or his/her representative and request that the change be incorporated into field procedures. Documents generated by USA will be drafted, reviewed, finalized, and approved for use by the appropriate sections to include Safety, QC, and Operations.

4.0 SUBMITTAL OF CHANGES OR REVISIONS

Personnel identifying a need for change or revision to an existing document will complete a Change/Revision Request Form and submit it to the management chain for processing. The following guidance is designed to assist in properly addressing the change/revision being sought.



Request for a change or revision to an existing document must be accompanied by a draft of the change or revision being sought. This draft must include the original text, the proposed text, references for the proposed change or revision (i.e., regulatory update, contract change, variation of equipment) to include page, paragraph, bullet, drawing, figure, section, or subsection of the reference material.

5.0 REVIEW AND APPROVAL PROCESS

Request for changes or revisions to an existing document will follow a review and approval process that incorporates the various sections or departments as needed to determine the validity of the request and

ensure that authorized, appropriate personnel have agreed to and signed the approval form for a change or revision to be completed. Personnel assigned to review the request will determine the following:

- Has the request been submitted for an existing document;
- Does the request document the change or revision needed;
- Has a draft, with reference material, been submitted;
- Have the various sections or departments affected by the request been notified.

Once the request has been entered into the review and approval process personnel assigned to the request will determine the following:

- Is the change or revision required by a regulatory or contractual document;
- Is the change or revision necessary due to variations in equipment, training, or personnel;
- Will the change or revision affect other document(s) and have they been identified;
- Will the change or revision impact safety, quality, or production in a positive or negative manner and
- Does the proposed change or revision meet the needs of the requirement?

Once a change or revision has been accepted and implemented, outdated or obsolete documents will be removed from use and the change or revision disseminated and briefed to affected personnel, sections or departments. Those changes or revisions that affect other documents will be briefed as well to ensure continuity between the various documents.

Training required by a change or revision will be addressed by site management and have the necessary training scheduled as appropriate.

6.0 SUMMARY

This SOP is designed to assist those personnel requesting a change or revision to an existing document. This document is not to be considered all inclusive and is to be used in conjunction with existing policies, directives, regulations, and guidance. Personnel requesting, reviewing, approving, and implementing documents have an obligation to ensure that subject material, references, interpretations, or other input is accurate and its inclusion suited to the request for change or revision.

USA
FIELD CHANGE/REVISION REQUEST FORM

Date:	**Department:**	**Name:**
Change or Revision:	**Plan/Procedure/SOP Name or #:**	
Site Location:		

Preliminary Information

Current Document	Check All That Apply	Supporting Documentation (List document, page, para., etc.)	Submitted By (Initials)	Reviewed By (Initials)
Change or Revision Due To:				
1. Regulatory Update				
2. Contract Requirement				
3. Equipment Change				
4. Newly Identified				
a) Safety Hazard				
b) QC Measure				
c) Operational Issue				
5. Other:				

Summary of Change or Revision: (Identify procedural, contractual, equipment, or operator and how this affects the current SOP)**:**

Change or Revision Requested: (Identify page, para, figure, table, etc. that is changed or revised)

Requestors Signature:	
Change or Revision: Accepted Rejected Reason for Rejection -	**Reviewers Signature:** **Safety/QC Signature:**
Corporate: Concurrence Non-Concurrence	**Corporate Approval Signature:**

TITLE: **STANDARD OPERATING PROCEDURE FOR SIDE SCAN SONAR SURVEYS**

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I. OBJECTIVE

The objective of this procedure is to collect side scan sonar data for use in the detection of specific targets, obstructions, submerged cultural resources, for the creation of mosaic maps, or as reference for other project activities. Similar procedures may be used for other regions or purposes with slight modifications as appropriate.

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II. MATERIALS AND EQUIPMENT

1. Side scan sonar towfish
2. Towfish Cable with grip or towing point
3. Side scan sonar topside unit
4. Power supply and necessary accessories for sonar (batteries with jumpers , inverter, generator with extension cord and fuel)
5. Spare parts kit for sonar
6. Side scan sonar 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 side scan sonar 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 towfish towing point on the vessel must be installed or configured based on the towfish to be used.

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2. On-Site Equipment Setup and Calibration

2.1 If using RTK positioning, the base station must be setup. Launch the vessel and transfer all the necessary equipment.

2.2 Assemble the computer, positioning system, and side scan sonar. At dockside, verify that each component is working individually and that the survey control software is receiving data from the GPS. Carefully inspect the components in the towfish safety mechanism and ensure they are secure.

2.3 Start the sonar operating software. Send power to the towfish and do a "rub" test to ensure both transducers are functioning.

2.4 After arriving at the survey location, go to the area that is expected to have the deepest water. Lower the towfish to the appropriate altitude. The optimal altitude is based on the range to be used. The towfish should be towed at an altitude above the bottom equal to 10 percent of the range. The amount of cable fed out should be measured for layback calculations. Layback should be set either using the Hypack Towfish driver or manually calculating the layback and entering this into the survey software and side scan sonar software.

2.5 Run a test line and review the quality of the records. Adjust gain, towfish height, layback, or boat speed as necessary to obtain the best records possible. Do not adjust the range to a smaller area of coverage without ensuring the lane spacing and smaller range will still allow for the desired coverage. Depending on environmental conditions, it may be necessary to run all the lines in the same direction.

2.6 Tow the sensor past a known target such as a navigational buoy, piling, or other object. Ensure the target is detected. Make another pass on the same target in the opposite direction. Ensure the position at which the target is detected is the same to check the layback measurements/calculations.

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 that the line to be surveyed is the active line. Begin the approach to the line with sufficient space to ensure a straight entry. Begin logging data at the start of the line. Check to ensure the data is logging. Once at the end of the line, end logging. The line should increment or decrement to the next line to be run.

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3.3 Constantly monitor the sonar record to ensure good image quality. Adjust gain as necessary. Monitor the water column in the sonar record to ensure the towfish is at the appropriate altitude and to avoid the towfish dragging on the bottom.

3.4 At the end of the day or end of the project, re-survey the two or more lines or run tie lines perpendicular to the survey lines for statistical accuracy analysis if applicable.

4. Quality Assurance

4.1 All raw survey data and information (e.g., field notes, instrumentation frequencies) must be documented electronically or in a field note book. At the end of each day, check daily computer data from the Hypack Max and the sonar system software 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 Side scan records are reviewed in both their proprietary software under various color palettes to ensure all pertinent data can be obtained from the records. The data is also reviewed in Chesapeake Technologies SonarWeb Pro software for mosaicing adjacent survey lines to check the overall accuracy of the records.

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TITLE: **STANDARD OPERATING PROCEDURE FOR MULTIBEAM HYDROGRAPHIC/BATHYMETRIC SURVEYS**

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I. OBJECTIVE

The objective of this procedure is to collect hydrographic data for use in the creation of contour maps, point plots, or as reference for other project activities. In designing and running a survey, ACOE Hydrographic Survey minimum performance standards or other (if applicable) must be followed.

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II. MATERIALS AND EQUIPMENT

1. Swath Plus or equivalent survey grade multibeam fathometer
2. Transducer mounting bracket
3. GPS antenna mount
4. Power cable for fathometer
5. Data transfer cable for fathometer
6. Bar or disc for calibration of fathometer
7. Fathometer manual
8. Laptop computer with power supply
9. Inverter for computer
10. Computer hood or mount
11. GPS system (RTK or DGPS) which includes at a minimum: receiver, antenna, power cable, data cable, antenna cable

III. PROCEDURE

1. Survey Preparation

1.1 *General*

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 usually sufficient to collect the required data. However, the spacing between parallel lines will vary depending on the desired coverage or scale of the site. Adjustments to transect spacing will be made real time to account for depth changes to ensure coverage overlap.

1.2 *GPS Ephemeris & DOP*

Pre-survey planning of satellite geometry and availability shall be reviewed prior to each day of data acquisition. The hydrographer in charge must determine if there will be excessive periods of GPS outages or periods of high dilution of precision (DOP) and note such occurrences in the daily field notes.

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1.2 *Survey Control*

All horizontal or vertical controls used for Real-time Kinematic (RTK) GPS enabled mapping projects will utilize benchmarks registered with a State Geodetic Survey or the National Geodetic Survey (NGS) and be of third order accuracy or better. All work shall be relative to NAD83 as the horizontal input coordinate system and NAVD 88 in the vertical plane unless otherwise noted. A minimum of five satellites shall be used to resolve vertical and horizontal positions at both the base and aboard the survey vessel. The monument name and general location shall be recorded in the daily field notes. Base station quality relative to the local network of NGS/National Ocean Service (NOS) survey control markers shall also be recorded in the daily field notes. The quality check entails checking at least one known geodetic benchmark of third order horizontal and vertical accuracy in the local survey area. The surveyed northing, easting and orthometric height of the chosen benchmark as well as the NGS/NOS published northing, easting and orthometric height shall be recorded and compared. Acceptable values for RTK GPS enabled mapping projects should be within +/- 0.1 m (0.3 ft) both horizontally and vertically unless otherwise specified. For further quality analysis, the number of satellites currently tracked, as well as horizontal dilution of precision (HDOP) shall also be recorded. In the absence of an acceptable NGS/NOS survey control for either use as a base station location or quality check, a temporary benchmark (TBM) will be established.

1.3 *General Navigation*

The hydrographer shall modify the vessel navigation software parameters to fit survey conditions. Modified parameters may include but are not limited to:

- ❑ Heave filter mode and average heave period
- ❑ GPS antenna attitude constraints
- ❑ RTK baseline search mode
- ❑ Waterline adjustments due to vessel loading changes and or water type
- ❑ DGPS link baud rate (i.e. radio or cellular communications)

Any changes made to navigation software parameters shall be recorded in the daily field notes and a copy of the parameters shall also be stored electronically for future reference.

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1.4 *Verify Vertical Positioning*

When available, the hydrographer will verify the accuracy of vertical RTK GPS elevation data collected onboard the survey vessel to nearby NOAA NOS, USGS, USACE, or other approved water level gauge stations at the start of a mapping project. As a general check, acceptable values should be within +/-0.25 m. Prior to data acquisition the operator will need to verify the datum being referenced by the gauge and account for differences between it and the datum being referenced aboard the survey vessel. Results shall be noted in the daily field notes.

2. Data Collection / QA/QC

2.1 *Hydrographic Data Collection*

UCI data collection methods reference guidelines and general hydrographic surveying technique recommendations set forth in the following publications:

- U.S. Army Corps of Engineers Hydrographic Surveying Manual; EM 1110-2-1003 and Change 1
- NOS 2010 Hydrographic Surveys Specifications and Deliverables
- NOAA Office of Coast Survey 2010 Field Procedures Manual
- International Hydrographic Organization Publication C-13 Manual on Hydrography

2.2 *Field Notes*

Detailed field notes shall be recorded on a daily basis and supplemented with additional information as needed at the end of the survey. The following shall be included in the notes:

- Base station location (if RTK-based survey)
- Survey area, calendar date and day, Julian date
- Personnel/Operators
- General weather and sea state
- Line name, vessel speed, heading and GPS status (i.e. DGPS/Float/Fix)

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- ❑ Additional comments as outlined in this SOP

2.3 *Echosounder System Setup*

The hydrographer shall run the echosounder processing unit built in self test (BIST) and record the results of the test in the daily field notes. As needed, the user shall also modify the mulitbeam acquisition software runtime parameters to fit survey conditions and note changes to in the daily field notes.

Modified parameters may include but are not limited to:

- ❑ Sonar head sector coverage
- ❑ Beam spacing and width
- ❑ Bottom tracking mode
- ❑ Survey depth range
- ❑ Ping rate

2.4 *Sound Velocity Profiles*

Sound velocity profiles (SVP's) are to be collected at a minimum of twice daily. Additional casts may be required when noticeable changes in water properties are observed. Changes may be due to but are not limited to the following: tides, wind shifts, precipitation events, and proximity to swash, inlet or other water discharge area. For each sound velocity dip, the time, location, and chosen file name shall be recorded in the survey notes. Recorded SVP's shall be uploaded into the runtime parameters of the multibeam acquisition software and noted in the daily field notes.

2.5 *Waterline/Sound Velocity QC*

Changes in weight of the vessel due to loading may alter the position of the waterline. A lead-line test shall be conducted at the dock at the start of a new survey project and throughout the rest of the survey as deemed necessary by the hydrographer. Result of the lead-line test shall be compared to the nadir beam depth after a current SVP has been uploaded into the system. The result should be less than +/-0.25 m and recorded in the daily field notes.

2.6 *Patch Test*

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A patch test to properly align the multibeam system sensors will be conducted at any occasion the sonar heads or ancillary sensors (e.g. heave compensation unit or GPS antennas) may have undergone significant change in position or angular orientation on the survey vessel as to impact the quality of the survey or at the commencement of a new survey project. The patch test shall follow the guidelines as outlined in Chapter 12 of the U.S. Army Corps of Engineers Hydrographic Surveying Manual (EM 1110- 2-1003 Change 1). Results of the patch test shall be analyzed and changes incorporated back into the following system components:

- Multibeam acquisition software
- Post- processing software vessel file
- Navigation software

Any changes made to position or angular offsets of shall be recorded in the daily field notes.

2.7 *Data Acquisition*

The hydrographer shall monitor data collection in real-time for significant static and dynamic artifacts and shall attempt to correct as conditions permit in the field. Monitoring data quality also applies to navigation inputs, and includes recording considerable degradation in the quality of the RTK GPS signal and or complete loss of communications with the RTK base station. The hydrographer shall record any changes in GPS signal quality. During data acquisition the hydrographer will establish additional survey tracks that will serve as Daily Alignment and Cross Check Analysis lines. During post-processing these lines will serve as a QA check of the overall survey and system accuracy.

2.8 *Data Archiving & Initial Processing*

At the conclusion of a survey day, all raw multibeam data files, sound velocity data files and other ancillary data shall be downloaded from the field system and backed up on a portable hard drive for transfer to a dedicated data server. Copies of daily field notes shall be given to the person in charge of post-processing. Data will undergo an initial quality check for large errors and undergo further bathymetric processing that will correct measured depths for departures from accepted true depths. Post-processing corrections shall include but are not limited to:

- Instrument error corrections
- Vessel offsets

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- Velocity of sound corrections
- Motion and instrument latency corrections including heave, pitch, roll, and heading applied to soundings to correct for the motion of the vessel and its sensors during acquisition.

3. Data Deliverables

3.1 At a minimum, processed data will be output as both X,Y,Z files and Geo-Tiffs. The density of the data output into the X,Y,Z can be specified by the client or sorted to give good data resolution as well as have manageable file sizes. The Geo-tiffs will be color shaded relief maps showing the water depths/elevations which can be used as background files as well as to easily see changes in depth for quick analysis of site conditions.

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SWATH*plus*

Key Features

- Bathymetry and sidescan imaging sonar
- Interferometric technology
- Range of sonar frequencies to support all applications
- Compact, portable and robust
- Low power
- USB Interface
- Time synchronisation support
- Real-time data acquisition software
- Post-processing calibration, quality control and mapping software
- Interfaces to many industry-standard software packages

Marine and Inshore Survey

SWATHplus is a wide swath sonar system for surveying underwater surfaces. It acquires high density bathymetry and sidescan data. Processed data output includes Digital Terrain Models and sidescan images. It is equally well suited for use at sea, and for inland waterways and lakes.

From Very Shallow to Deep

SWATHplus surveys to water depths of 350 metres. It is particularly efficient in shallow water, and is low-cost, compared with similar sonar systems.

Highly Configurable

The core SWATHplus system consists of sonar transducers, a transducer interface unit, and real-time and postprocessing software. A system can be supplied complete with computer, transducer mounting hardware, spares, positioning system, attitude system and compass. System manuals and on-line help are provided as standard.
SWATHplus can be provided as a complete, integrated system, or as components for integration into a client's existing systems.
SWATHplus has been used on a wide range of vessels and vehicles, including survey vessels, small launches, unmanned surface vehicles (USVs) and unmanned underwater vehicles (UUVs). The transducers can be mounted on side or bow mounted poles, or fixed to the vessel's hull. Mounting hardware and advice can be provided.

Full Suite of Software

A full suite of data acquisition and processing software is provided as standard, and the system can be integrated with most industry-standard acquisition and processing software tools. Data formats and advice can be provided for users who wish to develop their own processing applications.

Performance Advantages

SWATHplus uses interferometric processing. This gives high data densities and wide swath widths.
The advantages of SWATHplus include:

- Very wide swath width, especially in shallow water. Ratios of swath width to water depth typically exceed 15:1, over 20:1 in less than 10m depth.
- Simultaneous Side Scan: SWATHplus produces sidescan imaging data of a quality on a par with any sidescan-only system, co-registered with the bathymetry.
- Portability: the system is small, light (<5kg for the 468kHz version), and consumes little power (<20W apart from the computer).
- High Resolution and Accuracy: the system records many more data points than beam-forming sonars, and gives survey accuracy to international standards, including IHO S44 Special Order.
- Cost of Ownership: system simplicity results in a low initial purchase price, high reliability, simple maintenance and long service life

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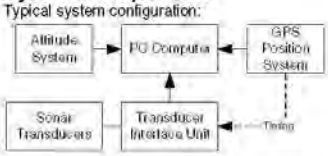
System Components

Typical system configuration:



Transducer Interface Unit

Connects the sonar transducers to Windows PCs, including laptops
Generates the sonar pulses, and amplifies the sonar returns
Digitises the sonar data and sends it to the PC computer for further processing
Maintains time synchronisation using 1PPS inputs

Interfaces

- 2 SWATHplus transducer connectors: MIL-C-26482
- 2 USB connections to PC computer
- 2 signal ground connections: screw terminal
- Sync port: supports trigger pulse output to echosounders
- 1PPS port for timing: BNC
- 230V Mains in: IEC connector

Dimensions

120mm H × 290mm W × 285mm D

Power

100-240V AC mains, < 20W

Sonar Transducers

Transmit the sonar pulse into the water, and receive the returned signals
Range of sonar frequencies available
Extremely robust construction
Deep pressure ratings available on request

Transducer Dimensions

Item	Height /mm	Width /mm	Depth /mm	Weight /kg	
				in air	in water
117 kHz	235	550	90	13	1.6
234 kHz	160	350	60	6	0.9
468 kHz	100	215	46	1	0.1

Transducer Mounting

Mechanical kits for transducer mounting are available, including bow-mount, side pole mount, and hull-mount

PC Computer

Works with Microsoft Windows-compatible PC computers, including laptops.

Sensor Interfaces

Interfaces to most industry standard auxiliary sensors, including:

- Attitude: CodaOctopus F180 series, Applanix POS/MV and Wavemaster, Ixsea Octans & Hydrins, TSS DMS, and many others
- GPS systems: All NMEA 0183- compatible systems
- Gyro compasses: All NMEA 0183- compatible systems
- Real-time & profiling speed of sound sensors
- Echosounders
- SEA's ECHO*plus*

Software

Microsoft Windows XP and Vista.

Swath Processor

Real-time and first-line replay functions, including:

- Controlling the sonar electronics system
- Acquiring data from the sonar electronics
- Acquiring data from the auxiliary systems, through the PC's serial and Ethernet ports
- Storing raw data
- Converting the raw data to depth, position and amplitude (xyza), combining auxiliary data, such as motion, position, etc.
- Filtering the data
- Displaying the data
- Storing processed data in a range of formats

Grid Processor

Post-processing functions, including:

- Creating gridded digital terrain model (DTM)
- Displaying depth and amplitude
- Displaying statistical information
- Comparison of overlapping data sets
- Automatic "patch test" calibration, giving accurate sensor offset data
- Filtering and adjusting the data in the grid
- 2D depth numerical and colour-map chart views; scaled print-out
- 3D surface and point cloud views
- Interactive depth editing in 3D view
- Depth, sidescan or statistical information shown in 2D and 3D views

Third-Party Software Support

Open-format file and TCP/IP data exchange and control.
Full real-time sonar control and process:

- QPS's QINSy
- PDS2000
- Hypack

Data processing and visualisation:

- Caris
- Fledermaus
- Surfer
- Any ASCII xyz-compatible system

Sidescan processing

- CodaOctopus' Geosurvey
- Chesapeake Technologies' SonarWeb

Documentation

- User Manuals,
- On-Line, context-driven Help Pages
- Installation Guides

System Performance

	Sonar Frequency		
	117 kHz	234 kHz	468 kHz
	SWATHplus -L	SWATHplus -M	SWATHplus -H
Maximum Water Depth	350m	150m	75m
Maximum Swath Width	1000m	400m	200m
Swath Width	Up to 20 times depth, up to Maximum Swath Width, typically 10-15 times, depending on depth and bottom type		
Resolution Across Track (best case)	7.5cm	5cm	3.0cm
Beam Width	1.7° Azimuth	1.1° Azimuth	1.1° Azimuth
Transmit Pulse Length	68µS to 1mS	34µS to 500µS	17µS to 250µS

Covers SWATH*plus* Version 3

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APPENDIX L. RESERVED

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APPENDIX M. USACE SOP FOR ENDANGERED SPECIES

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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

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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 Explosive of Concern
MRS	Munitions Response Sites
Navy	Department of Navy
NMFS	National Marine Fisheries Service
SOPs	Standard Operating Procedures
TPP	Technical Project Planning
UIT	Underwater Investigation Team
USACE	U.S. Army Corps of Engineers

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

1.0 INTRODUCTION

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

Figure 1. Location Map of Culebra.

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

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

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

Figure 2. DERP-FUDS Projects for Culebra.

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

2.0 PURPOSE AND NEED

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

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

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

3.0 LISTED THREATENED OR ENDANGERED SPECIES

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

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

3.1 Loggerhead Sea Turtle (*Caretta caretta*)

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

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

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

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

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

3.2 Green Sea Turtle (*Chelonia mydas*)

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

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

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

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

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

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

Figure 5. Green Sea Turtle Critical Habitat.

3.3 Leatherback Sea Turtle (*Dermochelys coriacea*)

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

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.

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.

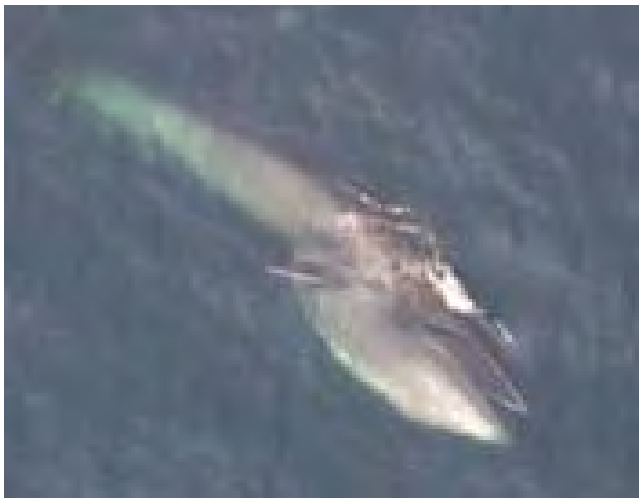

Figure 11. Sei Whale
Source: http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/seiwhale.htm#more

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**).

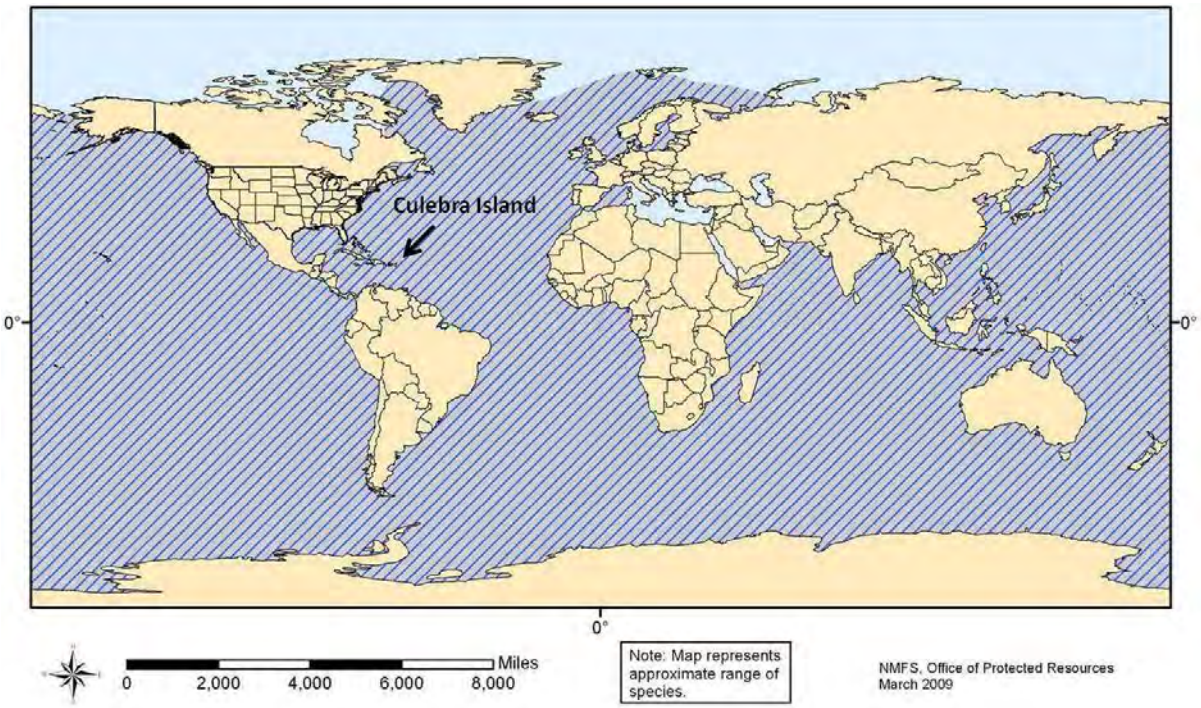

Figure 14. Approximate range map for Humpback, Sei, Sperm and Blue whales.

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

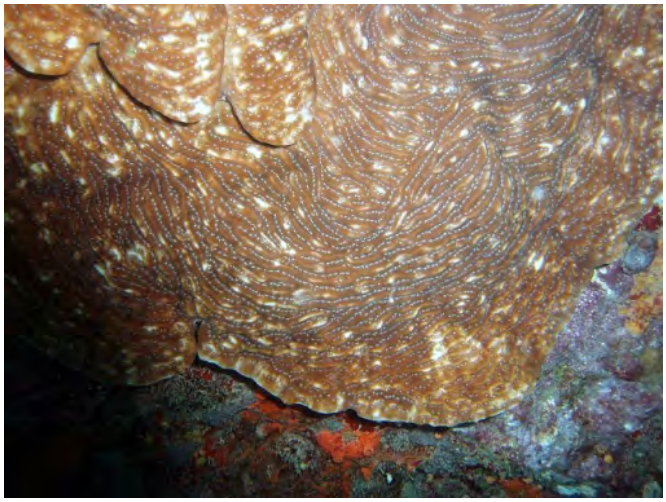

Figure 19. Lamarck's Sheet Coral
Source: http://coralpedia.bio.warwick.ac.uk/en/corals/agaricia_lamarcki.html

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**).

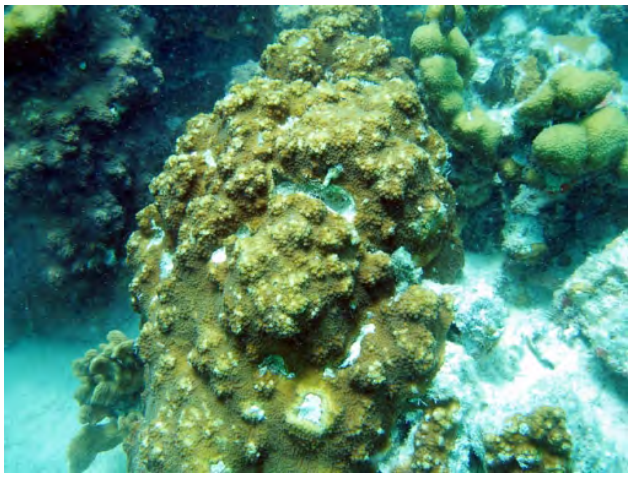

Figure 22. *Monstastraea franki*
Source: http://coralpedia.bio.warwick.ac.uk/images/Montastraea%20franksi01.JPG

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

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Name	Organization	Telephone/Email
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Ana Roman Deputy Project Leader and Culebra NWR Manager	FWS	Desk: 787-742-0115 / 787-306-1389 Ana_Roman@fws.gov
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José Rivera Habitat Conservation Division	NMFS	Desk: 787-405-3605 Jose.A.Rivera@noaa.gov
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Damaris Delgado Bureau of Coast, Reserves and Refuges	DNER	Desk: 787-999-2200 ext. 2107 ddelgado@drna.gobierno.pr
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LIST OF APPENDICES

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

B. Addendum to the 2008 SOPs (April 2011)

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APPENDIX A

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

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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

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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

<u>Measures to Avoid or Minimize Possible Impacts Resulting from Munitions Clearance and Detonation Activities</u>

Vegetation Removal:

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

Beach Monitoring

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

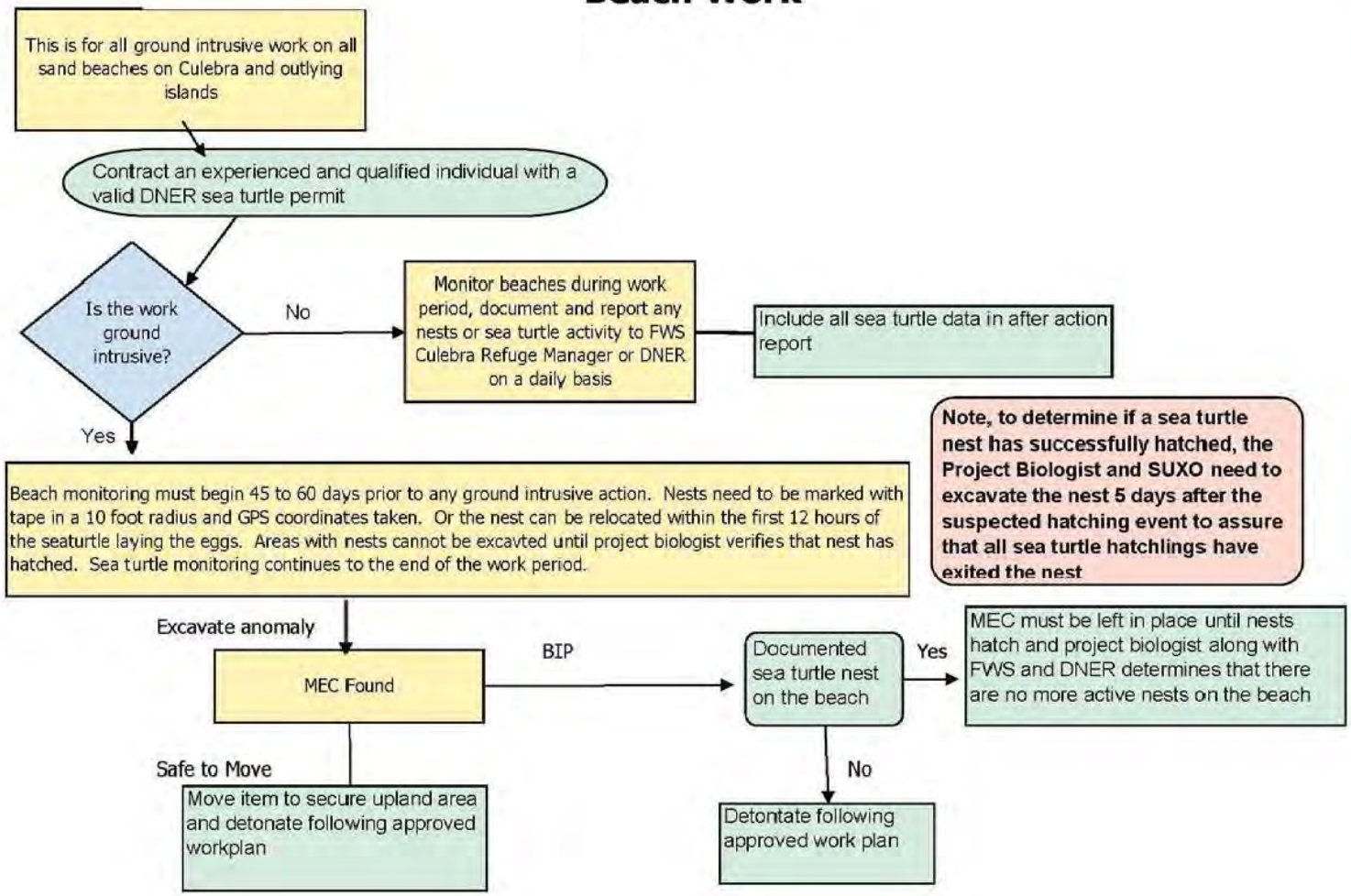
Prior to commencement of clearance activities, including vegetation removal and removal of unexploded ordnance, on Culebra, Culebrita, Cayo Norte and Cayo Luis Peña the contractor shall appoint a Project Biologist whose qualifications shall be submitted for the approval of the contracting officer and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

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

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

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

Sea Turtle Conservation Measures for Ground Intrusive Beach Work



Designation of Beach Zones for Vegetation Removal and Munitions Detonation:

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

The work zones proposed are:

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

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

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

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

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

Vehicular Traffic

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

Vessel Traffic

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

NMFS Protected Species Vessel Strike Avoidance Measures and Reporting

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

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

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

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

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

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

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

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

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

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

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

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

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

Considerations for Other Species

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

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APPENDIX B

Addendum to the 2008 SOPs (April 2011)

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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

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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.

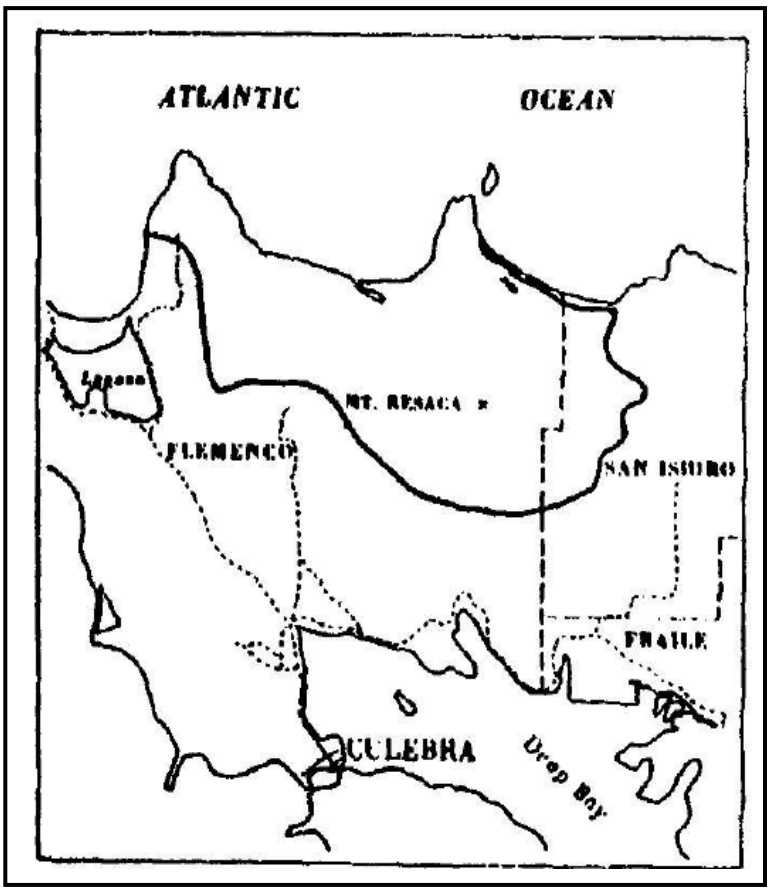

Figure 4. Boundaries of the critical habitat designated for the Culebra Island Giant Anole. Source: Critical Habitat Designations for PR and USVI (FWS 2007).

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 inconspicuosly 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 <u>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.</u>

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.

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APPENDIX N. SNORKELING PLAN

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ACRONYMS AND ABBREVIATIONS

APP	Accident Prevention Plan
AHA	Activity Hazard Analysis
CFR	Code of Federal Regulation
CPR	Cardiopulmonary Resuscitation
DDC	District Diving Coordinator
DDESB	Department of Defense Explosives Safety Board
DNER	Department of Natural and Environmental Resources
DOD	Department of Defense
DQO	Data Quality Objective
EOD	Explosive Ordnance Disposal
ESA	Endangered Species Act
°F	Degrees Fahrenheit
FSW	Feet of Salt Water
GIS	Geographical Information System
GPS	Global Positioning System
GSA	General Services Administration
MEC	Munitions and Explosives of Concern
MPPEH	Materiel Potentially Presenting an Explosive Hazard
MRS	Munitions Response Site
NATO	North Atlantic Treaty Organization
NAUI	National Association of Underwater Instructors
PADI	Professional Association of Diving Instructors
PFD	Personal Flotation Device
PPE	Personal Protective Equipment
QC	Quality Control
RI	Remedial Investigation
RPM	Remedial Project Manager
SP	Snorkeling Plan
SS	Snorkeling Supervisor
TP	Technical Paper
USACE	U.S. Army Corps of Engineers
USA	USA Environmental, Incorporated
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
UXOTI	Unexploded Ordnance Technician I
UXOTII	Unexploded Ordnance Technician II
UXOTIII	Unexploded Ordnance Technician III
VHF	Very High Frequency
WP	Work Plan

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LIST OF ATTACHMENTS

Attachment 1	Snorkeling Site Maps
Attachment 2	Activity Hazard Analysis (AHA) Forms
Attachment 3	Forms and Records

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1.0 PROJECT OBJECTIVES

USA Environmental (USA) prepared this Snorkeling Plan (SP) for Culebra Island, Puerto Rico (Formerly Used Defense Site (FUDS) Project Number I02PR0068) under Contract No: W912DY-04-D-0006, Task Order No. 0022, from the U.S. Army Corps of Engineers, Engineering and Support Center, Huntsville (USAESCH).

This SP reflects the procedures and methods USA will utilize to perform environmental snorkeling surveys of the underwater environment to include identification of coral and other endangered species protected under the Endangered Species Act (ESA) as well as those 7 corals species to be added to the ESA list (See Appendix M). These environmental surveys are in support of a Remedial Investigation (RI) of the intended investigation sites.

This RI is designed to perform an in-depth study to gather the data necessary to determine the nature and extent of known contamination at the site, assess risk to human health and the environment, and establish criteria for cleaning up the site.

This document is included as an appendix to the Environmental Baseline Survey Work Plan for project operations on both land and water, which includes extensive information pertaining to site operations, quality control, and safety (Site Safety and Health Plan, etc). The Environmental Baseline Survey Work Plan will be utilized for additional guidance relating to the underwater RI/FS effort.

2.0 PURPOSE AND SCOPE

The primary purpose of snorkeling operations is to collect supplemental Environmental Baseline Survey data within shallow water areas of the Munitions Response Site (MRSs). Snorkeling activities are to satisfy the project Data Quality Objectives (DQOs) as established by Table 3-1 of the Environmental Baseline Survey Work Plan.

The following is a listing of MRSs intended for underwater survey and investigation within Culebra Island, Puerto Rico:

- MRS 13 Cayo Luis Pena Impact Areas
- MRS 09 Soldado Point Mortar and Bombing Area

Snorkeling operation will be focused within these MRSs, and maps reflecting the location, boundaries, water depth, and specific transects are presented in Attachment 1. Encountered water depths are not expected to be deeper than 10 Feet of Salt Water (FSW).

2.1 LOCATION AND HISTORY

Culebra Island and the surrounding cays, consisting of approximately 8,430 acres, were used for aerial bombing, maneuvers, artillery firing, and amphibious training by a collection of military forces between 1902 and 1975 (USACE, 2005).

The U.S. Navy (Navy) and U.S. Marine Corps (Marines) used portions of Culebra Island as a training facility from 1902 through 1944. The island complex was later used by forces of the North Atlantic Treaty Organization (NATO).

To support the increased training needs during Viet Nam operations, the Navy acquired additional training areas on cays 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 Viet Nam. 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 puff rounds until ordnance use was terminated on September 30, 1975. Between 1975 and 1982, the facilities were turned over to the General Services Administration (GSA).

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 cays are managed by the U.S. Fish and Wildlife Service (USFWS). The Puerto Rico Department of Natural and Environmental Resources (DNER) also manages land on Culebra.

2.2 CLIMATE

The weather at Culebra Island is generally warm year round due to its tropical marine climate. Average rainfall is approximately 36 inches, with the heaviest rain in May, October, September, and November. The months of August through November are considered the wet season, and the driest months are January through April. Daily temperatures average 80°F year round with an average maximum of 86 °F and an average low of 74 °F. Prevailing Winds are generally from the east-northeast during November through January and from the east during February through October. Winds speeds average 8 knots. Hurricane season is from June through November, and severe hurricanes hit Culebra every 10 to 20 years.

2.3 WATER CONDITIONS

Anticipated water surface and subsurface conditions consist of the following:

- Water temperature range from 78 - 81 °F in winter months to 82 - 84 °F in summer months
- Tidal range from 0.5 to 2 ft
- Underwater visibility from 15 to 60 ft
- Currents- see description below
- Surface conditions- see description below

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 majority of the intended snorkeling sites do experience currents due to wind driven water and tidal fluctuations. It is anticipated that current speeds within the channels that separate the main landmass of Culebra with the neighboring island will be increased due to the natural effects of the area. This is especially noted within the channel separating Cayo Luis Pena and Culebra Island.

Given the varying geographic locations of the waterborne areas for each MRS, surface wave conditions and currents will fluctuate. Robust currents and wave action can have a detrimental effect on the ability to safely perform snorkeling, effectively maneuver support vessels, and accurately deploy and operate underwater instruments. The effectiveness of waterborne operations being attempted during these periods may be considerably affected, and field operations must be properly managed to ensure that the safety of personnel is not compromised.

2.4 SENSITIVE MARINE HABITAT

It is anticipated that snorkeling sites may contain sensitive underwater elements, consisting of corals, sea grasses, and a collection of fish, turtles, and other species. The federally and state-listed waterborne species of most concern are green sea turtle, hawksbill sea turtle, leatherback sea turtle, and loggerhead sea turtle. In addition, the Elkhorn and Staghorn corals in the surrounding waters are threatened species.

A listing of the federally and state-listed waterborne species of most concern, along with a SOPs for operating within a sensitive marine environment, is contained with the Environmental Baseline Survey Work Plan and Appendix M.

All snorkeling, and associated support boat/vessel operations, will adhere to the actions reflected in the SOP to ensure the protection of sensitive marine habitats.

2.5 INITIAL SUMMARY OF RISK FROM MEC

Given the history of military activities throughout Culebra and the adjacent islands, there is a potential to encounter the following MEC items while conducting underwater operations:

- Small arms
- 37mm, 75mm, and 155mm projectiles
- 81mm, 3-inch, and Stokes mortars
- 6 and 8-inch projectiles
- 30-pound fragmentation and 100-pound demolition bombs

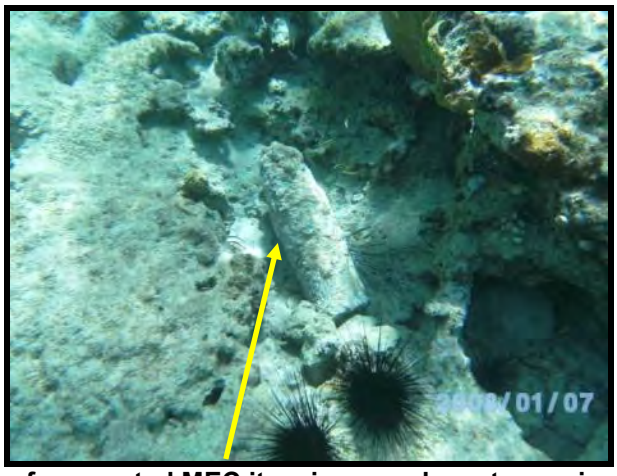

Image of suspected MEC item in an underwater environment

Depending on the length of time a MEC item has been submerged in a saltwater environment, and the resulting condition of the exterior body, specific recognition of the item may be inhibited. This includes recognition of the type, model, fuzing configuration, and fired or unfired status.

3.0 DESCRIPTION OF INTENDED OPERATIONS

Snorkeling operations will be conducted in order to complete the following tasks:

- Visual surveys of the seafloor to survey marine habitat types
- Visual survey of suspected MEC items
- Collection of related underwater data (water depth, site conditions, etc.)

All snorkeling will be planned and performed with the highest consideration of personnel safety, and will account for site weather conditions, surf zone elements, and sufficient support assets.

4.0 SNORKELING SURVEY PLAN

All snorkeling survey operations will be conducted in accordance snorkeling requirements reflected in related guidance documents and instructions.

4.1 SNORKELING SAFETY

The depth range for snorkeling operations within all transects is 1 to 10 FSW. The following general safety practices will be adhered to during all snorkeling operations.

- Snorkeling surveys will only be done on the surface of the water. No diving of any kind is permitted.
- As required, snorkelers and water based support personnel will wear a device providing a minimum of 15.5 pounds (7.03 kg) of positive buoyancy (Type III PFD, fully inflated snorkeling vest, etc.)
- Untethered snorkelers will remain within 50 ft (15.24 m) of each other at all times
- Snorkelers will be equipped with appropriate thermal protection
- Areas of extreme water velocity and turbulence will be avoided
- In the case where encountered water depths are greater than 10 FSW, snorkelers will be tended

  > While the requirement to be tended is normally aligned to water depths greater than 5 FSW, it is anticipated that snorkeling sites will be in areas where constant maneuvering by the safety/support vessel will be restricted/limited

  > Tending from vessels in these restricted areas will add an increased hazard which is more significant than allowing personnel to snorkel untethered in up to 10 FSW given the following elements:

  - All snorkelers will function in teams of 2 or more personnel
  - All snorkelers will wear buoyancy devices
  - Support boats will remain in proximity to the snorkelers, and all snorkeling sites are located close to shorelines

Prior to snorkeling operation each day, a comprehensive assessment of the site, surf zone, and general weather conditions will be performed in order to ensure that safe access into the water body is achievable. This assessment will also be performed through the execution of snorkeling activities in order to detect changes in the site conditions that may impact the safe conduct of snorkeling.

The designated U.S. Army Corps of Engineers (USACE) District Diving Coordinator (DDC) will be contacted in order to review and accept any changes to mission, personnel, or equipment. This coordination will be completed prior to implementation of the change.

Attachment 2 of this SP contains applicable Activity Hazard Analysis (AHA) forms associated with snorkeling operations.

4.1.1 SUPPORT/SAFETY VESSEL

A support/safety vessel will maneuver in proximity to the snorkelers, with the distance dependant on the conditions/state of snorkeling site.

The support/safety vessel will be available during all snorkeling operations in order to quickly respond to any emergencies. If an injured 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 snorkeler is not capable of climbing onto the support/safety vessel, a ring buoy or throw bag will be deployed, and with the assistance of the second snorkeler/assistant, the individual will be carefully towed back to a shore-based location, as required.

The support/safety vessel will also display a standard red/white dive flag to indicate the presence of personnel in the water performing snorkeling. In the case where the support/safety vessel is not able to maneuver near the site of operations, the dive flag can be attached to a buoy and placed in the water

near the snorkelers or pole mounted and displayed from shore. Deployment and use of the dive flag will be dependent on site conditions.

The support/safety vessel will be equipped with a throw bag and/or ring buoy attached to least 70 ft of line, and will be capable of performing a rescue on the snorkeler in an emergency situation. The vessel will also be used to warn other vessels that approach the site of the presence of snorkelers, and direct them away from the site.

4.2 SNORKELING SURVEY

Snorkelers will complete surveys of the seafloor, advancing along the required distance (miles) of idealized transect lines while visually surveying a 5-ft-wide path.

In the event that a suspected MEC item is encountered during visual target investigation along each transect, the item will be marked through use of a GPS unit, and the following procedures will be followed: At no time will the suspected MEC item be handled by hand or with equipment. Locations of suspected MEC items will be reported to USACE. At no time will locations of items be shared outside of the USA project team.

- An expanded survey will be completed within an estimated 100-ft radius of the item (200 ft in diameter)
- If an additional item/s is located, one additional 100-ft radius will be surveyed (from the position of the item most distant from the initial point) in order to characterize the boundary of the potential area of concentration.
- No additional expansions of the area will be completed following this second survey.

The expanded survey is intended to identify any additional MEC items located in close proximity, which may indicate the previous presence of a waterborne target or concentration area.

4.3 SNORKELING TEAM AND PROCEDURES

The snorkeling team will be composed of the following personnel:

- Snorkeling Supervisor (1)
- UXO Technician/Survey Snorkeler (1)
- Marine Biologist/Survey Snorkeler (1)
- Support/Safety Vessel Operator (1).

4.3.1 SNORKELING SUPERVISOR

The USA Snorkeling Supervisor (SS) will report directly to the Project Manager on issues pertaining to the field operations. The USA SS will have the following operations and safety/health related responsibilities:

- Managing the funding, manpower and equipment necessary to safely conduct site operations
- Reviewing and becoming familiar with the site SP and the overall SI Site Health and Safety Plan (SSHP) included in Appendix D of the Environmental Baseline Survey Work Plan.
- Ensuring that all snorkeling and support personnel review and are aware of the guidelines and procedures reflected in the SP and the overall SI SSHP
- Coordinating and overseeing all snorkeling operations
- Coordinating the assignment of personnel during snorkeling operations
- Ensuring implementation of project quality and safety and health procedures

- Assessing weather and site conditions to ensure that safe and effective snorkeling can be accomplished
- Identify potential problem areas, including safety and health matters, and instituting corrective measures.

4.3.2 SURVEY 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, to include 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.

In addition, all UXO Technician/survey snorkelers will also meet the applicable requirements of DDESB TP-18 for the related position.

The USA 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.

4.3.3 ASSIGNED SNORKELING TEAM PERSONNEL

The following table reflects the related snorkeling positions, and personnel assigned to those positions:

Position	Name
Snorkeling Supervisor (SS)	TBD
Snorkeler 1	TBD
Snorkeler 2	TBD
Snorkeler 3	TBD
Safety Vessel Operator	TBD

Due to the anticipated date of actual snorkeling operations, the names and qualification level of snorkeling personnel are not available for inclusion in this SP.

The information will be provided to the applicable reviewing authority approximately one month prior to the date of snorkeling operations.

4.3.4 GENERAL PROCEDURES

The following general procedures will apply to daily snorkeling operations:

- Snorkeling Supervisor (SS) will guide the survey snorkeler/s along each idealized transect through use of the float mounted GPS unit.

- Snorkeler/s following approximately 5 to 10 ft behind performing survey of the seafloor to the outboard side of the transect.
- Upon encountering a suspected MEC item, GPS location data will be recorded and a picture taken of the item.
- Once at the seaward end point of an individual transect, the snorkeling team will turn and proceed back along the same transect, with the snorkeler performing survey of the opposite outbound side of the transect.
- A support/safety vessel will maneuver in proximity to the snorkelers, with the distance dependent on the conditions/state of the site, in order to respond to any incidents.

The support/safety vessel will also be used to warn other vessels that approach the site of the presence of snorkelers, and will maintain a 300-ft exclusion area around each snorkeling operation.

4.4 SNORKELING EQUIPMENT

The snorkeling team will utilize the following primary equipment as needed:

- Professional grade diving mask and snorkel
- Flotation device providing a minimum of 15.5 pounds (7.03 kg) of positive buoyancy [Type III Personal Flotation Device (PFD), fully inflated snorkeling vest, etc.]
- Swim fins
- Appropriate thermal and environmental protection based upon site conditions
- Underwater camera.

Safety equipment will also be maintained at the snorkeling site, and will include the following minimum equipment:

- First-aid kit meeting/exceeding the requirements of both 385-1-1 (Section 3) and OSHA 29 CFR Part 1910.151
- Stokes litter or backboard, with flotation capability
- Vehicle staged at support/safety vessel berthing location for local transport of injured snorkeler.

4.5 COMMUNICATION

Snorkeling operations will require effective means of communication to complete intended tasks in a safe and efficient manner.

4.5.1 SNORKELING TEAM

Both verbal and hand signal communication will be maintained within the snorkeling team during conduct of field work. The team will develop hand signals to accomplish basic in-water communication as required.

In the case where a snorkeler is injured and requires assistance, the injured snorkeler or assistant will indicate the need for assistance by waving arm/s continuously and rapidly overhead. This universal signal will be emphasized during daily safety briefs, and will be recognized by all team members.

The support/safety vessel operator will also monitor VHF channel 16, and communicate to random boat traffic that snorkeling operations are in progress and to stay clear.

4.5.2 SNORKELING SITE TO SUPPORT AGENCIES

The snorkeling site will maintain communication with supporting agencies through use of cellular phone and handheld marine Very High Frequency (VHF) radio.

Prior to the commencement of each work day when snorkeling operations are planned, the USA SS will ensure that communication elements (phone and VHF radio) are functioning in order to contact local agencies required to support an emergency medical situation.

Communication with the USA Corporate office will be through cellular phone and e-mail.

5.0 KEY PERSONNEL

Contact information for key personnel is listed in the following table:

Position	Name	Office Phone	Cellular Phone	E-mail
USA Corporate Office	Administration	813-343-6336	N/A	N/A
USA Project Manager	Matthew Tucker	813-343-6370	813-426-2426	mtucker@usatampa.com
USA Underwater Operations Manger	Brian Skubin	813-343-6384	813-426-2427	bskubin@usatamapa.com
USA Director of Safety and Quality	Robert Crownover	813-343-6364	813-426-2424	rcrownover@usatampa.com
USA Snorkeling Supervisor	TBD			
Marine Biologist/ ESA Observer	Mark Padover	908-347-9776		padover@aquasurvey.com
USACE District Dive Coordinator	John Houvener	(410) 962-4101		

6.0 SAFETY BRIEFS AND SUPERVISOR CHECKS

USA will routinely conduct four distinct team safety and operations briefs during execution of snorkeling operations:

- Pre-Snorkeling brief
- Snorkeling Supervisors Checklist
- Daily Safety Brief
- Post-Snorkeling Debrief

The Pre-Snorkeling Brief will be completed prior to each snorkeling evolution, while a Daily Safety Brief will be completed prior to commencement of each work day. The USA SS will provide these briefs, highlighting both snorkeling and MEC related safety precautions. The marine biologist will also provide daily briefs on endangered species identification and avoidance practices.

The briefs will focus on the specific hazards (fire coral, etc.) anticipated at each work site during that day's operations and the safety measures that will be used to eliminate or mitigate those hazards. Review of applicable Activity Hazard Analysis (AHA) sheets, contained in Attachment 2, will also be conducted. The briefs will also refer to other operations within the area whose proximity may have safety ramifications.

As work progresses and the team's location changes within a site, or from site-to-site, any corresponding changes in anticipated hazards or emergency procedures will be reviewed.

In addition, the SS may hold a safety stand-down at any time a degradation of safety or a safety issue that warrants a review is noted.

The Snorkeling Supervisor will also complete a checklist prior to daily snorkeling operations to ensure that equipment is inspected and fully functional, that all snorkelers have the proper snorkeling equipment, and that all preparations for safe and effective operations are in place.

The general Post-Snorkeling Debrief will be completed at the conclusion of each day when snorkeling operations were conducted, and is intended to review the day's operations, lessons learned, and complete planning for the next snorkeling operation.

A written daily record of the Pre-Snorkeling, Snorkeling Supervisors Checklist, and Daily Safety Briefs will be maintained.

All USA team members are considered safety observers, and if at any time an unsafe situation is present or is developing, all operation will cease until complete resolution of the procedures or conditions are resolved.

6.1 TRAINING AND QUALIFICATIONS

Prior to mobilization, all USA snorkeling personnel will fulfill the following qualification and examination requirements:

- HAZWOPER 40 hour (and 8-hour refresher/supervisor refresher)
- Certification in Cardiopulmonary Resuscitation (CPR)
- Certification in First Aid
- Annual Physical to include medical clearance to perform in-water based activities (diving and/or snorkeling) by a licensed physician.
- Sea Turtle/Marine mammal observer will be a degreed Marine Biologist

As part of the mobilization process, USA will perform site specific training for all personnel assigned to this project.

The purpose of this training is to ensure that all personnel fully understand the procedures and methods USA will use to perform snorkeling operations, to include individual duties and responsibilities, and all safety and environmental practices/procedures.

Familiarization with project specific equipment, including medical and watercraft, will be completed, along with training on recognition and safety precautions regarding the anticipated MEC items that may be encountered while conducting snorkeling operations.

7.0 EMERGENCY MANAGEMENT PLAN

Each snorkeling site will present unique safety concerns that must be addressed. The following subsections reflect immediate actions relating to injuries and hazardous events, along with information relating to medical facilities and emergency contact numbers.

7.1 INJURED SNORKELER ACTIONS

- If possible, injured snorkeler will verbally communicate with other snorkelers or signal the support/safety vessel that assistance is required. Signal will be made through rapidly and continuously waving arm/s over the snorkeler's head

- Injured snorkeler will be recovered from the water by the safest means available, and placed in a secure location on the support vessel or on shore
- The USA SS 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 snorkeler will be enacted

7.2 DISCOVERY OF FIRE

- On-site personnel will immediately enact fire fighting actions
- If the fire is on a vessel supporting snorkeling personnel, the SS will assess if directing the snorkelers to the vessel will place them in danger, or if it is safer for snorkelers to remain in the water during firefighting actions
- Once firefighting efforts are complete, all 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.

7.3 ADVERSE WEATHER CONDITIONS

- The SS will terminate snorkeling operations as required based on adverse weather conditions that could negatively affect the safety of personnel.
- If conducting snorkeling operations from a waterborne platform, the SS and vessel operator will assess whether the vessel should return to the originating port, or if temporary shelter should be sought at a location in close proximity to the site.
- For lightning conditions, all personnel will exit the water and seek shelter within land based vehicles/structures.
- The SS will determine when weather conditions will safely allow snorkeling operations to re-commence.

7.4 INTERNAL SAFETY INSPECTIONS

The assigned SS will conduct daily safety inspections of site operations, equipment condition, and personnel adherence to safety standards.

7.5 LOCAL AND REGIONAL MEDICAL FACILITIES

A local medical facility and ambulance service is available on the island of Culebra, and is capable of treating immediate 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.

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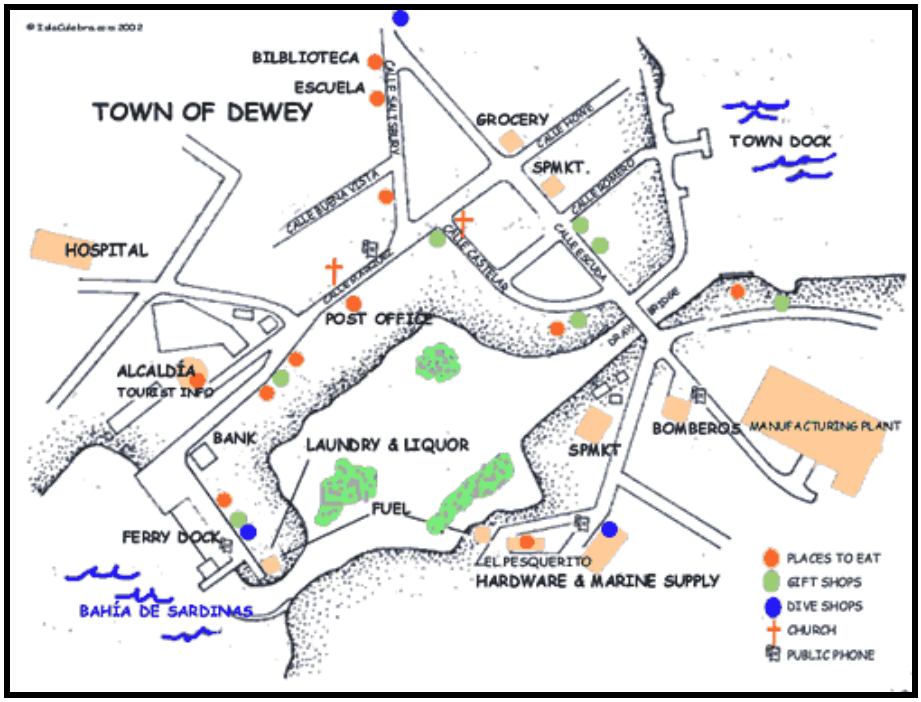
The following map indicates the location of the medical facility:



Any serious injury will require air/helicopter transport to a hospital on the main island of Puerto Rico.

7.6 EMERGENCY CONTACT INFORMATION

The following is a list of local first responders and medical facilities, along with applicable reference sources for snorkeler related injuries:

Agency	Contact Information
US Coast Guard San Juan Sector Search and Rescue Response Center	787-289-2041 VHF Channel 16
Centro Medico, Recompression Chamber	787-777-3535/ 3827 Extension: 6476,6475,6068
Culebra Police	787-742-3501
Culebra Hospital and Local Ambulance	787-742-3511/0001

Prior to the commencement of each work day when snorkeling operations are planned, the SS will ensure that communication element (phone and VHF radio) are functioning in order to contact local agencies required to support an emergency medical situation.

8.0 GENERAL REFERENCES

The following are references applicable to snorkeling operations conducted in support of the RI. USA will comply with applicable Federal, State, and local requirements to ensure the safety and health of onsite personnel and the local community.

8.1 US ARMY CORPS OF ENGINEERS

- US Army Corps of Engineers, Safety and Health Requirements Manual, EM-385-1-1,
- 15 September 2008

8.2 DOD

- DOD 6055.9-M, Ammunition and Explosive Safety Standards
- DDESB TP-18, Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel

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APPENDIX N - ATTACHMENT 1
MAPS

Refer to Figures 3-1 and 3-2 in the Environmental Baseline Survey Work Plan, for the following maps:

- MRS 9 – Baseline Survey Coverage Map
- MRS 13 – Baseline Survey Coverage Map.

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APPENDIX N - ATTACHMENT 2
ACTIVITY HAZARD ANALYSIS

The Activity Hazard Analysis sheets for boat and snorkeling operations are included in Appendix D (APP) of the Environmental Baseline Survey Work Plan.

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APPENDIX N - ATTACHMENT 3
FORMS

This attachment contains the following snorkeling-associated forms:

- Daily Snorkeling Log
- Pre Snorkeling Brief
- Snorkeling Supervisor Checklist.

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DAILY SNORKELING LOG

Date:	**Geographic Location:**		**Air Temp (F):**
Project:	**Snorkeling Platform (Boat or Shore):**		**Wave Height (ft):**
Snorkeling Supervisor:	**Purpose:**		**Water Temp (F):**
In-Water Visibility:		**Tools Used:**	**Current (knots):**

Snorkeler (Last Name, First Name)	**Snorkeling Time Start**	**Snorkeling Time Complete**	**Issues or Problems**

_____
Snorkeling Supervisor Name

_____
Snorkeling Supervisor Signature

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PRE SNORKELING BRIEF

****This pre snorkeling brief will be conducted each work day snorkeling operations are planned, and will be completed in concert with the other required project Safety meetings and Tailgate Safety Briefs.**

DATE _____

SNORKELING SUMMARY

Purpose of the Snorkeling Task: _____

Location of Site: _____

Safety Vessel in Use _____

Special Tools/Equipment _____

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

Snorkeling Supervisor _____

Snorkeler #1 _____

Snorkeler #2 _____

Snorkeler #3 _____

Safety Observer/Assistant _____

SNORKELER READINESS

1) Personnel on medication:

Name _____ Medication_____

Name_____ Medication _____

2) Any snorkeler have pre-existing medical conditions that the Snorkeling Supervisor should be aware of:

Name _____ Condition _____

Name _____ Condition _____

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 Police _____

Local Ambulance _____

Local Medical Facility _____

USCG Air Operations _____

SAFETY

All snorkelers 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 Snorkeling Supervisor will take charge, assess the situation, and direct required response actions.

Pre-assigned positions consist of the following:

1) Name/Position:_____
- Contact local medical response agencies as required
- Immediately prepare to get underway

2) Name/Position: _____
- Provide CPR and/or administering emergency oxygen

Remaining personnel will secure equipment for transit, provide additional First Aid, and provide additional support as directed.

QUESTIONS

If there are no questions, complete all preparations for snorkeling.

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SNORKELING SUPERVISOR CHECKLIST

DATE: _____

A. EQUIPMENT INSPECTION COMPLETED	
B. COMMUNICATION VERIFIED	
C. SAFETY VESSEL AND EVACUATION VEHICLE OPERATIONAL AND ON-SITE	

Checks	Snorkeler #1	Snorkeler #2	Snorkeler #3
Fins			
Mask			
Personal Flotation Devices			
Tending lines/harnesses attached and serviceable (as required)			
Reiterate the purpose of the snorkeling operation			
Reiterate the task assignments			
Direct snorkelers to enter the water and commence tasks			

_____ _____

Snorkeling Supervisor Name Snorkeling Supervisor Signature

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APPENDIX O. RESERVED

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APPENDIX P. RESERVED

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APPENDIX Q. REFERENCE DOCUMENT

This appendix contains the following reference document for use on this project:

- Methods Used to Map the Benthic Habitats of Puerto Rico and the U.S. Virgin Islands (NOAA National Ocean Service).

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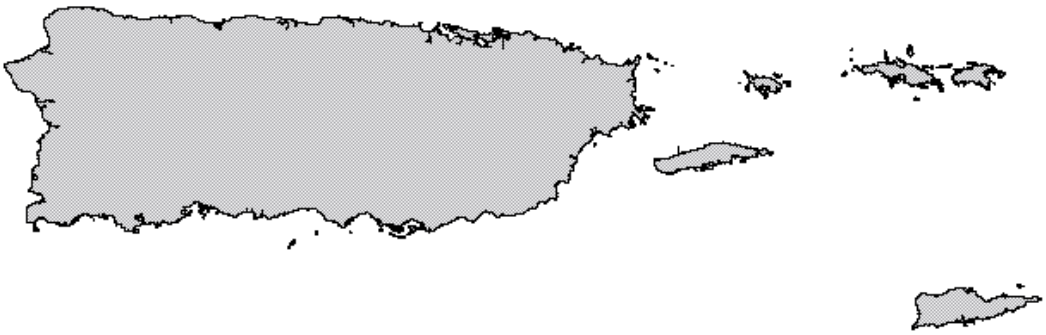
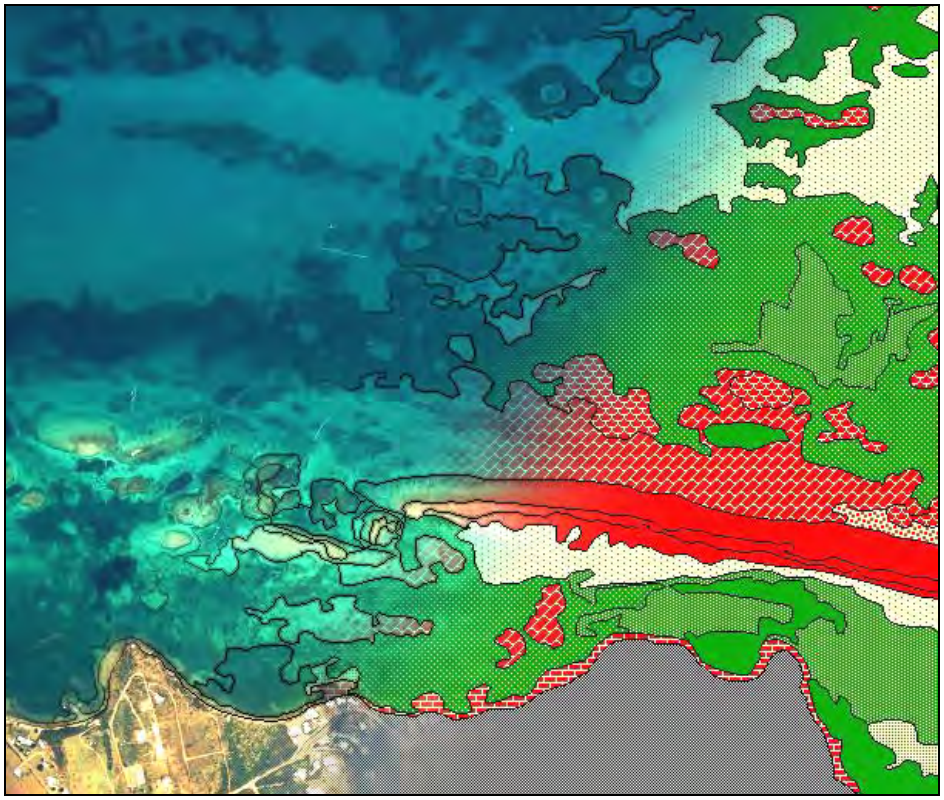


Methods Used to Map the Benthic Habitats of Puerto Rico and the U.S. Virgin Islands



Benthic features were delineated from aerial photos into 26 categories including coral reefs, seagrass beds, and mangroves.

NOAA National Ocean Service
National Centers for Coastal Ocean Science
Center for Coastal Monitoring and Assessment
Biogeography Team

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Introduction

The National Oceanic and Atmospheric Administration (NOAA) National Ocean Service acquired aerial photographs for the nearshore waters of Puerto Rico and the U.S. Virgin Islands in 1999. These images were used to create maps of the region's coral reefs, seagrass beds, mangrove forests, and other important habitats. A primary product of this project is a benthic habitat map. This document describes the specific methods used to create this map.

Twenty-six distinct benthic habitat types within nine zones were mapped directly into a geographic information system (GIS) using visual interpretation of orthorectified aerial photographs. To supplement the maps, digital scans of the original aerial photographs, georeferenced mosaics, a GIS mapping tool for use with ArcView, and supporting data sets were also created. To see or download this information, visit http://biogeo.nos.noaa.gov/projects/mapping/caribbean/.

This document will show data users how the data was collected and help them replicate the data for comparison purposes at a later date. Document contents include:

- A description of each of the habitat classifications with example aerial and underwater photographs
- Directions for using the "habitat digitizer" extension to ArcView
- A description of the specific methods used to create the habitat maps
- An assessment of the thematic accuracy of the maps along with a comparison of map accuracy relative to other mapping techniques

Citation: 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.

1. NOAA National Ocean Service, Biogeography Team; 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

Developing the Habitat Classification Scheme

A hierarchical classification scheme was used to define and delineate habitats. The classification scheme was influenced by many factors including: requests of the management community, existing classification schemes for coastal ecosystems in Puerto Rico (Kruer, 1995; Reid and Kruer, 1998; Lindeman et al.,1998), the Virgin Islands (Conservation Data Center; Beets et al., 1986; Boulon, 1986), other coral reef systems (Holthus and Maragos, 1995; Shepard et al., 1995; Vierros, 1997; Chauvaud et al., 1998; Florida Fish and Wildlife Conservation Commission, Florida Marine Research Institute and NOAA, 1998; Mumby et al.,1998; NOAA et al., 1998), quantitative habitat data for Puerto Rico and the Virgin Islands, the minimum mapping unit (MMU- 1 acre for visual photointerpretation), and analysis of the spatial and spectral limitations of the scanned aerial photographs. The scheme is hierarchical to allow users to expand or collapse the detail of the resulting map to suit their needs. Furthermore, it is encouraged that additional hierarchical categories be added in the GIS by users with more detailed knowledge or data for specific areas. For example, habitat polygons delineated as continuous seagrass using this scheme could be further categorized by standing crop information (low, medium, or high shoot density) or species composition (*Thalassia*, *Syringodium*).

General Description of the Classification Scheme

The classification scheme defines benthic communities on the basis of two attributes: large geographic "zones" which are composed of smaller "habitats". Zone refers only to benthic community location and habitat refers only to substrate and/or cover type. Every polygon on the benthic community map will be assigned a habitat within a zone (e.g. sand in the lagoon, or sand on the bank). Zone indicates polygon location and habitat indicates composition of each benthic community delineated. Combinations of habitat and zone that are analogous to traditionally used terminology are noted where appropriate. The description of each zone and habitat includes example images. Both underwater and aerial photographs are included for habitats, whereas only aerial images are included for zones. The zone/habitat approach to the classification scheme was developed by the Caribbean Fishery Management Council; Dr. Ken Lindeman, Environmental Defense; and the NOS Biogeography Team.

Nine mutually exclusive zones were identified from land to open water corresponding to typical insular shelf and coral reef geomorphology (Fig. 1-2). These zones include: land, shoreline/intertidal, lagoon, back reef, reef crest, fore reef, bank/shelf, bank/shelf escarpment, and dredged (since this condition eliminates natural geomorphology). Zone refers only to each benthic community's location and does not address substrate or cover types within. For example, the lagoon zone may include patch reefs, sand, and seagrass beds, however, these are considered structural elements that may or may not occur within the lagoon zone and therefore, are not used to define it.

Twenty-six distinct and non-overlapping habitat types were identified that could be mapped by visual photointerpretation. Habitats or features that cover areas smaller than the MMU were not considered. For example, sand halos surrounding patch reefs are too small to be mapped independently. Habitat refers only to each benthic community's substrate and/or cover type and does not address location (e.g. on the shelf or in the lagoon). Habitats are defined in a collapsible hierarchy ranging from four broad classes (submerged vegetation, unconsolidated sediment, coral reef/hard bottom, and other), to more detailed categories (e.g., mangrove, seagrass, algae, individual patch reefs, bedrock, etc.), to patchiness of some specific features (e.g., 50-70 percent cover of seagrass).

Zones:

Land
Shoreline Intertidal
Lagoon
Back Reef
Reef Crest
Fore Reef
Bank/Shelf
Bank/Shelf Escarpment
Dredged*
Unknown

***not depicted in figures**

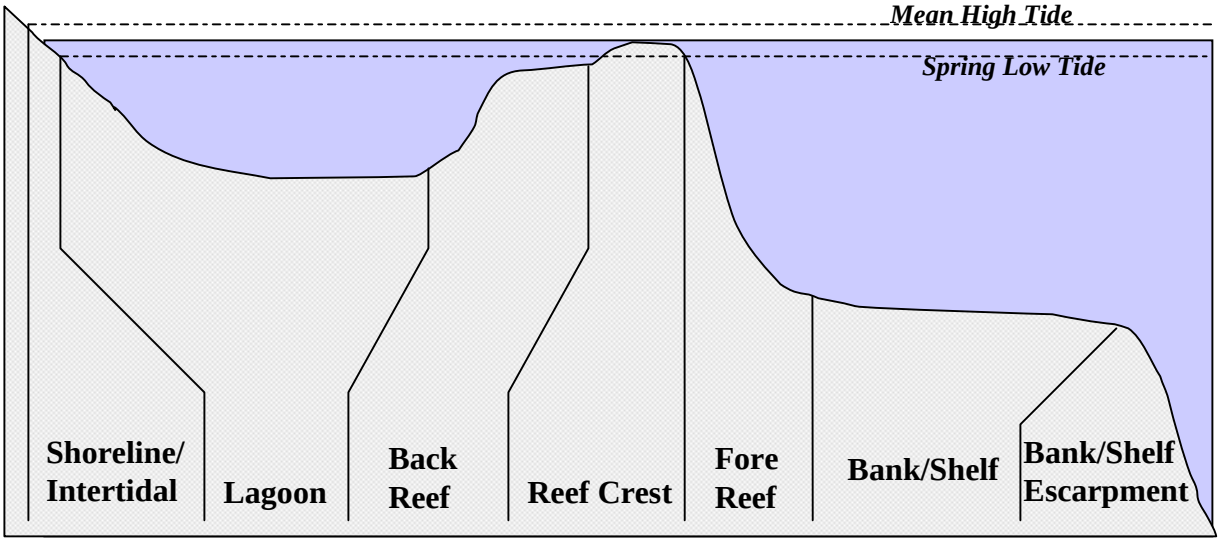


Figure 1. Cross-section of *Zones* where an emergent reef crest is present:

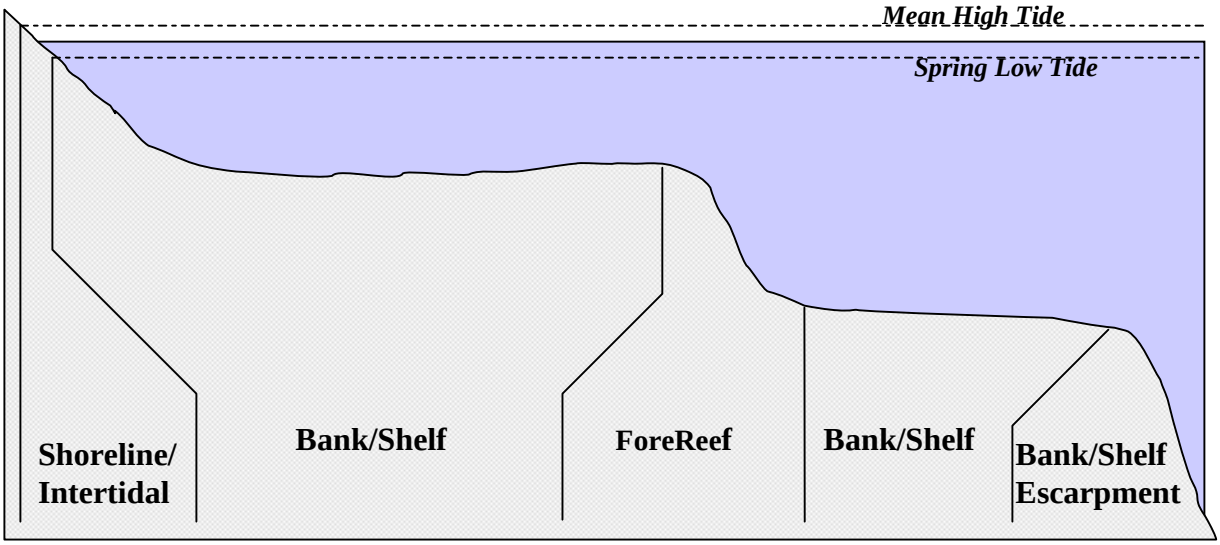


Figure 2. Cross-section of *Zones* where **no** emergent reef crest is present:

Habitats:

Unconsolidated Sediments (0 percent to less than 10 percent submerged vegetation)
- **Sand**
- **Mud**

Submerged Vegetation
- **Seagrass**
  - **Continuous Seagrass (90 percent to less than 100 percent cover)**
  - **Patchy (Discontinuous) Seagrass (70 percent to less than 90 percent cover)**
  - **Patchy (Discontinuous) Seagrass (50 percent to less than 70 percent cover)**
  - **Patchy (Discontinuous) Seagrass (30 percent to less than 50 percent cover)**
  - **Patchy (Discontinuous) Seagrass (10 percent to less than 30 percent cover)**
- **Macroalgae**
  - **Continuous Macroalgae (90 percent to less than 100 percent cover)**
  - **Patchy (Discontinuous) Macroalgae (50 percent to less than 90 percent cover)**
  - **Patchy (Discontinuous) Macroalgae (10 percent to less than 50 percent cover)**

Coral Reef and Hardbottom
- **Coral Reef and Colonized Hardbottom**
  - **Linear Reef**
  - **Spur and Groove**
  - **Individual Patch Reef**
  - **Aggregated Patch Reefs**
  - **Scattered Coral/Rock in Unconsolidated Sediment**
  - **Colonized Pavement**
  - **Colonized Bedrock**
  - **Colonized Pavement with Sand Channels**
- **Uncolonized Hardbottom**
  - **Reef Rubble**
  - **Uncolonized Pavement**
  - **Uncolonized Bedrock**
  - **Uncolonized Pavement with Sand Channels**

Other Delineations
- **Land**
- **Mangrove**
- **Artificial**
- **Unknown**

Zones

Shoreline Intertidal: Area between the mean high water line (or landward edge of mangroves when present) and lowest spring tide level (excluding emergent segments of barrier reefs). Typically, this zone is narrow due to the small tidal range in this part of the Caribbean.

Typical Habitats: Mangrove, sand, seagrass, colonized bedrock, and uncolonized bedrock.

Lagoon: Shallow area (relative to the deeper water of the bank/shelf) between the shoreline intertidal zone and a back reef or barrier island. This zone is protected from the high-energy waves commonly experienced on the bank/shelf and reef crest. If no reef crest is present, there is no lagoon zone.

Typical Habitats: Sand, seagrass, algae, pavement, bedrock, and patch reefs.

Back Reef: Area between the seaward edge of a lagoon floor and the landward edge of a reef crest. This zone is present only when a reef crest exists.

Typical Habitats: Sand, reef rubble, seagrass, algae, linear reef, and patch reef.

Reef Crest: The flattened, emergent (especially during low tides), or nearly emergent segment of a reef. This zone lies between the back reef and fore reef zones. In aerial images, breaking waves will often be visible at the seaward edge of this zone.

Typical Habitats: Reef rubble and linear reef.

Fore Reef: Area from the seaward edge of the reef crest that slopes into deeper water to the landward edge of the bank/shelf platform. Features not forming an emergent reef crest but still having a seaward-facing slope that is significantly greater than the slope of the bank/shelf are also designated as fore reef (Fig.2).

Typical Habitats: Linear reef and spur and groove.

Bank/Shelf: Deep water area (relative to the shallow water in a lagoon) extending offshore from the seaward edge of the fore reef to the beginning of the escarpment where the insular shelf drops off into deep oceanic water. The bank/shelf is the flattened platform between the fore reef and deep open ocean waters or between the shoreline/intertidal zone and open ocean if no reef crest is present.

Typical Habitats: Sand, patch reefs, algae, seagrass, linear reef, colonized and uncolonized pavement, colonized and uncolonized pavement with sand channels, and other coral reef habitats.

Bank/Shelf Escarpment: The edge of the bank/shelf where depth increases rapidly into deep oceanic water. This zone begins at approximately 20 to 30 meters deep, near the depth limit of features visible in aerial images. This zone extends well into depths exceeding those that can be seen on aerial photos and is intended to capture the transition from the bank/shelf to deep waters of the open ocean.

Typical Habitats: Sand, linear reef, and spur and groove.

Unknown: Zone uninterpretable due to turbidity, cloud cover, water depth, or other interference.

Dredged: Areas in which natural geomorphology is disrupted or altered by excavation or dredging.

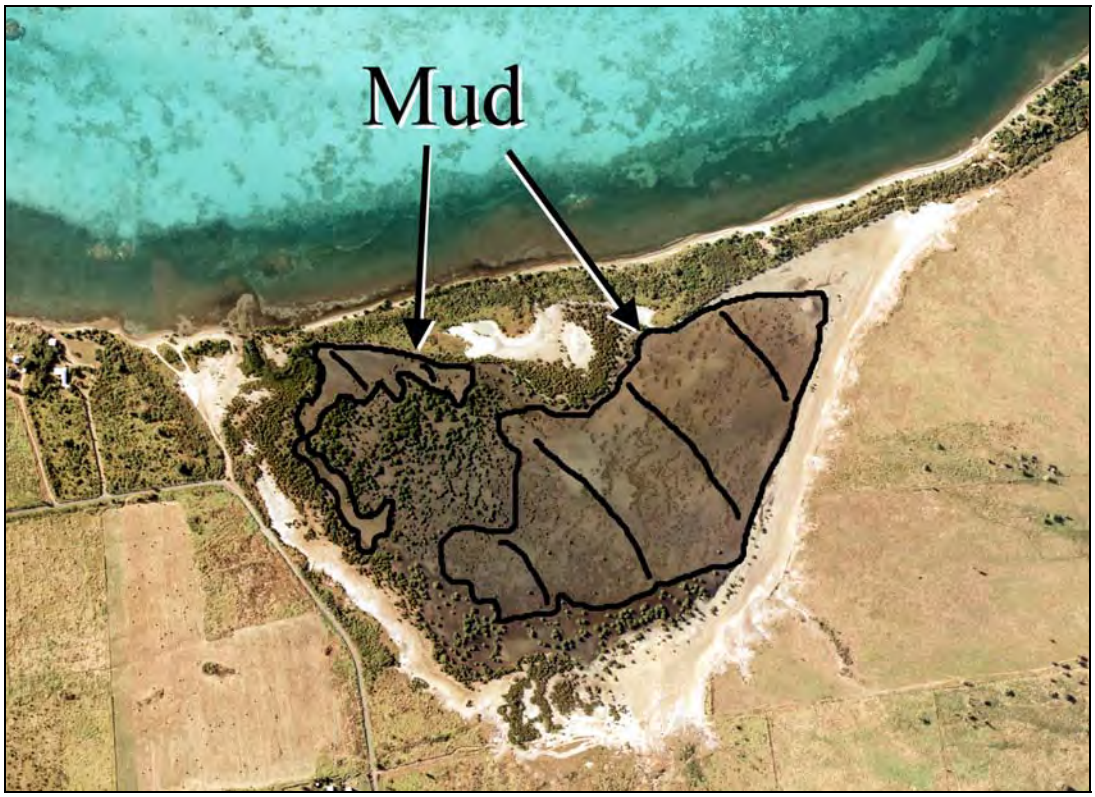
Typical Habitats: Sand, mud, seagrass, or algal bottom.

Habitats:

Unconsolidated Sediment: Unconsolidated sediment with less than 10 percent cover of submerged vegetation.

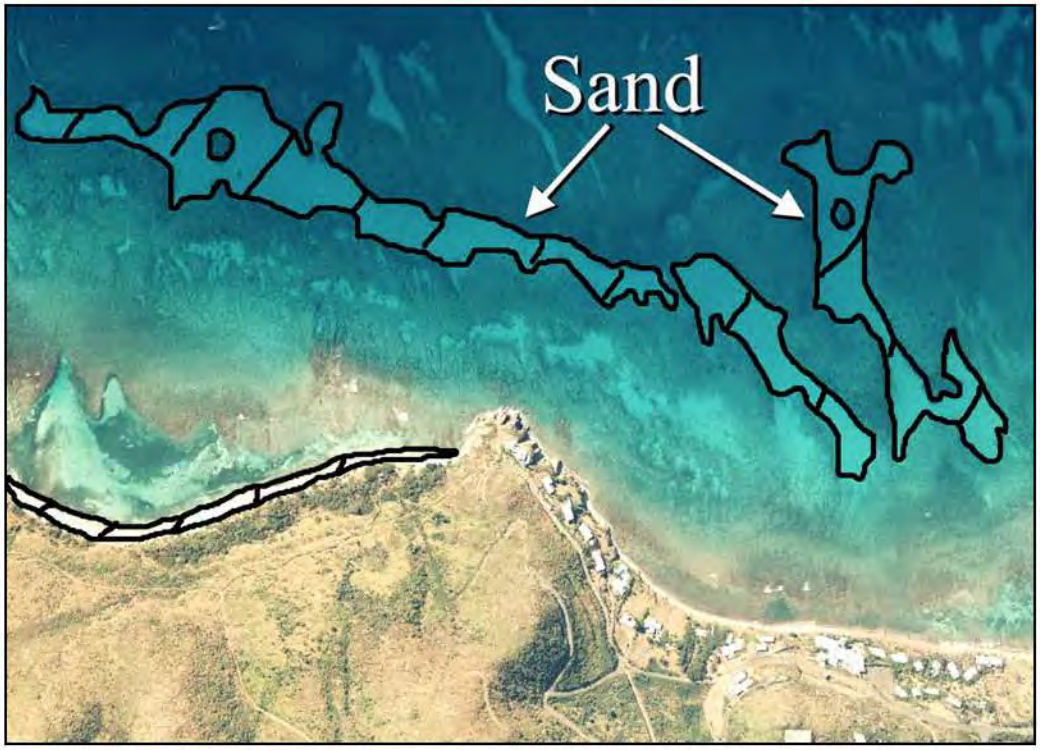
Unconsolidated Sediment

Mud: Fine sediment often associated with river discharge and buildup of organic material in areas sheltered from high-energy waves and currents.



Unconsolidated Sediment

Sand: Coarse sediment typically found in areas exposed to currents or wave energy.

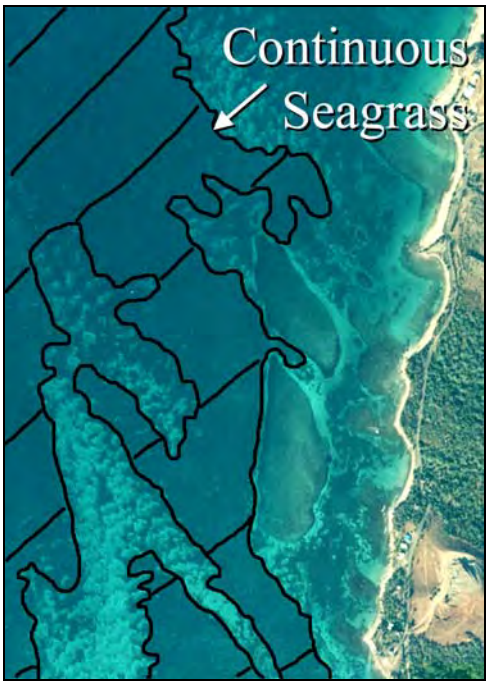


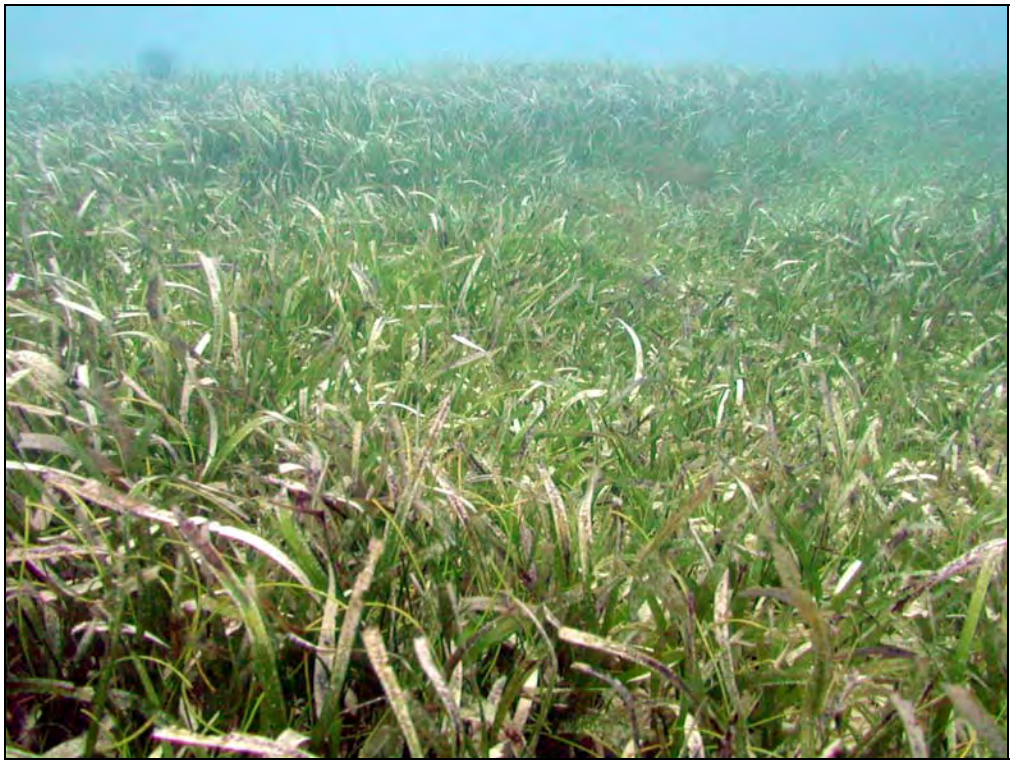
Submerged Vegetation

Submerged Vegetation: Greater than 10 percent cover of submerged vegetation in unspecified substrate type (usually sand, mud, or hardbottom).

Seagrass: Habitat with 10 percent or more cover of *Thalassia testudinum*, *Syringodium filiforme*, *Halodule wrightii*, *Halophila baillonis*, or some combination thereof.

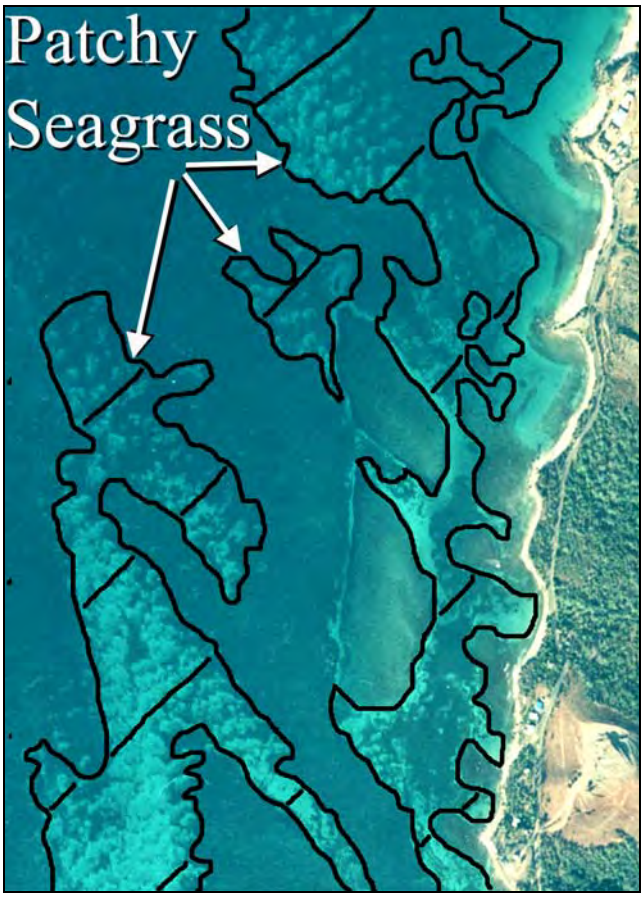
Continuous Seagrass: Seagrass covering 90 percent or more of the substrate. May include blowouts of less than 10 percent of the total area that are too small to be mapped independently (less than MMU). This includes continuous beds of any shoot density (may be a continuous sparse or dense bed).





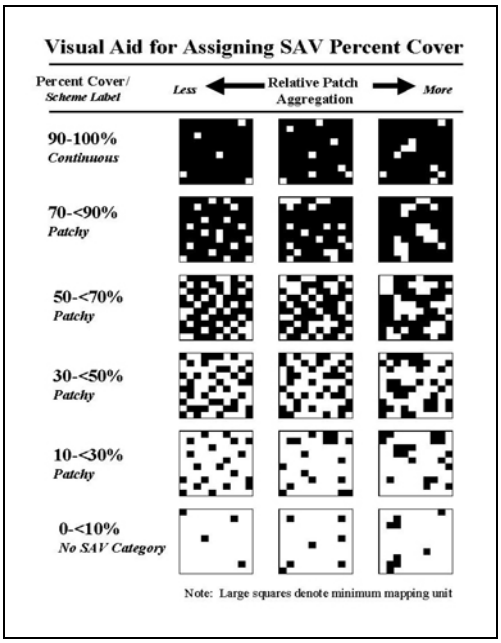
Patchy Seagrass:
Discontinuous seagrass with breaks in coverage that are too diffuse or irregular, or result in isolated patches of seagrass that are too small (smaller than the MMU) to be mapped as continuous seagrass.

Representative Species:
Thalassia testudinum
Syringodium filiforme
Halodule wrightii
Halophila baillonis



Visual Aid used for Assigning Degree of Patchiness:

Patchy Seagrass (70 to less than 90 percent cover)
Patchy Seagrass (50 to less than 70 percent cover)
Patchy Seagrass (30 to less than 50 percent cover)
Patchy Seagrass (10 to less than 30 percent cover)



Submerged Vegetation

Macroalgae: An area with 10 percent or greater coverage of any combination of numerous species of red, green, or brown macroalgae. Usually occurs in deeper waters on the bank/shelf zone.

Continuous Macroalgae: Macroalgae covering 90 percent or more of the substrate. May include blowouts of less than 10 percent of the total area that are too small to be mapped independently (less than the MMU). This includes continuous beds of any shoot density (may be a continuous sparse or dense bed).

Patchy Macroalgae: Discontinuous macroalgae with breaks in coverage that are too diffuse or irregular, or result in isolated patches of macroalgae that are too small (smaller than the MMU) to be mapped as continuous macroalgae.

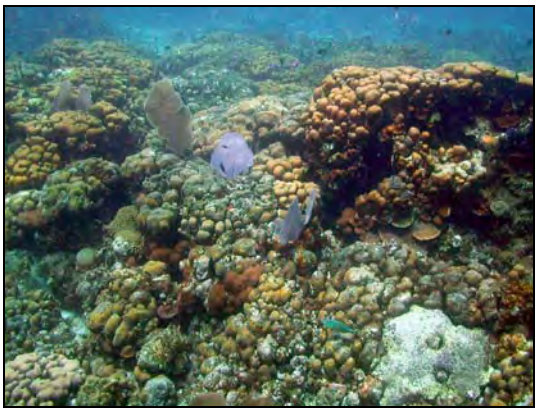
Patchy Macroalgae (50 to less than 90 percent cover)
Patchy Macroalgae (10 to less than 50 percent cover)

Representative Species:
Caulerpa spp.
Dictyota spp.
Halimeda spp.
Lobophora variegata
Laurencia spp.

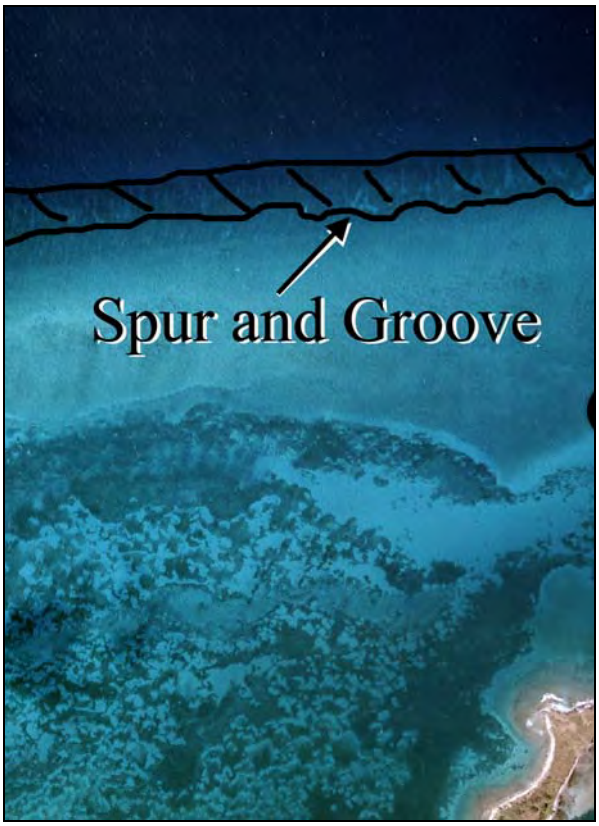
Coral Reef and Hardbottom: Hardened substrate of unspecified relief formed by the deposition of calcium carbonate by reef building corals and other organisms (relict or ongoing) or existing as exposed bedrock.

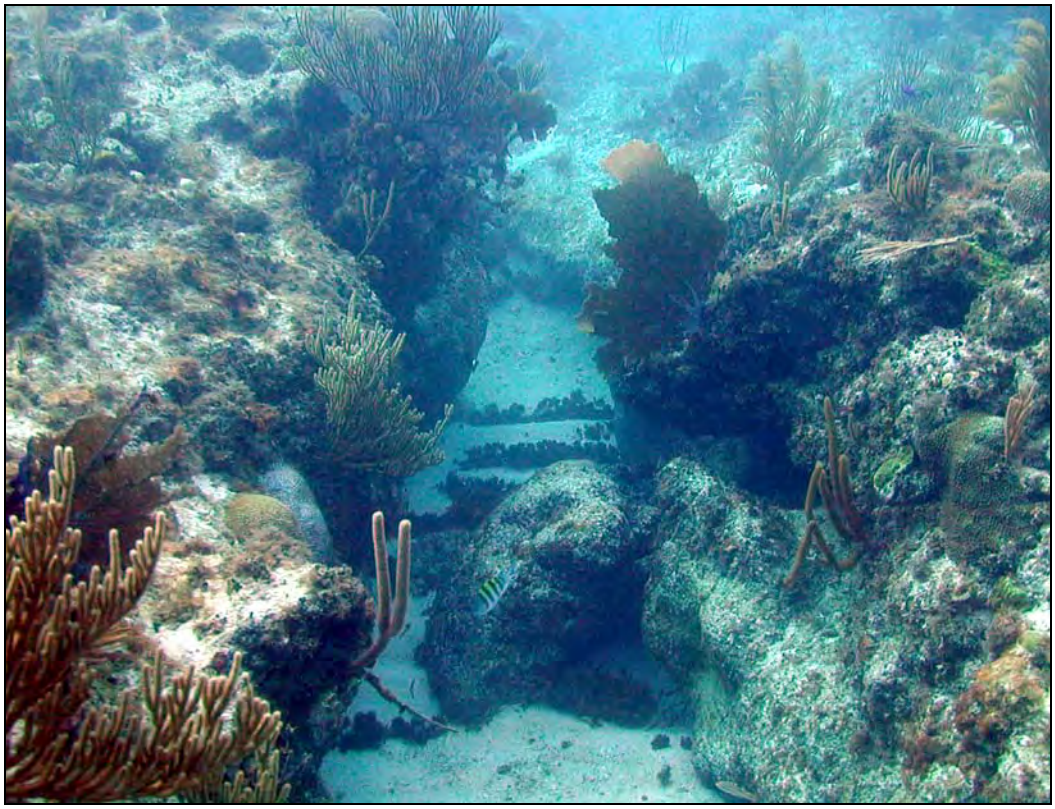
Coral Reef and Colonized Hardbottom: Substrates formed by the deposition of calcium carbonate by reef building corals and other organisms. Habitats within this category have some colonization by live coral, unlike the **Uncolonized Hardbottom** category.

Linear Reef: Linear coral formations that are oriented parallel to shore or the shelf edge. These features follow the contours of the shore/shelf edge. This category is used for such commonly used terms as fore reef, fringing reef, and shelf edge reef.



Spur and Groove: Habitat having alternating sand and coral formations that are oriented perpendicular to the shore or bank/shelf escarpment. The coral formations (spurs) of this feature typically have a high vertical relief compared to pavement with sand channels and are separated from each other by 1-5 meters of sand or bare hardbottom (grooves), although the height and width of these elements may vary considerably. This habitat type typically occurs in the fore reef or bank/shelf escarpment zone.

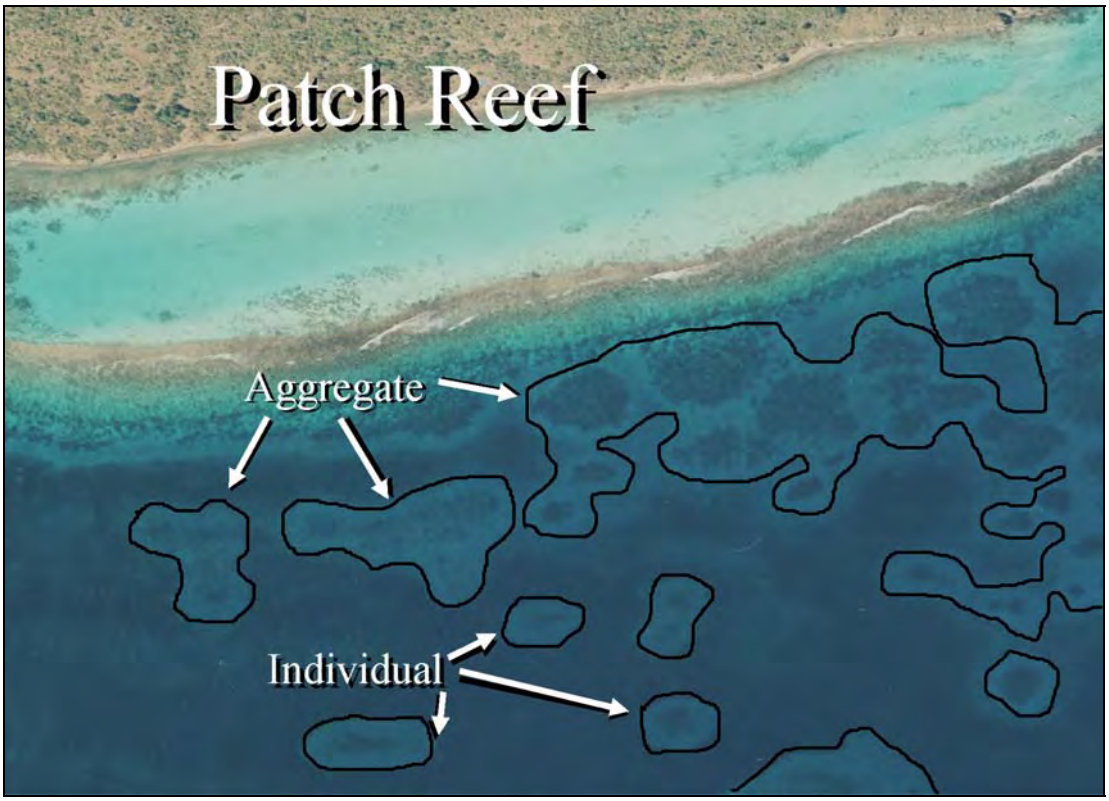




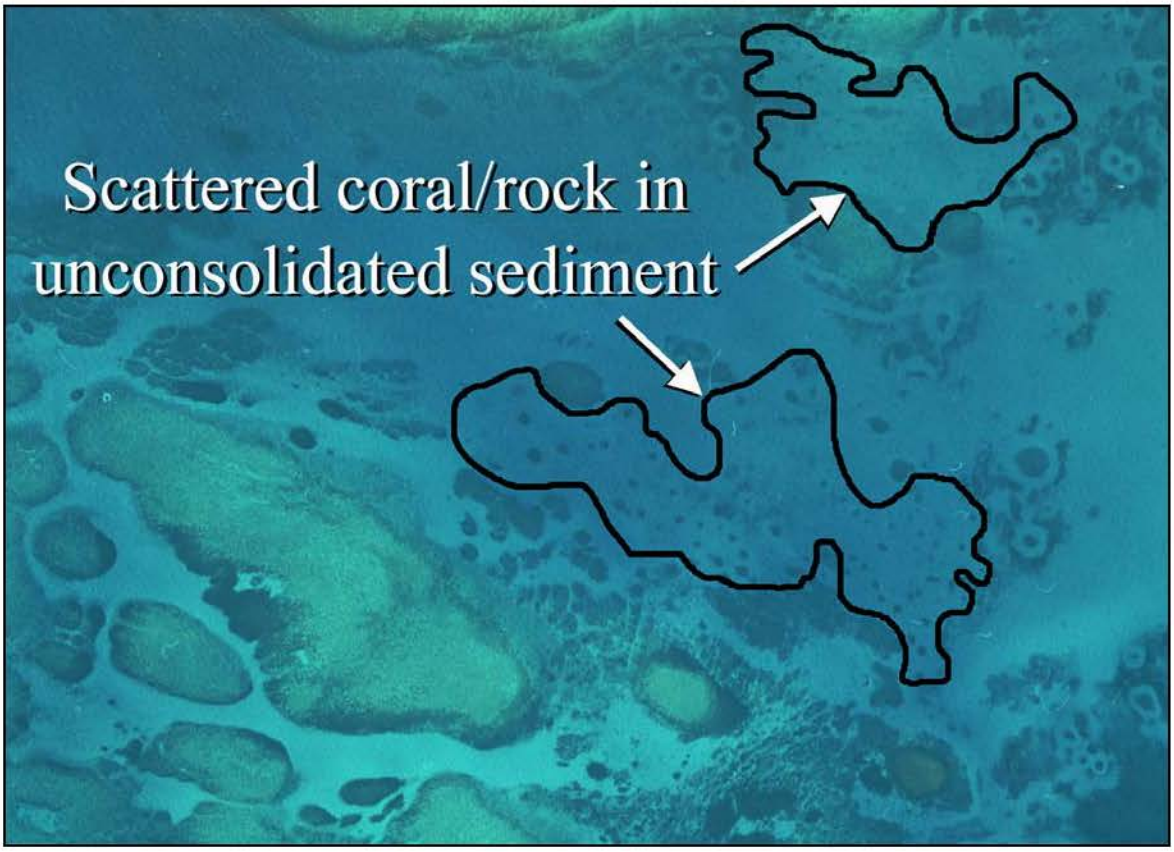
Patch Reef(s): Coral formations that are isolated from other coral reef formations by sand, seagrass, or other habitats and that have no organized structural axis relative to the contours of the shore or shelf edge. A surrounding halo of sand is often a distinguishing feature of this habitat type when it occurs adjacent to submerged vegetation.

Individual patch reef: Distinctive single patch reefs that are equal to or larger than the MMU. When patch reefs occur in submerged vegetation and a halo is present, the halo is included with the patch reef polygon.

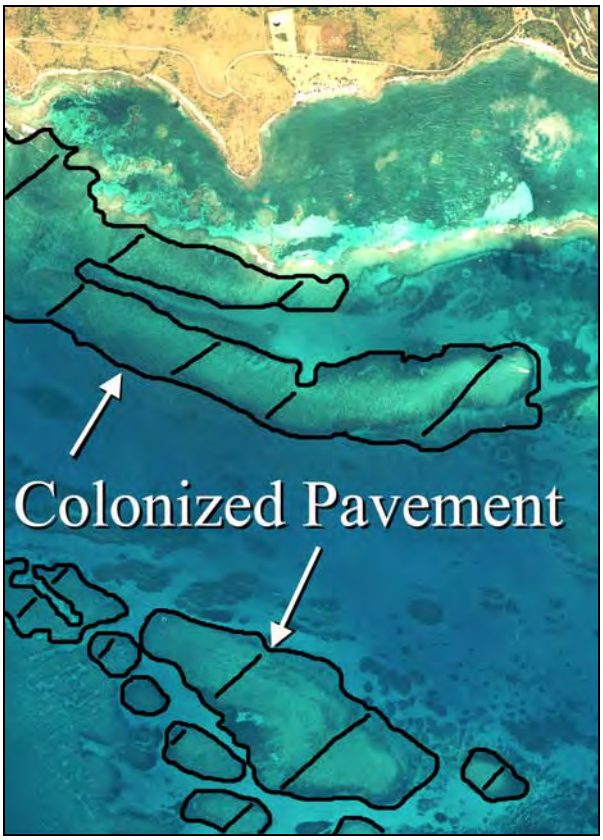
Aggregate patch reefs: Clustered patch reefs that individually are too small (smaller than the MMU) or are too close together to map separately. Where aggregate patch reefs share halos, the halo is included in the polygon.

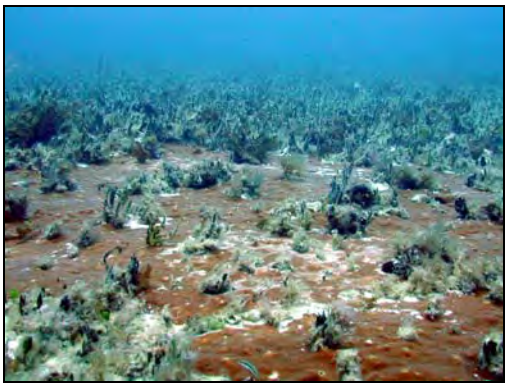


Scattered Coral/Rock in Unconsolidated Sediment: Primarily sand or seagrass bottom with scattered rocks or small, isolated coral heads that are too small to be delineated individually (i.e., smaller than individual patch reef).

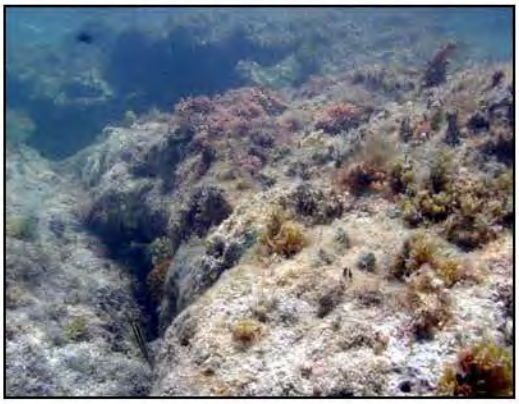


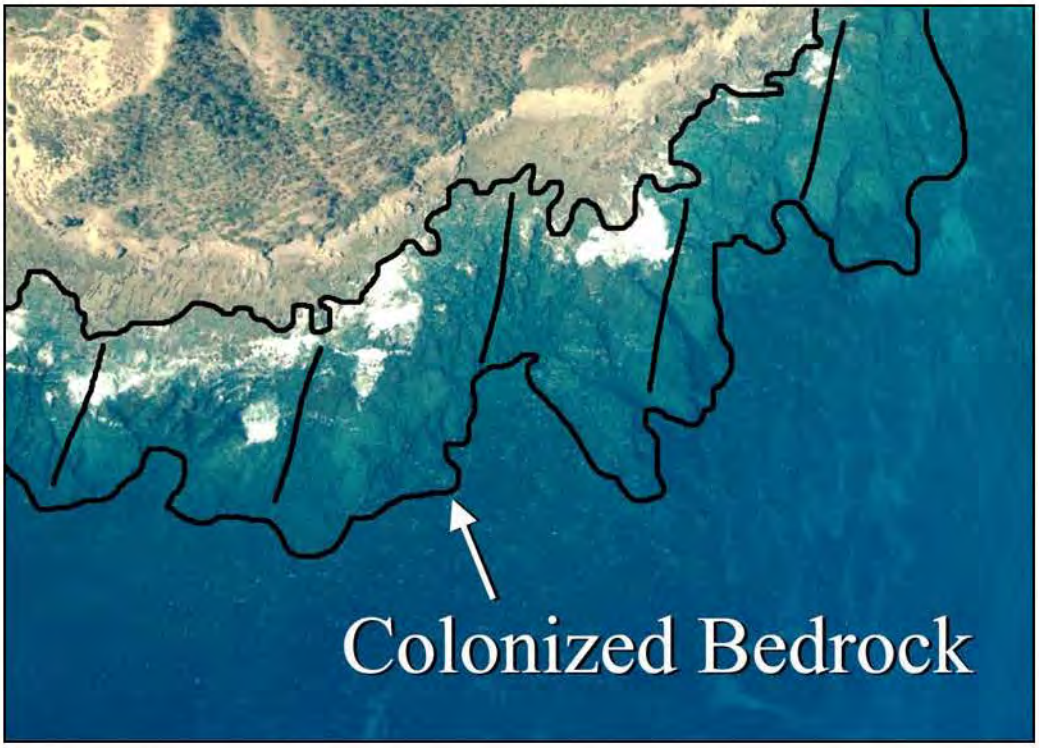
Colonized Pavement: Flat, low-relief, solid carbonate rock with coverage of macroalgae, hard coral, gorgonians, and other sessile invertebrates that are dense enough to partially obscure the underlying carbonate rock.



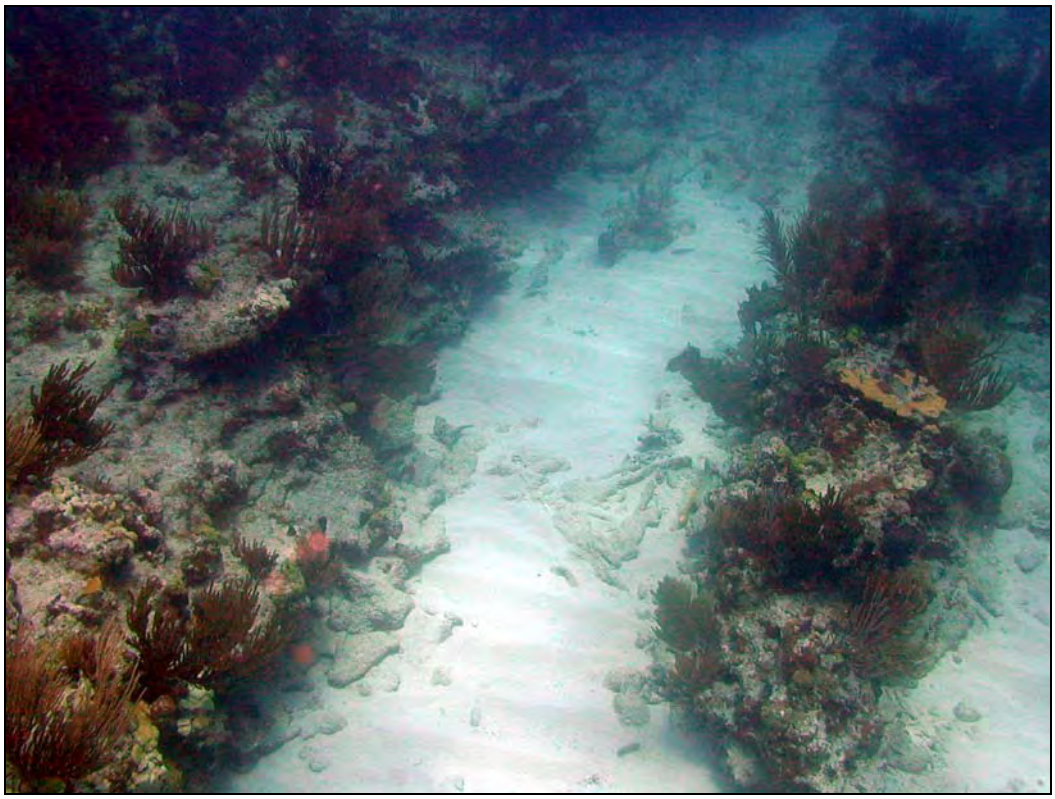


Colonized Bedrock: Exposed bedrock contiguous with the shoreline that has coverage of macroalgae, hard coral, gorgonians, and other sessile invertebrates that partially obscures the underlying rock.





Colonized Pavement with Sand Channels: Habitat having alternating sand and colonized pavement formations that are oriented perpendicular to the shore or bank/shelf escarpment. The sand channels of this feature have low vertical relief compared to spur and groove formations. This habitat type occurs in areas exposed to moderate wave surge such as that found in the bank/shelf zone.

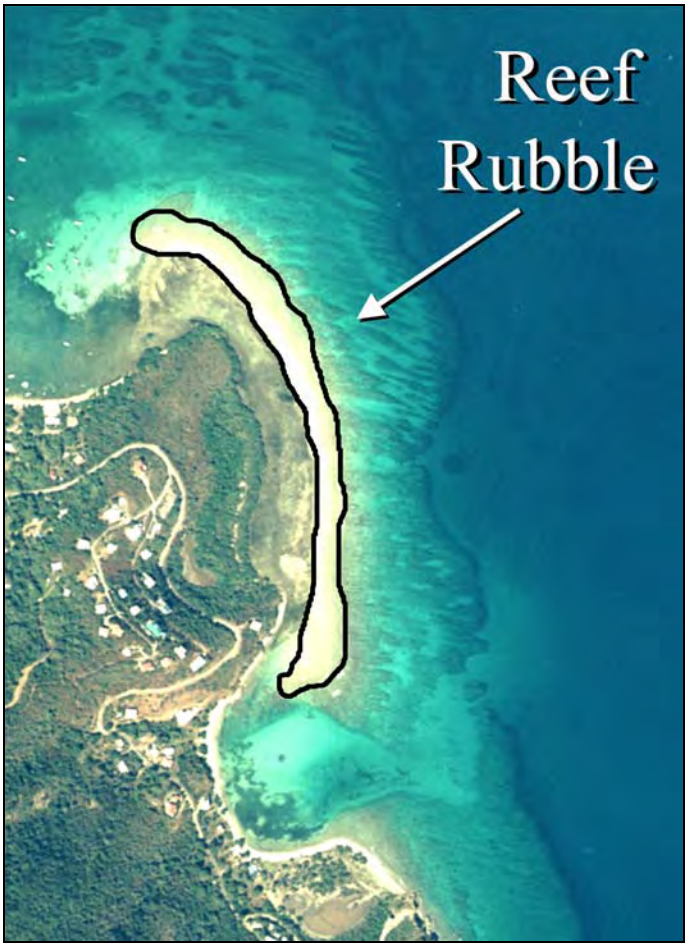


Representative Species:
Acropora palmata
Acropora cervicornis
Diploria spp.
Millepora complanata
Montastrea spp.
Porites spp.
Siderastrea spp.

Un-Colonized Hardbottom

Uncolonized Hardbottom: Hard substrate composed of relict deposits of calcium carbonate or exposed bedrock.

Reef Rubble: Dead, unstable coral rubble often colonized with filamentous or other macroalgae. This habitat often occurs landward of well developed reef formations in the reef crest or back reef zone.

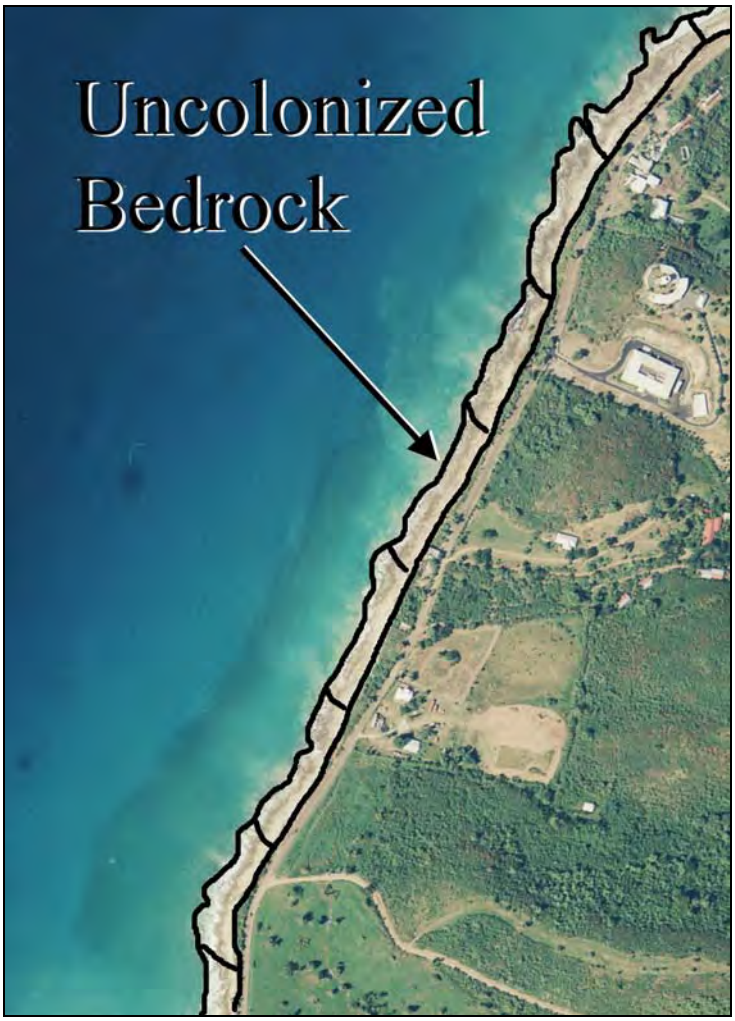


Un-Colonized Hardbottom

Uncolonized Pavement: Flat, low relief, solid carbonate rock that is often covered by a thin sand veneer. The pavement's surface often has *sparse* coverage of macroalgae, hard coral, gorgonians, and other sessile invertebrates that does not obscure the underlying carbonate rock.

Un-Colonized Hardbottom

Uncolonized Bedrock: Exposed bedrock contiguous with the shoreline that has s*parse* coverage of macroalgae, hard coral, gorgonians and other sessile invertebrates that does not obscure the underlying rock.



Uncolonized Pavement with Sand Channels: Habitat having alternating sand and uncolonized pavement formations that are oriented perpendicular to the shore or bank/shelf escarpment. The sand channels of this feature have low vertical relief compared to spur and groove formations. This habitat type occurs in areas exposed to moderate wave surge such as that found in the bank/shelf zone.

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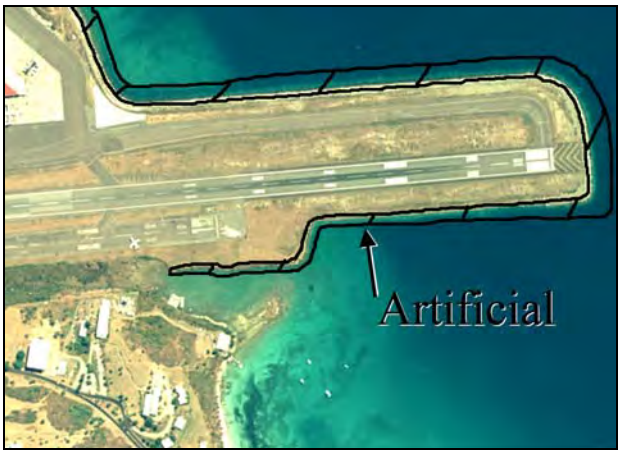
Other Delineations:

Mangrove: Emergent habitat composed of red, black, or white mangroves, or some combination thereof. Mangroves are generally found in areas sheltered from high-energy waves. Mangroves must be part of an open tidal system to be mapped. This habitat type is found only in the shoreline/intertidal, back reef, or barrier reef crest zone.

Representative Species:
Rhizophora mangle
Avicennia germinans
Laguncularia racemosa

Other Delineations

Artificial: Man-made habitats such as submerged wrecks, large piers, submerged portions of rip-rap jetties, and the shoreline of islands created from dredge spoil.



Unknown: Bottom type uninterpretable due to turbidity, cloud cover, water depth, or other interference.

Chapter 2: On-Screen Mapping with ArcView's Habitat Digitizer

The habitat digitizer extension to ArcView 3.1 was developed to facilitate mapping benthic habitats of Puerto Rico and the U.S. Virgin Islands using the classification scheme described in Chapter 1. The extension was originally created to map habitats using this scheme by visually interpreting orthorectified aerial photos. The extension's capabilities have been expanded to allow users to map from other georeferenced image data such as satellite images and side scan sonar. The extension allows users to rapidly delineate and attribute polygons using simple menus. It also allows new hierarchical classification schemes to be easily created, modified, and saved for use on future mapping projects.

The extension is available on the "Benthic Habitats of Puerto Rico and the U.S.Virgin Islands CD-ROM" or over the Internet at *http://biogeo.nos.noaa.gov/products.* The extension and accessory files are found in "data/ext/hab_dig.zip". This folder contains three files including:

habitat.avx	the extension
coral.hcs	a classification scheme for tropical marine habitats
coral.avl	an example legend for the coral.hcs classification scheme

Hardware and Software Requirements

The habitat digitizer extension is compatible with ArcView 3.1 and requires hardware similar to that recommended for proper operation of ArcView. Additional memory may enhance performance for handling large image files. The appropriate Image Support extension (TIFF, MrSID, etc.) is required depending on the format of the image files used. The Image Analyst extension is not necessary, but is recommended to facilitate manipulation of image brightness, contrast, and color balance.

Getting started

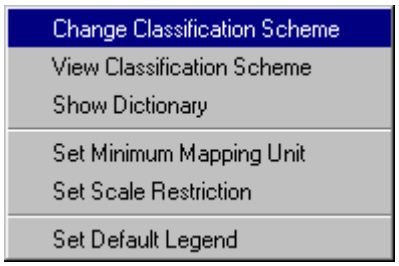
To begin using Habitat Digitizer, save the habitat.avx file in either ArcView's Ext32 directory or the USEREXT directory. The coral.hcs and coral.avl files can be saved anywhere, but they should preferably be placed in the ArcView project's working directory.

After starting ArcView, load the Habitat Digitizer Extension (and any other desired extensions) by selecting "File/Extensions…" and click on the box next to the Habitat Digitizer Extension in the "Available Extensions" list. Click "OK" to install the extension. If a project already exists that used the Habitat Digitizer Extension, opening the project will automatically load the extension.

Setting the Projection Parameters for the Image Data:

The Habitat Digitizer enables users to specify a minimum mapping unit (MMU), digitizing scale, and offers several other spatial functions that require the View's projection and map units to be set properly. The projection properties of the View must be set to those of the image data from which habitats are being interpreted. Once the View's projection is set properly, shapefiles created using Habitat Digitizer will be unprojected (in decimal degrees). To set the projection properties, select View/Properties and set the map and distance units as well as the Projection information of the image. If this information is not set, the shapefile will be created in the projection coordinates of the image files.

The Habitat Digitizer Menu



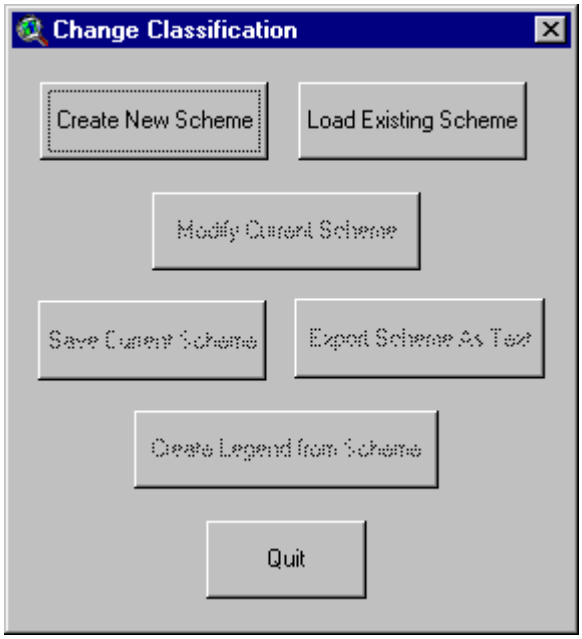
Once the Habitat Digitizer Extension has been activated the "Habitat Digitizer" pull-down menu and digitizing tools which control the functions of the extension will appear on the ArcView toolbar. Beginning with the process of creating and loading classification schemes, a detailed description and instructions for each function in the extension are provided below.

Creating a new classification scheme

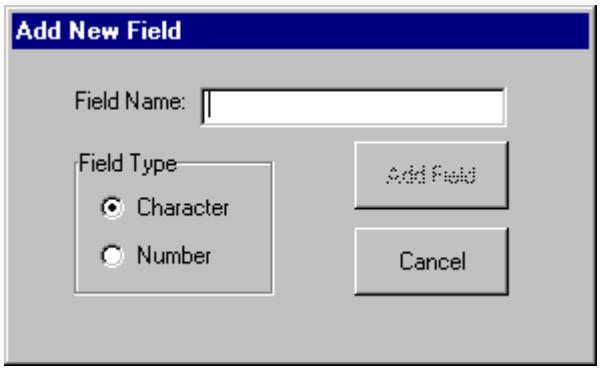
Unless an existing classification scheme such as coral.hcs is used, a new scheme must first be created to use the extension. Before creating a new scheme using the dialogs of the extension, it may be useful to sketch the scheme out on paper to ensure that all fields and categories in the hierarchy are entered properly. There are several advantages to using a scheme with a hierarchical structure including: the detail of habitat categories can be expanded or collapsed to suit user needs, the thematic accuracy of each category/hierarchical level can be determined, and additional categories can be easily added or deleted at any level of the scheme to suit user needs. An example of a scheme framework is provided in Table 2.1 below.

Table 2.1: Example Classification Scheme Framework

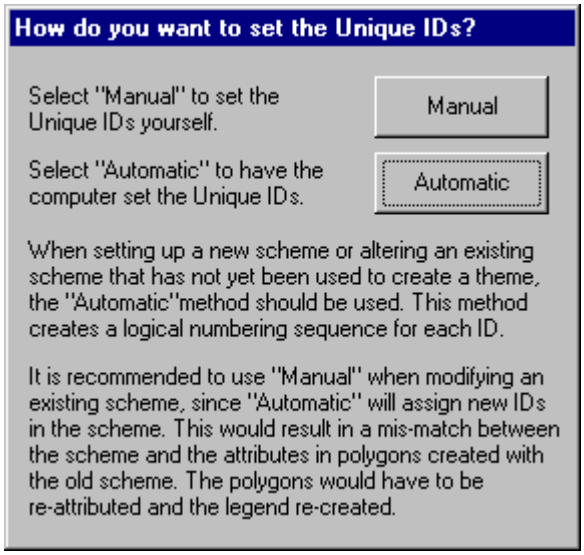
Field 1	*Field 2*	*Field 3*	*Field 4*	*UniqueID*
Category 1	**Subcategory 1**	**Subcategory 1**	**(empty)**	**111**
		Subcategory 2		**112**
	Subcategory 2	**Subcategory 1**		**121**
		Subcategory 2		**122**
Category 2	**Subcategory 1**	**Subcategory 1**		**221**
		Subcategory 2		**222**
	Subcategory 2			**22**
Category 3	**Subcategory 1**			**31**
	Subcategory 2			**32**



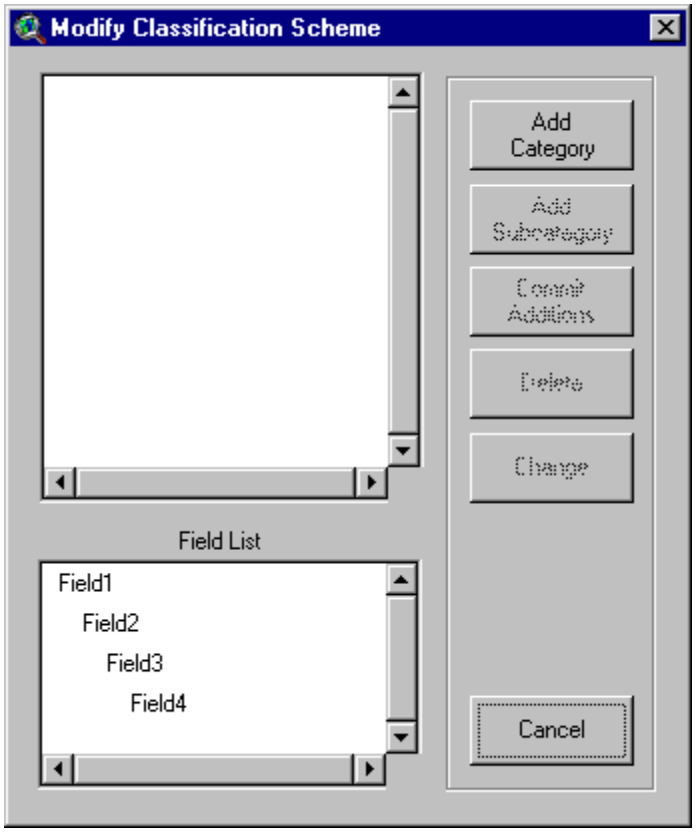
To create the new scheme using the extension, select **Habitat Digitizer/Change Classification Scheme** and in the next dialog box, select **Create New Scheme**. Type the name of the new classification scheme in the message box and click **Okay**. The other options in this dialog will be unavailable until a scheme has been either created or loaded.



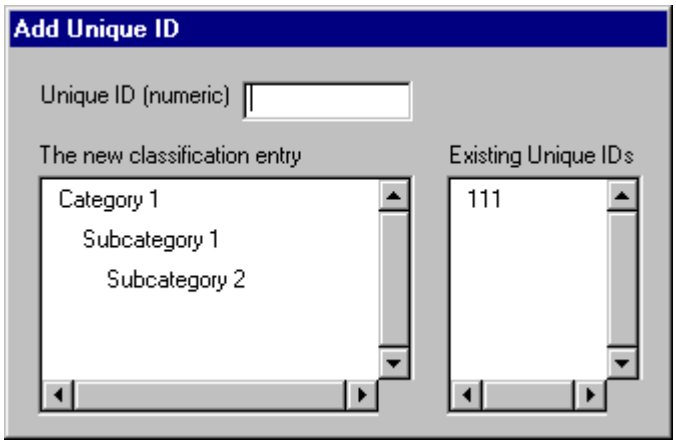
In the "Add New Field" dialog, selecting **Cancel** will end the creation process without creating a scheme. Once the first field name has been added, this button is replaced with the **Finished** button, which will complete the field naming process and go to the next step in creating the scheme. First, type in the field name for the most general hierarchical level in the new classification scheme (Field 1 in Table 2.1). Field names are limited to 10 characters in length. Select whether the field will be character or numeric and click **Add Field**. Add additional field names in the order of the classification hierarchy. A fieldname must be entered for every level in the hierarchy. Because new fields cannot be added after the scheme creation process is closed, add a few extra fields as placeholders in case any additional unforeseen levels in the hierarchy are required at a later time. After all the field names have been entered select **Finished** to proceed to the next step. Once **Finished** is selected, no additional fields may be added to the classification scheme. Note that a field named "UniqueID" is added automatically after **Finished** is selected.



The extension uses the uniqueID field to identify each possible combination of hierarchical categories with one unique number (see Table 2.1). ArcView uses uniqueIDs to link polygon attributes to the legend. The dialog at left sets the method of assigning uniqueIDs. When setting up a new scheme or altering an existing scheme that has not yet been used to create a theme, the **Automatic** method should be used. The **Automatic** method creates a logical numbering sequence for each uniqueID (see Table 2.1). When modifying a scheme that has already been used to create a theme, use the **Manual** method. If **Automatic** was used, new uniqueID's would be assigned to the scheme, creating a mis-match between the ID's of the new scheme and those of the polygons attributed using the old scheme.

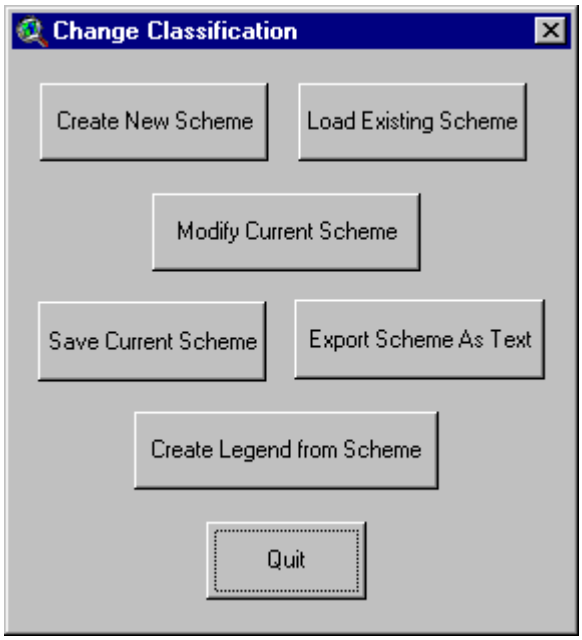


In the "Modify Classification Scheme" dialog, categories and subcategories can be added to a new or existing classification scheme. Begin by adding a category to the most general level in the classification hierarchy (Category 1 in Table 2.1). Click **Add Category**, then type the category name and click **Okay**. Additional categories at this level in the hierarchy can be added in this way. Adding a category at this level will activate the **Add Subcategory** button. Subcategories are added within individual categories by selecting the category of interest then clicking **Add Subcategory** and completing the dialog boxes. If the uniqueIDs are to be assigned using the **Automatic** option (previous dialog), the **Delete** and **Change** buttons are activated and can now be used to modify category names. In the **Automatic** method, clicking the **Finished** button will assign a uniqueID to each classification combination. If **Manual** was selected, the **Delete** and **Change** buttons will not be activated until the uniqueIDs for each of the categories and subcategories have been added (next dialog). To add uniqueIDs manually, click the **Commit Additions** button after all categories and subcategories have been added, then complete the **Add Unique ID** dialogue box as described below. Once the uniqueIDs have been assigned the **Delete** and **Change** buttons will be activated. If the **Cancel** button is selected, the scheme creation process will end without creating a scheme.



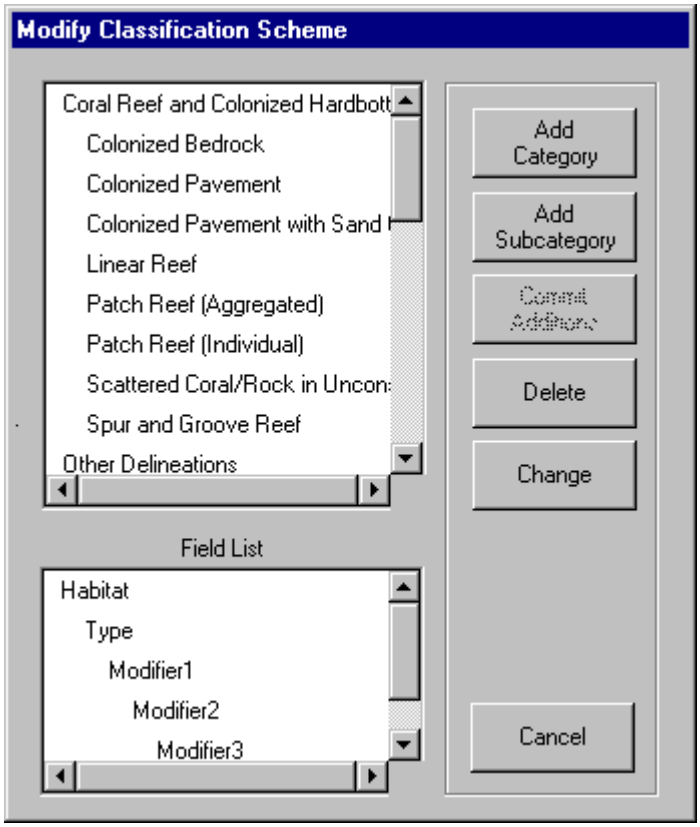
If **Manual** was selected for assigning uniqueIDs, the "Add Unique ID" dialog will appear after selecting **Commit Additions**. A unique numeric identifier must be entered for each possible combination of classifications in the hierarchy. The **Existing Unique IDs** list shows which numbers are already used in the scheme. Duplicate numbers cannot be added. See Table 2.1 or the coral.hcs scheme that is included with the extension to get suggestions on how to assign **uniqueIDs**. Once uniqueIDs are set through either the **Manual** or **Automatic** method and **Finished** is selected in the "Modify Classification Scheme" dialog, the new scheme can be saved and used to digitize habitats.

Saving, Re-Loading, and Creating Scheme Legends



Once finished creating or modifying a scheme, save the scheme to a file by selecting **Save Current Scheme** in the "Change Classification" dialog box. The file will be saved as a *.hcs (habitat classification scheme) file. To access this scheme, select **Load Existing Scheme** in the "Change Classification" dialog box. A file selection dialog will open showing only the *.hcs files. Additional options that can be used at this time include the **Export Scheme As Text** button which will create a text file showing the hierarchical structure of the scheme, and the **Create Legend from Scheme** button which will create a legend that contains each uniqueID and its attributes. Legend labels will have all of the categories in the classification hierarchy concatenated into one string. Colors will be randomly selected and an additional **Unclassified** category will be added with a uniqueID of zero.

Editing an existing classification scheme

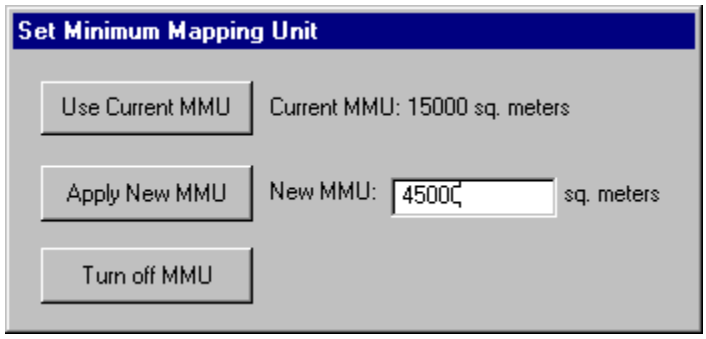


To edit an existing scheme, select **Modify Current Scheme** in the "Change Classification" dialog box. After selecting the method of assigning the uniqueID (in this case, using **Manual** is recommended), the "Modify Classification Scheme" dialog appears. Follow the same instructions in **Creating a new scheme** to edit this scheme using the dialog at left.

Digitizing Restrictions

Minimum Mapping Unit

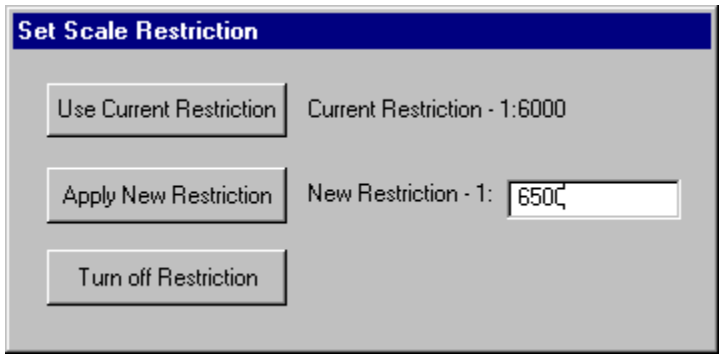
Depending on the quality of aerial images used and the specific goals of the project, it is often desirable to limit the minimum size of the features that are delineated. For example, poor image resolution may preclude the interpretation of features smaller than some minimum size threshold. Other features, while interpretable in the imagery, may simply be too small and therefore beyond the scope or goals of the desired map product. To limit the size of the features that can be digitized in the habitat map, a minimum mapping unit (MMU) can be set in Habitat Digitizer. Features must be larger than the MMU to be included in the habitat map.



Set the MMU restriction by selecting **Habitat Digitizer/Set Minimum Mapping Unit**. If the view's map and distance units are set, a dialog will appear showing the current MMU. Enter the desired numerical MMU into the text box and select **Apply New MMU**. If a satisfactory MMU has already been set, **Use Current MMU** will close the dialog without changing the MMU. Once an MMU is set, if the area of a newly digitized polygon is below the value specified, a message box will ask whether the polygon should be added to the theme. If no MMU restriction is desired, **Habitat Digitizer/Set Minimum Mapping Unit/Turn off MMU** will allow digitizing polygons with no size restriction.

Scale Restriction

It is possible to adjust the scale of the image files as they appear on the computer monitor. For example, the scale of hard copy photographs used for mapping may be 1:48000, however the actual photo interpretation may be conducted on the computer monitor while zoomed in on the scanned photographs at a much larger scale (e.g.1:6000). It is often desirable to conduct all polygon delineation at the same scale, so that all polygons have the same level of detail. Set the scale restriction by selecting **Habitat Digitizer/Set Scale Restriction**. Enter a number in the text box and select **Apply New Restriction**. If digitizing is attemped while a scale restriction is in place and the view is not at the specified scale, a message box will appear and offer to zoom the view to the proper scale. If **No** is selected, a polygon cannot be digitized. If a scale restriction is not desired, use **Habitat Digitizer/Set Scale Restriction/Turn off Restriction** to allow digitizing at any scale. The view's map and distance units must be set to use this tool.



Creating a theme and using the digitizing tools

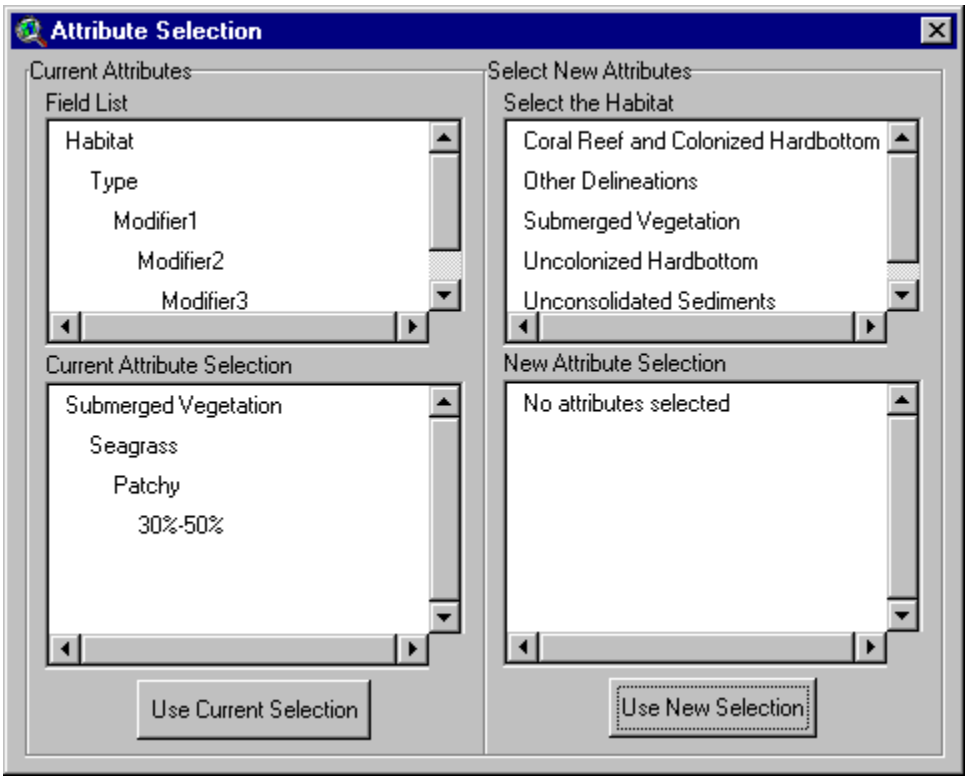
Once a classification scheme has been loaded, this button creates an empty theme with the appropriate fields. If a default legend has not been created using **Habitat Digitizer/Set Default Legend** or the **Change Classification** dialog, a dialog will appear to select a legend file. A second

message box will appear asking if this legend should be made the default legend for all new themes created using this classification scheme. After creating a new theme, set the snapping tolerance by using the menu selection **Theme/Properties** and in the **Editing** selection, click the **General** box and set the tolerance to a number smaller than the pixel size of the images used for interpretation (since no interpretation will presumably be conducted within pixels). If this is not done, adjacent polygons will not always share a common border.

To start digitizing a new polygon, select this tool and trace the feature of interest by clicking around its perimeter with the mouse. A double click closes each new polygon. If a polygon is digitized inside or completely around an existing polygon, "donut" and "donut hole" polygons will be formed. Once the polygon is complete, a message box will allow the classification to be set as outlined below.

Use this tool to add a polygon adjacent to an existing polygon. To create a polygon using this tool, start tracing a line inside of an existing polygon and end the line by clicking twice inside of the same or another existing polygon. This tool will not work when attempting to digitize a polygon inside of another polygon (use the Split tool below to do that). The scale restriction and MMU also apply to this tool. If several polygons are created with a single line and some are below the MMU, a warning message will appear. If **No** is selected on the warning message only the polygons that fall below the MMU will be removed.

Once polygons are completed using the **Add** and **Append** tools, a dialog will appear to guide assignment of classification attributes.

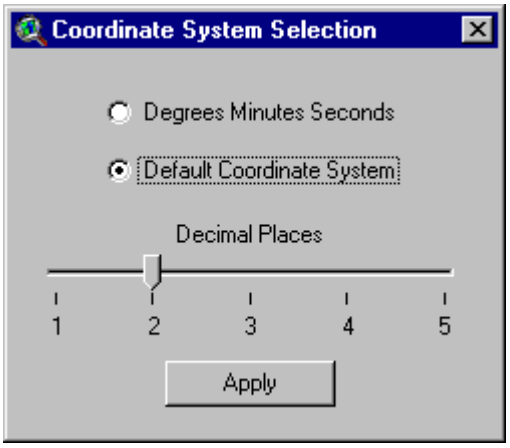


The **Field List** displays the hierarchical structure of the fields in the scheme. **Current Attribute Selection** shows the classification type, if any, currently selected. Either select **Use Current Selection** or select a new classification type by clicking through the desired classification attributes in the **Select New Attributes** window. As new attributes are selected they will be displayed in the **New Attribute Selection** window. The **Use New Selection** button will be activated when the attribute in the lowest hierarchical level for the new classification is selected.

This tool splits one or more polygons into several polygons. All of the attribute information for the resulting polygons will be the same as the original(s), but can be changed as explained below under "Tools from the Right Mouse Button". Please note that due to a bug in ArcView, this tool sporatically works when attempting to split along the inside border of a donut polygon. The scale restriction and MMU also apply to this tool. If several polygons are split and some of the resulting polygons fall below the MMU, choosing **No** will remove the entire line and merge the split polygons back together.

This tool places a MMU sized red box on the view by clicking the button and then clicking directly in the View at the desired location. This box enables users to estimate the size of features in the imagery relative to the MMU. This box disappears when panning, zooming in or out, or after completing a polygon. To use this feature while adding a new polygon see "Tools from the Right Mouse Button" below.

This tool brings up a dialog to display the cursor's x/y position in the upper right hand corner of the ArcView window in either the coordinate system of the view (default) showing from 1-5 significant digits, or in degrees, minutes, and seconds. This requires that the view's projection be set and the map units specified.



Tools from the Right Mouse Button

Click and hold down the right mouse button to view a list of additional tools and options:

Panning will recenter the display over the spot where the right mouse button was clicked. This is useful while digitizing large polygons that do not fit entirely within the view frame.
Pan to Location will center the display at the coordinates entered in a message box
Show attributes will display a message box showing the habitat attributes for the currently selected polygon.
Change habitat attribute will allow the user to change the habitat attributes for polygons that are selected.
MMU Box places an MMU box on the View where the right mouse button was clicked (can be added while digitizing a polygon).
Polygon Area shows the area of a selected polygon.

When a project is saved, the settings (classification scheme, MMU, scale restriction, default legend, cursor display precision, and current attribute selection) will be stored along with the project. Upon opening the saved project, these settings will be restored and do not need to be re-entered.

Chapter 3: Creating and Interpreting Digital Orthophotographs

Habitat maps of Puerto Rico and the U.S. Virgin Islands were created by visual interpretation of aerial photos using the Habitat Digitizer (Chapter 2). Aerial photographs are valuable tools for natural resource managers and researchers since they provide an excellent record of the location and extent of habitats. However, spatial distortions in aerial photos due to such factors as camera angle, lens characteristics, and relief displacement must be accounted for during analysis to prevent incorrect measurements of area, distance, and other spatial parameters. These distortions of scale within an image can be removed through orthorectification. During orthorectification, digital scans of aerial photos are subjected to algorithms that eliminate each source of spatial distortion. The result is a georeferenced digital mosaic of several photographs with uniform scale throughout the mosaic. After an orthorectified mosaic is created, photointerpreters can accurately and reliably delineate the boundaries of features in the imagery as they appear on the computer monitor using a software interface such as the Habitat Digitizer. Through this process, natural resources managers and researchers are provided with spatially accurate maps of habitats and other features visible in the imagery.

Creating the Digital Mosaic

Aerial photographs were acquired for the Puerto Rico and U.S. Virgin Islands Benthic Mapping Project in 1999 by NOAA Aircraft Operation Centers aircraft and National Geodetic Survey cameras and personnel. Approximately 600, color, 9 by 9 inch photos were taken of the coastal waters of Puerto Rico and the U.S. Virgin Islands at 1:48000 scale (photography scale varied for some specific islands, see Table 3.1). Specific sun angle and maximum percent cloud cover restrictions were adhered to when possible during photography missions to ensure collection of high quality imagery for the purpose of benthic mapping. In addition, consecutive photos were taken at 60 percent overlap on individual flightlines and 30 percent overlap on adjacent flightlines to allow for orthorectification and elimination of sun glint.

Prints and diapositives (color transparencies) were created from the original negatives. Diapositives were then scanned at a resolution of 500 dots per inch (DPI) using a metric scanner, yielding 2.4 by 2.4 meter pixels for the 1:48000 scale photography (pixel size varied for some specific islands due to the scale of the original photography, see Table 3.1). All scans were saved in tagged image file (TIF) format for the purposes of orthorectification and photointerpretation. Original TIF's were also converted to *.jpg format to reduce file size and facilitate web-based image distribution, and are currently available on the NOAA Biogeography Program's Web Site at 72, 150, and 500 DPI resolution.

Georeferencing/mosaicing of the TIF's was performed using Socet Set Version 4.2.1. First, lens correction parameters were applied to each frame to eliminate image distortion. Airborne kinematic GPS (location of the aircraft at the time of each exposure) was then used when available to provide a first order geolocation. When this information was not available, measurements were made between flightline strips for input into Socet Set to provide preliminary co-registration.

Image to image tie-points (distinct features visible in overlap areas of each frame such as street intersections, piers, coral heads, reef edges, and bridges) were then used to further co-register the imagery, especially for photos taken over open water where ground control points were not available (see below). Socet Set has limited ability to automatically find such features common to overlapping photographs but this automated function performs poorly for submerged features.

Fixed ground features visible in the scanned photos were selected for ground control points (GCP's) which were then used to georeference the imagery (i.e. link the image pixels to a real world coordinate system such as latitude/longitude). GCP's were measured using real-time DGPS (differential Global Positioning System). We obtained points with a wide distribution throughout the imagery, especially on peninsulas and outer islands whenever possible since this results in the most accurate registration throughout each image. Only ground control points for terrestrial features were collected due to the difficulty of obtaining precise positions for submerged features (see Appendix 1: Ground Control Points).

A custom digital terrain model (DTM) was then created using the Socet Set software to correct for feature displacement due to terrain effects. To accomplish this, water features and the shoreline were set to an elevation of zero. Preliminary experimentation revealed that the effects of refraction on the position of submerged features in the imagery were not significant (less than one pixel) enough to make a correction for underwater displacement according to Snell's law. Selected land elevation points were then inserted

from USGS 1:24000 Digital Elevation Models or other elevation data sets where clouds or other sources of interference prevented the Socet Set software from automatically making an accurate DTM.

Once the terrain models were complete and a draft orthorectified mosaic was produced, a set of independent ground control points was used to measure the quality of each mosaic's rectification and ensure that it met acceptable limits of horizontal spatial accuracy. If the spatial accuracy was not acceptable based on this comparison, additional modifications were made to the DTM, tie-points, etc., until a satisfactory mosaic was created for each island. In general, mosaics were georeferenced such that pixels are positioned within one pixel width of their correct location.

Average spatial accuracy of the individual mosaics is reported in Table 3.1. Values reported are an average error for all control points used to measure accuracy of the mosaics. Accuracy is variable within different areas of each mosaic. Features near land (near GCP's) are generally georeferenced with accuracy similar to the values reported in the table while the accuracy of features away from land is generally not as good. Where no land is in the original photographic frame only kinematic GPS and tie points were used to georeference the images. Also, spatial accuracy may be especially poor near clouds over land since this interferes with creation of an accurate DTM.

Once all the photos were orthorectified, the best segments of each photo were selected for creation of the final mosaic. Segments of each photo were selected to minimize sun glint, cloud interference, turbidity, etc. in the final mosaic. Where possible, parts of images obscured by sun glint or clouds were replaced with cloud/glint free parts of overlapping images. As a result, most mosaics have few or no clouds or sun glint obscuring bottom features. However, in some cases, clouds, sun glint, or turbid areas could not be replaced with overlapping imagery. In these areas, such obstructions were minimized but could not be eliminated completely.

Segments from 309 out of the ~600 original aerial photos were selected to create the final mosaic (Table 3.1). Final mosaics were created in "geoTIF" file format (georeferenced image file) with the following projection parameters: North American Datum 83, Universal Transverse Mercator (UTM) Zone 19 for Puerto Rico, and UTM Zone 20 for the U.S.Virgin Islands. These files are available on the "Benthic Habitats of Puerto Rico and the U.S. Virgin Islands" CD-ROM and at the NOAA Biogeography Program web site in Mr.SID format. No color balancing was attempted since this alters color and textural signatures in the original imagery and interferes with the photointerpreter's ability to delineate habitats. As a result, mosaics have visible seams between adjacent photos. This provides the photointerpreter with "true color" imagery for maximum ability to identify and delineate benthic features.

Table 3.1: Mosaic Specifications for each Island. Accuracy's are in meters +/- standard deviation.

Location	*UTM Zone*	*Photo Scale*	*Pixel Width (m)*	*# of Photos*	*Avg. Spatial Accuracy X*	*Avg. Spatial Accuracy Y*
St. John	20	1:48000	2.4	14	4.31 +/- 5.2	2.14 +/- 8.4
St.Thomas	20	1:48000	2.4	20	1.48 +/- 1.3	1.05 +/- 3.4
St.Croix	20	1:48000	2.4	27	1.21 +/- 3.0	0.69 +/- 3.4
Culebra	19	1:48000	2.4	14	5.51 +/- 20.1	7.04 +/- 18.2
Mona	19	1:28000	1.5	14	2.76 +/- 9.1	4.06 +/- 4.5
Desecheo	19	1:20000	1.0	3	4.26 +/- 30.0	9.47 +/- 36.4
Puerto Rico: South	19	1:48000	2.4	72	0.06 +/- 3.0	0.89 +/- 4.4
Puerto Rico: East	19	1:48000	2.4	55	0.85 +/- 9.5	2.59 +/- 7.8
Puerto Rico: West	19	1:48000	2.4	34	1.65 +/- 5.1	1.04 +/- 6.7
Puerto Rico: North	19	1:48000	2.4	51	4.88 +/- 9.6	4.06 +/- 5.3

Digitizing Benthic Habitats

Individual georeferenced mosaics were loaded into ArcView with the Habitat Digitizer and Image Analysis extensions activated. Each mosaic was then converted into an image analysis file (IMG) that could be easily manipulated using ArcView's Image Analysis extension (e.g., adjust contrast, brightness, and color). The Minimum Mapping Unit (MMU) restriction was set to 1 acre in the Habitat Digitizer extension. One acre was selected based on the scale of the photography and the objectives of the mapping project. As a result, some features visible in the imagery such as small isolated patch reefs and sea walls that, while important features, are quite small and beyond the scope of this mapping project.

Digitizing scale was set to 1:6000 in the Habitat Digitizer. Experimentation indicated that digitizing at this scale optimizes the tradeoff between positional accuracy of lines and time spent digitizing. In general, line placement conducted while zoomed in at large scales results in excellent line accuracy and detail but can be quite time consuming. Conversely, while zoomed out, lines can be drawn quickly but lack both detail and positional accuracy.

To determine the optimum digitizing scale to maximize accuracy and minimize map production time, a 25 acre area composed of a variety of habitat types was mapped at 1:1500, 1:3000, 1:6000, and 1:12000 on-screen scale (scale that the image appears on the computer monitor as indicated by ArcView). Five replicates were conducted at each scale. Each trial was timed so we could evaluate the influence of mapping scale on production time. Resulting maps were evaluated for deviations in polygon detail relative to the map digitized at 1:1500 scale. At 1:1500, individual pixels are clearly discernable allowing highly detailed and accurate maps to be created by closely following the contours of even the most convoluted habitat boundary. Additional increases in zoom do not result in an increase in map detail and accuracy since individual pixels are already visible at 1:1500. Therefore, the map created at 1:1500 scale was used as a reference against which to compare maps digitized at 1:3000, 1:6000, and 1:12000 scale.

The results of this experiment indicated that there is no appreciable loss in polygon detail and accuracy by digitizing at 1:6000 while mapping time was dramatically reduced. Therefore all polygons were digitized at this scale except when subtle habitat boundaries were not easily discernable at 1:6000 and zooming out to a more broad scale was required to place boundaries correctly. In this case, digitizing generally took place at a scale of approximately 1:10000.

Using the Habitat Digitizer, habitat boundaries were delineated around signatures (e.g., areas with specific color and texture patterns) in the orthorectified mosaic corresponding to habitat types in the classification scheme (Chapter 1). This was often accomplished by first digitizing a large boundary polygon such as the habitats that compose the shoreline and then appending new polygons to the initial polygon or splitting out smaller polygons within. Each new polygon was attributed with the appropriate habitat designation according to the classification scheme. It is believed that the positional accuracy of polygon boundaries is similar to that of the mosaics since delineation is performed directly on the digital imagery. Brightness, contrast, and occasionally color balance of the mosaic were manipulated with Image Analysis to enhance the interpretability of some subtle features and boundaries. This was particularly helpful in deeper water where differences in color and texture between adjacent features tend to be more subtle and boundaries more difficult to detect. Particular caution was used when interpretation was performed from altered images, since results from color and brightness manipulations can sometimes be misleading.

The original 1:48000 scale color prints and diapositives were available to the photointerpreter to aid in delineating and attributing polygons. The high quality diapostives were frequently viewed under magnification on a light table to aid in this process. Additional collateral information including previously completed habitat maps, NOS nautical charts, and other descriptive references dealing with benthic and coastal habitats of Puerto Rico and the U.S. Virgin Islands was used to assist with image interpretation (Kumpf and Randall, 1961; Rodriguez et al, 1977; Morelock, 1978; Adey, 1979; Goenaga and Cintron, 1979; Beach and Trumbull, 1981; Grove, 1983; Beets et al, 1986; Pilkey et al, 1987; Trias, 1991; Rodriguez et al, 1992; Morelock et al, 1994; Bacle, 1995; Reid and Kruer, 1998; Kruer 1995; Garcia et al, 2000; NOAA et al, 2000).

Ground Validation

Following careful evaluation of the aerial photography, and in some cases creation of a "first draft" habitat map through the process outlined above, selected sites were visited in the field for typological

validation. This validation included: (1) areas in the aerial photography and mosaic with confusing or difficult to interpret signatures, (2) transects across many representative habitat types occurring in different depths and water conditions, (3) a survey of the Zones, and (4) confirmation of preliminary habitat delineations if a first draft was produced. Navigating to field sites was accomplished in a variety of ways including uploading position coordinates from the mosaic into an onboard GPS and navigating to those waypoints, using an onboard PC connected to GPS allowing navigation using digital nautical charts or the mosaic, and visual navigation using landmarks visible in the diapositives. On most occasions, field activities were conducted with the guidance of local experts.

Diapositives, and when available, draft delineations were used in the field to facilitate comparison of signatures in the imagery to actual habitats at each site. Individual sites were visually evaluated by snorkeling and free diving or directly from the boat in shallow, clear water. Habitat transitions were evaluated by swimming transects across habitat types to further guide placement of polygon boundaries. Habitat type(s), zone, approximate depth, position (GPS), image number, and other descriptive information were recorded at each site. Field data for each site was then compiled into a text table with a latitude/longitude field to allow overlay of the field information on the mosaic and habitat polygons (Appendix 2: Ground Truth Points). Where depth and water clarity permitted, the diapositives were used to navigate across multiple bottom features allowing continuous confirmation of habitat types and transitions between each site.

Following processing of the field data, polygon boundaries and habitat classifications were created or revised where necessary, and zone attributes were assigned to each polygon using the Habitat Digitizer. This draft of the habitat maps was then reviewed and revised with the guidance of a panel of local experts at peer review sessions in Puerto Rico, the U.S. Virgin Islands, and over the internet. Review session participants included members of the local research and management community. During these peer review sessions, particular attention was given to polygons labeled as “unknown” and areas not visited during ground truth activities. Revisions based on comments from local experts were then completed and final habitat maps were produced. Thematic accuracy was assessed for these final maps (see Chapter 4).

Chapter 4: Assessment of Classification Accuracy

Periodic assessment of thematic accuracy during map production is a critical part of any mapping project. Mapmakers want to know how reliably a given habitat type can be classified, this is called "producers accuracy". Map users want to know what percentage of the polygons labeled with a specific habitat type is classified correctly, this is called "users accuracy" (Congalton, 1991; Verbyla, 1991). Such periodic assessment is necessary to monitor and maintain acceptable standards of quality following creation of each draft. Most importantly, once final products are produced, the reliability of results must be estimated and reported.

Thematic accuracy of the Puerto Rico and U.S. Virgin Islands habitat maps was evaluated for the three most general habitat categories: unconsolidated sediment, submerged vegetation, and coral reef/hard bottom. Accuracy was estimated at each of two locations within the project area that included the full complement of habitat types, depth ranges, and water conditions representative of Puerto Rico and the U.S. Virgin Islands. For this reason, the accuracy of maps measured at these two locations is assumed to be representative of map accuracy elsewhere in the project area. This approach, which focused in two small areas, enabled a statistically robust evaluation of thematic accuracy to be conducted without the logistic difficulty of collecting data for accuracy assessment over the entire project area.

In addition, since a novel mapping approach was used to enhance production time and provide additional project deliverables, it was necessary to ensure that maps produced using the ArcView Extension had comparable accuracy to maps produced using more routinely used techniques. To accomplish this goal, the thematic accuracy of ArcView maps was compared to the accuracy of maps produced using published and well known photogrammetric techniques.

Goals of the accuracy assessment:

1. Compare the thematic accuracy of maps produced from on-screen digitizing using the ArcView Extension to those produced by digitizing directly from hard copy photos using a stereoplotter.
2. Evaluate the ArcView derived products more thoroughly, including areas with different reef environments/ water conditions representative of sites throughout the project extent.

Comparing Thematic Accuracy: On-screen vs. Stereoplotter Digitizing

Buck Island National Monument, St.Croix and the surrounding ecosystem (approximately 5000 acres) was selected as the site for comparing thematic accuracy resulting from on-screen vs. analytical stereoplotter digitizing due to several factors. First, almost all habitat types in the Puerto Rico/ Virgin Islands project area are present at this site (except mud and mangroves). In addition, there is a long history of research focused on the habitat in and around Buck Island resulting in a variety of historical data with which to compare NOAA map products. Finally, there is excellent logistic support for field activities through the National Park Service and USGS.

Maps of this area were created using two techniques; the ArcView Extension and on-screen digitizing process described in Chapter 3, and standard photogrammetric techniques using an analytical stereoplotter to visually interpret benthic features from hard copy photos. Maps derived using the stereoplotter were created by the NOAA Coastal Services Center using Coastal Change Analysis Program (C-CAP) protocols. These protocols include widely accepted and commonly used photogrammetric techniques and instruments (see Dobson et al, 1995 for a complete description of this technique). Under these protocols, habitats were delineated directly from stereo pairs of the hard copy aerial photos that were scanned and used to create the orthorectified mosaics described in Chapter 3. Using the analytical stereoplotter, extremely detailed classification of the hard copy imagery is possible. Since the ArcView digitizing technique used to create maps relied on classification from scans of these photos (less resolution relative to the original hard copy), it was important to determine if there is a difference in thematic accuracy between maps produced using the two techniques given the classification categories and MMU described in Chapter 1.

While map production was underway, habitat type at approximately 120 sites was evaluated in the Buck Island test area to compare with habitat delineations derived from each mapping technique. A stratified sampling protocol was used during which sample sites were pre-selected so that overall thematic accuracy of the three major habitat types across the range of depths and water conditions found in the field could be evaluated. First, a grid with an approximatly1 acre cell size (MMU) was overlaid on the georeferenced mosaic of the test area. Next, one third of the grid cells were randomly selected as potential sample sites. The number of potential sample sites was further reduced by eliminating grid cells that contained multiple habitat types. This reduced the possibility of using sites that straddle polygon boundaries. Sites near habitat boundaries were avoided since comparing these locations with mapped polygons could be confounded by spatial accuracy of linework and/or coordinates of ground truth points. National Ocean Service bathymetry data was then overlaid and used to split the remaining cells into "shallow" or "deep" categories based approximately on the 40-foot isobath to assist with final site selection. This was done to ensure adequate representation of accuracy assessment within two depth strata, since depth is a major factor determining the interpretability of benthic features. Site selection was completed by using visual photointerpretation to select 20 sites for each of the three major habitat types within the two depth strata respectively. This process resulted in a total of 120 preselected sites across the range of depths and habitat types found at the test area.

The accuracy assessment dataset was collected in November 1999 for the Buck Island test area-eight months after the aerial photos were obtained. This short time interval minimized the possibility that habitats could have been altered significantly between the time of the aerial photography and collecting the accuracy assessment data.

A datasheet was created based on the categories in the habitat classification scheme to facilitate assessment of habitat type at each site in the field. Each preselected site was navigated to using real time DGPS. Data recorded at each site included habitat type, depth, and other descriptive information. Depth was determined using a hand-held depth sounder. Habitat type(s) were recorded within an approximately 5-7 meter radius around each pre-selected site. Habitat type directly at the DGPS coordinates was recorded first followed by any secondary habitat types observed within the 5-7m radius of the DGPS point. In most cases, habitat type was the same for the DGPS point and area around each site since we preselected grid cells encompassing areas of uniform tone and texture in the imagery. Logistics prevented evaluation of each site on the scale of the MMU (1 acre). Therefore, potential classification errors resulting from the difference between the MMU and size of accuracy assessment sites were accounted for in the analysis. For example, map classification was not considered incorrect in cases where an accuracy assessment point was scored as "sand" in the 5-7 meter area and the photointerpreter delineated a large, multiple acre polygon as "patchy seagrass", "aggregated patch reefs", and "colonized pavement with sand channels" since each of these classification categories have large areas composed of sand.

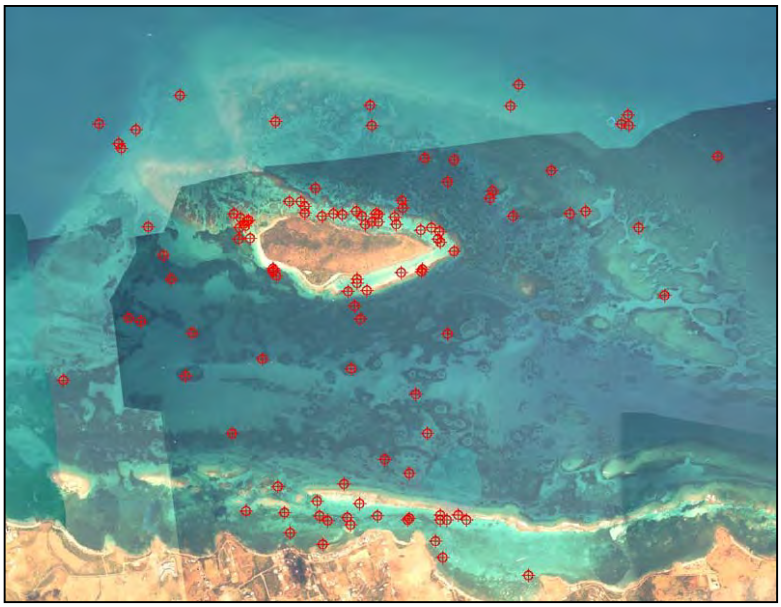


Figure 4.1: Distribution of accuracy assessment points around the Buck Island Reef National Monument test area (n=109).

Logistics prevented reliable data acquisition at 11 of the 120 pre-selected sites. Therefore 109 sites were used for the accuracy assessment (figure 4.1). Data recorded at each site was overlaid onto the

habitat maps and compared against the classification assigned by the photointerpreters. After comparing the map classification to each ground truth site, an error matrix was produced displaying both errors of inclusion and exclusion (tables 4.1-4.2). In addition, overall accuracy, users and producer's accuracy, and Kappa Statistic (measure of map accuracy relative to a map with classifications randomly assigned expressed as a percent) were reported.

Results: Thematic Accuracy of On-screen vs. Stereoplotter Digitizing

Comparison with the ground truth data revealed very similar levels of thematic accuracy between the two maps. Overall accuracy was 93.6 percent (Kappa 0.90) for on-screen digitizing and 87.8 percent (Kappa 0.82) for maps digitized directly from stereo pairs. Maps produced from on-screen digitizing were almost 100 percent accurate for the submerged vegetation and unconsolidated sediment categories but misclassified a small percentage of hardbottom sites as unconsolidated sediment. Similarly, the maps produced using the stereoplotter were 100 percent accurate at classifying submerged vegetation but misclassified a small percentage of hardbottom and unconsolidated sediment sites. These findings suggest that both of these mapping techniques result in acceptable levels of thematic accuracy for maps produced at this scale with this type of classification scheme.

Table 4.1: Error matrix for habitat classification using on-screen digitizing at the Buck Island test area. Numbers in the matrix indicate class coincidence, (U) indicates users accuracy, and (P) indicates producers accuracy based on analysis of 109 ground truth points.

Mapped Habitat Type	Actual Habitat Type: *Coral Reef/ Hardbottom*	*Submerged Vegetation*	*Unconsolidated Sediment*
Coral Reef/ Hardbottom	35 97.2% (U) 85.4% (P)	0	1
Submerged Vegetation	0	30 100% (U) 100% (P)	0
Unconsolidated Sediment	6	0	37 86.1% (U) 97.4% (P)

Table 4.2: Error matrix for habitat classification using a stereoplotter at the Buck Island test area. Numbers in the matrix indicate class coincidence, (U) indicates users accuracy, and (P) indicates producers accuracy based on analysis of 98 ground truth points. Slightly fewer points were used in this analysis since the extent of this map was smaller than the distribution of ground truth points.

Mapped Habitat Type	Actual Habitat Type: *Coral Reef/ Hardbottom*	*Submerged Vegetation*	*Unconsolidated Sediment*
Coral Reef/ Hardbottom	35 92.1% (U) 89.7% (P)	0	3
Submerged Vegetation	3	25 75.8% (U) 100% (P)	5
Unconsolidated Sediment	1	0	26 96.3% (U) 76.5% (P)

Methods for Evaluation of Thematic Accuracy for other Reef Morphologies and Water Conditions

The results from the Buck Island test area indicated that thematic accuracy of maps produced from on-screen digitizing was good given the clear water and reef morphologies that are representative of that area. However, both geomorphology and local water conditions can dramatically influence the ability to accurately and consistently photointerpret habitats. Therefore, the thematic accuracy of the ArcView derived products were further evaluated in another area with different water conditions and reef

morphologies than those present at the Buck Island site and more representative of the environment found elsewhere in the project area. The La Parguera, Puerto Rico area was chosen for additional evaluation of thematic accuracy. The variety of water conditions and habitat types at this site are representative of those occurring elsewhere in the Puerto Rico project area. In addition, the long history of research focused on the habitat in and around La Parguera by the University of Puerto Rico, Isla Magueyes Campus resulted in a variety of data with which to compare NOAA map products. Furthermore, the University of Puerto Rico provides excellent logistic support for field activities. Sites of accuracy assessment points were selected and analyzed with the same protocol as described above for the Buck Island test area (table 4.3).

Results: Thematic Accuracy for other Reef Morphologies and Water Conditions

Accuracy in the Parguera area was estimated using 200 ground truth points (Fig. 4.2) and was determined to be 93.6 percent overall (Kappa 0.93). Maps were 100 percent accurate for the unconsolidated sediment category and nearly so for coral reef/hardbottom categories. A small percentage of submerged vegetation sites were misclassified as coral reef/hardbottom. These values are well within acceptable levels of thematic accuracy and suggest that other areas in the project area with similar water conditions and reef morphologies will be mapped with similar accuracy.

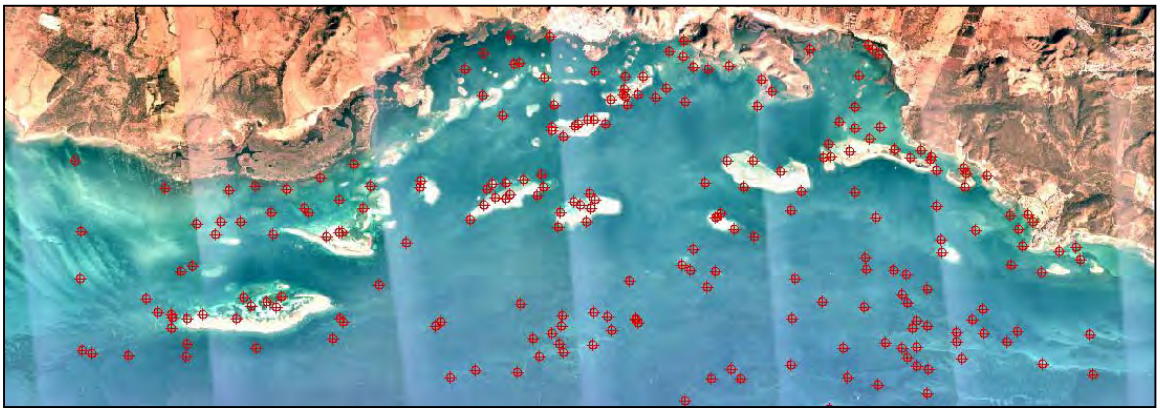


Figure 4.2: Distribution of accuracy assessment points around the La Parguera, Puerto Rico test area (n=200).

Table 4.3: Error matrix for habitat classification at La Parguera. Numbers in the matrix indicate class coincidence, (U) indicates users accuracy, and (P) indicates producers accuracy based on analysis of 200 ground truth points.

Mapped Habitat Type	Actual Habitat Type: *Coral Reef/ Hardbottom*	*Submerged Vegetation*	*Unconsolidated Sediment*
Coral Reef/ Hardbottom	76 91.6% (U) 98.7% (P)	7	0
Submerged Vegetation	1	92 98.9% (U) 92.9% (P)	0
Unconsolidated Sediment	0	0	24 100% (U) 100% (P)

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