DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
701 SAN MARCO BOULEVARD
JACKSONVILLE, FLORIDA 32207-8175

REPLY TO
ATTENTION OF

NOV 30 2016

CESAJ-PM-M

MEMORANDUM FOR SEE DISTRIBUTION LIST

SUBJECT: Final Uniform Federal Policy - Quality Assurance Project Plan (UFP-QAPP) for Time Critical Removal Action (TCRA) at Cayo del Agua, Culebra Island, Puerto Rico, Defense Environmental Restoration Program for Formerly Used Defense Sites (DERP-FUDS) Project No. I02PR006802, Culebra, Puerto Rico

The Jacksonville District, U.S. Army Corps of Engineers (Corps) is enclosing for your records the Final UFP-QAPP for TCRA at Cayo del Agua associated with the DERP-FUDS Project No. I02PR006802, Culebra, Puerto Rico.

Should you need additional information, please contact Wilberto Cubero, Corps Project Manager, at 904-232-1426 or by email at Wilberto.Cubero-delToro@usace.army.mil. You may also contact the undersigned at (904) 232-1758 or by e-mail at John.E.Keiser@usace.army.mil.

Sincerely,

Encl

for John E. Keiser, P.E.
FUDS Program Manager
Military/Interagency & International
Services Branch

Distribution List Final UFP-QAPP for TCRA at Cayo del Agua, Culebra Island, Puerto Rico	
Mr. Juan Babá Peebles Federal Facilities Coordinator PR Environmental Quality Board 1375 Ponce de León Avenue San Juan, PR 00926-2604	Ms. Marelisa Rivera US Fish and Wildlife Service Road 301, Km 5.1 Boquerón, PR 00622
Dr. Lisamarie Carrubba NOAA Fisheries Caribbean Field Office Road 301, Km 5.1 Boquerón, PR 00622	Dr. Craig Lilyestrom Director, Marine Resources Division Department of Natural & Environmental Resources PO Box 366147 San Juan PR 00936-6147
Mr. Julio Vazquez US EPA Region 2 Special Project Branch/Federal Facilities Section 290 Broadway – 18th Floor New York, NY 10007-1866	Ms. Diane E. Wehner NOAA Office of Response and Restoration 290 Broadway Rm 2059 New York, NY 10007
Ms. Ana Roman US Fish and Wildlife Service Culebra National Wildlife Refuge Manager Road 301, Km 5.1 Boquerón, PR 00622	Ms. Coral Parrilla Executive Director Autoridad de Conservación y Desarrollo de Culebra P.O. Box 217 Culebra, PR 00775
Mr. Jose Rivera NOAA Fisheries Annex Building Fundacion Angel Ramos 2nd Floor, Suite 202 Franklin Delano Rooselvelt Ave. # 383 San Juan, Puerto Rico 00918	

MUNITIONS AND EXPLOSIVES OF CONCERN
QUALITY ASSURANCE PROJECT PLAN
Time Critical Removal Action (TCRA)
Cayo del Agua
Culebra Island, Puerto Rico

Prepared for:

U.S. ARMY ENGINEERING & SUPPORT CENTER, HUNTSVILLE

CONTRACT NO. W912DY-10-D-0026
TASK ORDER NO. 0027
PROJECT NUMBER: I02PR006802
GEOGRAPHICAL DISTRICT: JACKSONVILLE

FINAL

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Reviewed By:

Robert Crownover
Director of Safety and Quality

FINAL

Munitions And Explosives Of Concern (MEC) Quality Assurance Project Plan
Time Critical Removal Action (TCRA)
Cayo del Agua
Culebra Island, Puerto Rico
FUDS Project: I02PR006802
November 2016

Contract No.
W912DY-10-D-0026
Task Order No. 0027

Prepared by:

USA Environmental, Inc.

720 Brooker Creek Boulevard

Suite 204

Oldsmar, Florida 34677

EXECUTIVE SUMMARY

Introduction

The U.S. Army Corps of Engineers (USACE) received approval to conduct a Time Critical Removal Action (TCRA) for Cayo del Agua, Culebra Island, Puerto Rico, per the TCRA Action Memorandum (AM) dated 7 June 2016. This Quality Assurance Project Plan (QAPP) (hereafter referred to as the QAPP) is the primary operations document for the TCRA at Cayo del Agua, Culebra, Puerto Rico. This QAPP comprises a series of worksheets that contain both general and specific information about the project, and combines information for the Munitions and Explosives of Concern (MEC) removal action and post-detonation Munitions Constituents (MC) sampling operations.

USA Environmental, Inc. (USA) prepared this QAPP for the U.S. Army Corps of Engineers, Jacksonville District (CESAJ), under Contract W912DY-10-D-0026, Task Order 0027, awarded by U.S. Army Engineering and Support Center, Huntsville (USAESCH). Cayo Botella is also addressed under the same contract number, but operations for that cayo will be managed under a separate QAPP. This QAPP addresses the requirements for the Performance Work Statement (PWS) (March 2016) located in Appendix A.

Culebra is located approximately 17 miles east of the main island of Puerto Rico. Cayo del Agua, also named Water Key or Agua Cay, is a small cayo located approximately 2,400 feet west of Cayo Luis Peña. The 5-acre cayo is located within Munitions Response Site (MRS) 02 of the Culebra, Puerto Rico, Formerly Used Defense Sites (FUDS), Project Number I02PR006802.

Based on available historic information, it was determined that Culebra was used as a coaling and communications station, for aerial bombing, maneuvers, naval gun and artillery firing, and amphibious training by the U.S. Marine Corps and the U.S. Navy during various periods between 1903 and 1975.

The former military use of Cayo del Agua was for aerial bombing and rocket firing. The U.S. Navy and U.S. Marines conducted fleet maneuvers and Fleet Landing Exercises (FLEX) between 1923 and 1975. Munitions confirmed or suspected to have been used on Cayo del Agua include MK 76 practice bombs with MK 4 spotting charges, MK 80 series bombs, 2.75-inch rockets, and aircraft flares. Recent 2015 RI fieldwork confirmed the presence of more than 60 MK 76 practice bombs (most with cartridges) on the land portion of the cayo, with many in the rocks along the beach. In addition, 2.75 inch rocket motors were also documented.

The objective of the TCRA per the AM dated 07 June 2016 is to mitigate and minimize the threat posed by the proximity of ordnance items found above the low water mark to United States Fish and Wildlife (USFWS) personnel, and recreational users/boaters whose activities may potentially trigger an unintentional detonation of a munitions item.

Project Authorization

A TCRA for Cayo del Agua has been determined to be required. Cayo del Agua is located within MRS 02 of the Culebra, Puerto Rico FUDS, Project Number I02PR006802. CESAJ, USAESCH, the Environmental and Munitions Center of Expertise (EMCX), and the Puerto Rico Environmental Quality Board (PREQB) (Puerto Rico Lead Regulator Agency for this TCRA) concurred that to reduce the risk to the public, a TCRA is necessary. The TCRA AM dated 7 June 2016 presents the selected response action at Cayo del Agua, Culebra, Puerto Rico. The Department of Defense (DoD) is the lead agency at Formerly Used Defense Sites (FUDS), and the Army is the Executive Agency on behalf of the DoD. The Army has delegated project management and execution responsibility for FUDS to the USACE under Defense Environmental Restoration Programs (DERP) at Culebra. The TCRA AM is consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, and met the removal factors and site specific condition as per the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

TCRA Technical Approach

During the TCRA, field teams will identify the locations of munitions [visually, through digital geophysical mapping (DGM), and through analog detection techniques] and remove MEC, Material Potentially Presenting an Explosive Hazard (MPPEH), and explosive hazards from the land portions of Cayo del Agua. Range-related debris equal to and greater than 37mm in diameter will be removed and is anticipated to also include tires used to define the target area. Due to the presence of sensitive species on the land and in the water, biological monitoring will be conducted prior to and during field operations. At locations of any demolition operations, environmental sampling will be conducted to evaluate if the TCRA munitions treatment by detonation resulted in a release of MC to surface soil.

Further details on the tasks are provided below.

Biological Monitoring and the Protection of Threatened and Endangered Species

Due to the known presence of Threatened and Endangered Species within the land and water portions of Cayo del Agua, the team will include a Biologist to maintain a daily record of sightings for Listed as Threatened or Endangered Species and/or protected species. The Biologist also will make recommendations on how to avoid and protect these species during the field work. The following are ecological concerns for the TCRA:

- Appendix G: Final Supplemental Standard Operating Procedures (SOPs) for Endangered Species Conservation and their Critical Habitat (Addendum 1-February 2015) (CESAJ, 2015) Appendix A, outlines biological monitoring procedures, and procedures the field team will follow in order to protect sea turtles (see section 4.2), Corals and seagrass avoidance measures (see section 4.3) and avoidance measures for marine mammals and sea turtles (see section 4.4).
- Procedures to follow and to avoid disturbances for protected seabirds that may be on site are outlined in Final Supplemental SOP for Endangered Species Conservation and their Critical Habitat (Addendum 1-February 2015) (CESAJ, 2015) Addendum 1 Section 4.4.6/Appendix B Section 3.1.4.

Specific species of concern at the cayo are noted in the CSM WS #10 - Conceptual Site Model (CSM).

Cayo del Agua is a Zone 1 turtle nesting area and does not require sea turtle beach monitoring to determine the presence of sea turtle nests.

Protected plant species may be present on the Cay. The team biologist will monitor field work to ensure protected plant species are: 1) identified, and 2) documented; the biologist will also provide recommendations to the field teams on how to protect the identified species.

General Ecological Conservation Measures can be found in WS #17.

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)

Two Federal laws and one Commonwealth law have been identified and evaluated to determine their applicability as ARARs during implementation of the TCRA removal actions. The ARARs (refer to Table ES-1) have action-specific requirements and their applicability, relevance, or appropriateness have been determined as applicable to this TCRA.

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Table ES-1: ARARs

Requirement	Status/Synopsis of Requirement	Action to be Taken to Attain Requirement
Endangered Species Act [US Code (USC) Title 16 Chapter 35§1538]	Relevant and Appropriate -Location-Specific/The Endangered Species Act (ESA) protects Federally listed species (fish, wildlife, and plants) which are either endangered or threatened and preserve critical habitat. The substantive requirement within the Act prohibits the "taking" of listed species [reference: 16 USC 1538; 50 Code of Federal Regulation (CFR) 17.95; 50 CFR 226.208)]	The TCRA technical approach must demonstrate the field approach avoids impacts to the endangered species and its habitat. USACE, in coordination with the National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), USFWS, and Puerto Rico Department of Natural and Environmental Resources (PRDNER), authored the: Final Supplemental Standard Operating Procedure (SOP) for Endangered Species Conservation and their Critical Habitat (CESAJ 2015). The processes identified in the above-listed SOP provide procedures that allow for munitions-related removal actions or investigations to be completed and avoid impact to endangered species. A removal action which "takes" an endangered species or destroys its habitat does not qualify as a suitable field method because the ESA ARAR would not be satisfied. A “take” can be authorized only through the issuance of an Incidental Take Statement in a Biological Opinion. Similarly, the ARAR cannot be waived in cases where take or damage and adverse modification of critical habitat may occur.
Marine Mammal Protection Act (MMPA) of 1972 USC Title 16 Chapter 31 §1372(a)	The MMPA provides protection for marine mammals, marine mammal products, and the sustainability of marine mammal populations through conservation and management; also, the MMPA recognizes that the marine mammal population is below its optimum sustainable levels. 50 CFR Subchapter C Part 216	The TCRA technical approach must demonstrate the field approach avoids impacts to marine mammals and their habitat. USACE, in coordination with NOAA, NMFS, USFWS, and PRDNER, authored the: Final Supplemental SOP for Endangered Species Conservation and their Critical Habitat (CESAJ 2015). The processes identified in the above-listed SOP provide procedures that allow for previous munitions-related investigations to be completed and avoid impact to marine mammals. Any TCRA removal action that causes injury or kills a marine mammal does not qualify as a suitable field method or procedure. Remedial alternatives that provide protection to marine mammals is preferred over seeking waivers from ARAR.
Common-wealth of PR Law 134	Commonwealth of Puerto Rico Rules and Procedures for the Issuing of Permits for Manufacture, Use, Possession, Storage, Sale, Transfer, Transportation and Disposal of Explosives.	The delivery, storage, and use of explosives in Puerto Rico requires specific procedures outlined with the PR Law 134. The entity delivering the explosives must coordinate directly with the San Juan Police Department prior to delivery. The entity performing the shipping and use of the explosives will be a holder of an explosives permit.

Site Survey Control

Existing Site Survey Control points on Culebra will be used and confirmed. Once confirmed, these points may be used to bring survey control onto the Cayo.

Instrument Verification Strip (IVS)

Prior to implementation of detection equipment, an IVS will be established for DGM detection equipment and documented in an IVS Technical Memorandum. The EM61-MK2 will be used.

An Analog Test Strip for analog detection equipment will be established near the DGM IVS. The Minelab ETRAC or other equivalent all-metals detector will be used.

An analog function check will be performed on the cayo.

Vegetation Removal

The type and density of vegetation on the cayo will require vegetation removal in most areas for reliable functionality of the detection equipment. Vegetation removal will be conducted prior to geophysical surveys/investigations being conducted. USA anticipates more vegetation removal will be required to allow for DGM, and less for analog instruments. In areas with protected plant species present, analog detection equipment will be employed, as it can operate in heavier vegetation and site preparation is anticipated to be less destructive. Vegetation removal will be conducted per Appendix G: SOP OPS-21, and Worksheets 11, 12, and 17.

MEC Removal

The first phase of the MEC removal work is a surface clearance of the entire project area.

Following the surface clearance, DGM will be conducted over the cayo's western acres in which the DGM equipment can be utilized effectively using an EM61-MK2. DGM anomaly selection for intrusive investigation will follow Appendix G: SOP OPS 5B, and Worksheets 11 and 12.

Reacquisition of DGM selected anomalies is performed primarily using Real-Time Kinematic Differential Global Positioning System (RTK DGPS). Tape measures will be used for DGM grids positioned with line and fiducials in areas in which RTK DGPS cannot receive positioning data. Intrusive work is performed using hand tools and analog instruments. Verification that the dig holes are cleared is performed by the field QC team, following the Acceptance Sampling for Anomaly Resolution table, with an EM61-MK2. Holes will be restored following resolution of the anomaly or MEC treatment through detonation, whichever is applicable.

Analog and dig clearance will be conducted for all of the eastern portion of the Cayo where the target was located. The analog and dig within established grids will follow the DGM phase or may be performed concurrently with the intrusive investigation of the DGM selected anomalies. Intrusive work is performed using hand tools. Holes will be restored following resolution of the anomaly or MEC treatment through detonation, whichever is applicable.

Upon discovery, MEC items will be marked (by physical indicators and by Trimble GEOXT, Tablet GPS if tablets are used, or DGPS). Prior to MEC treatment, coordinates may be updated with RTK DGPS. The items will receive treatment via detonation once all other intrusive field work and appropriate coordination for the Cayo is complete.

Debris Removal

Large quantities of Range Related Debris (RRD), which also includes tires used to define the target area, are anticipated. In order to load the estimated over 2000 pounds of RRD and Munitions Debris (MD) from the cayo the Caribbean Marine Services, Inc. (CMS) barge will be staged for the loading of the RRD/MD the location chosen free of live coral to moor the barge (see Appendix B: Figure 6 and Appendix G: SOP-OPS-41). The benthic habitat in which the barge will be moored is, consolidated hardbottom covered in large, medium sized rocks no coral or seagrass has been noted from the 4 foot depth curve to the shoreline

inside of the northern bay. All RRD and munitions debris (MD) greater than 37mm in diameter will be removed from the cayo per Appendix G: SOP OPS-41 and transported to a staging area off the cayo by a 29-ft CMS barge capable of handling 2000 pounds per trip.

USFWS has identified tires in which sea bird nesting occurs. These tires, if moved during the clearance work, will be put back in their original location once the TCRA field work is complete. At a minimum, the UXOQCS and project biologist will accompany the Culebra NWR Biologist to Cayo del Agua prior to surface clearance operations begin to identify which tires are used for nesting. These tires will be flagged with engineer's tape, photographed, and GPS referenced.

MPPEH Management

All recovered MPPEH items will undergo a 100% inspection and an independent 100% re-inspection to determine and document whether it is safe [Material Documented as Safe (MDAS)] or whether it is known to have or is suspected of having an explosive hazard [material documented as an explosive hazard (MDEH)]. Two qualified UXO Technicians will inspect and re-inspect the MD to deem the debris meets MDAS certification and is safe to move, to a staging area on Culebra Island where final packaging can take place. The use of top-sealing bulk bags to contain MDAS and transport from the Cayo to Culebra is recommended; however, the team leaders may deviate from using the bulk bags if required, with concurrence from the Unexploded Ordnance Safety Officer (UXOSO) or Senior UXO Supervisor (SUXOS). A material inspection form (see Appendix G: SOP-OPS-13) will accompany the material once inspection is complete. Final packaging will take place on Culebra. MDAS material destined for smelting will be packaged in 55-gallon drums, sealed, and then labeled with a 1348-A1 per Appendix G: SOP-OPS-13 and Appendix D: Forms. MDAS destined for disposal via smelting will be shipped for disposal to the Continental United States (CONUS). Tires (RRD) will be packaged in the container or truck provided by a San Juan vendor for eventual recycling. The MDAS material will be shipped in two separate shipments to control the buildup of the MDAS material in the holding and processing area on Culebra Island. All MDAS will be transported to appropriate disposal facilities off of Culebra. Following certification of MDAS, chain of custody will be maintained. If, during UXOQCS daily audits, the 55 gallon drum containers, or the tire container seal or lock, is broken, the material will be re-certified as MDAS.

In accordance with (IAW) DoD policies on Green and Sustainable Remediation, materials will be recycled when possible.

MEC Treatment

MEC treatment will involve disposal by detonation conducted IAW the TCRA Explosives Safety Submission (ESS) (see Appendix K: ESS), applicable demolition SOPs (see Appendix G: SOP OPS-03, SOP OPS-08, and SOP OPS-29), and SOPs for Endangered Species [Final Supplemental SOP for Endangered Species Conservation and their Critical Habitat (CESAJ 2015)].. The detonation of a MEC item will be conducted on the cayo in which the MEC item was discovered. If the item is deemed acceptable to move, it may be consolidated with other MEC items discovered on the Cay IAW the ESS prior to detonation. Should consolidation of MEC items occur, the items will be consolidated to locations where vegetation is not present, whenever possible.

USA will employ UXO Blasters with the Puerto Rico Blasters Permit to conduct the operation.

USA will maintain a Bureau of Alcohol, Tobacco, Firearms and Explosives (BATFE) Type II magazine on Culebra for donor explosive storage until the detonation occurs. When explosives are stored in the magazine, 24 hour security will be in place. The current BATFE Federal Explosives License/Permit held by USA is found in Appendix I.

Notification and coordination to all required agencies will occur prior to commencement of demolition operations. (See Worksheets 6 and 17).

No security will be placed on MEC items identified in the removal action. The cays are remote and leaving security personnel on these isolated cays is considered a safety issue.

MEC treatment options will be recommended by USA to the Project Delivery Team (PDT), taking into account: (1) the MEC item to be treated by detonation; (2) site conditions; (3) and ecological concerns.

MEC treatment will be in compliance with the ESS. Examples of optional approaches to MEC treatment are: (1) sandbagging of MEC item prior to detonation; (2) counter charging the munitions main charge with boosters or bulk explosives; (3) initiating the munitions booster cup by detonating an oil perforator shape charge, allowing the perforator explosive jet to propel through the munitions booster cup and detonating the munitions; (4) and "low order" the munitions by employing the Vulcan explosive tool which explosively propels a metal disc through the center of the munitions body, causing rapid expansion inside of the munitions and resulting in a mechanical explosion. When the Vulcan is used, clean-up detonations will be required.

Prior to detonation, the team Biologist will evaluate the area for the presence of sea turtles, seabirds, endangered plants on site, and other species of concern. Procedures identified in Appendix G: SOP Final Supplemental Standard Operating Procedures (SOP) for Endangered Species Conservation and their Critical Habitat (Addendum 1-February 2015) will be used to protect sea turtles and seabirds. Should a protected plant species be identified USA will provide recommendations on how to protect the plant species (e.g., establishing a fragmentation barricade with sand bags, etc.) to the USACE PDT and the project Regulators. A USFWS Biologist will be allowed to accompany the Demolition Team to the cayo prior to the demolition operation and after detonation has occurred.

Post-detonation Soil Sampling

Following the last demolition event on the Cayo, post-detonation soil samples will be collected at all MEC treatment (treatment by detonation) locations to evaluate if an imminent explosive hazard is present. During the TCRA field operations, information regarding type, location, and depths at which MEC are encountered and removed will be recorded to guide characterization of potential MC releases from MEC items as part of a future project.

The post-detonation samples will be collected as Cold Regions Research Engineering Laboratory (CRREL) 7-point wheel samples, adjusted to the size of the crater created by the demolition.

USA will provide the copies of the laboratory data packages in Portable Document Format (PDF), the eQAPP, Automated Data Review (ADR) output files, the laboratory data in staged electronic data deliverables (SEDD) format and an Excel file of results in the TCRA Site Specific Final Report (SSFR) appendices. In the TCRA SSFR main text, summary statistics to include: number of samples and number of detections (including maximum, minimum, and average) will be provided in table format.

Samples will be analyzed for Explosives (SW8330B) and Ammonium Picrate. Ammonium Picrate is analyzed due to the presence of munitions with Explosives D. Ammonium Picrate results will be calculated based on Picric Acid (SW8321A) results multiplied by a molecular weight conversion factor.

Sampling will be conducted only if soil is present at the location of the demolition event. Some areas of Cayo del Agua are devoid of topsoil. When MEC items are discovered and treated through detonation in areas in which there is no soil, then soil samples will not be collected.

Geospatial Data

USA will maintain and update a GeoDatabase for project boundaries, locations of grids, MPPEH/MD items found, demolition locations, samples, and property data. Any existing data in the USACE GeoDatabase will be added to the TCRA Geodatabase.

QAPP Worksheets

This QAPP was prepared IAW the requirements of the Uniform Federal Policy for Quality Assurance Project Plans (U.S. EPA 2005), and Engineer Manual (EM) 200-1-15. This MEC-QAPP uses the streamlined worksheet format developed during 2011 updates of EPA document QA/G5 Guidance for Quality Assurance Project Plans. The streamlined format condenses the 37 UFP-QAPP worksheets into 28 worksheets as described below. Both MEC-related and MC-related tasks are addressed in this QAPP.

- **Worksheet #1 & 2 –** Title and Approval Sign-off. This worksheet identifies the principal points of contact for all organizations having decision authority for the TCRA and individuals with approval or oversight authority.
- **Worksheet #3 & 5 –** Project Organization Chart and QAPP Distribution. This worksheet lists those entities who receive copies of the QAPP, subsequent revisions, addenda, and amendments, and it presents the Project Organization.
- **Worksheet #4, 7 & 8 –** Personnel Qualifications and Sign-off Sheet. This worksheet lists project personnel who will be performing the work under the TCRA. These personnel have read the applicable sections of the QAPP and will perform the tasks as described in the QAPP and associated subsidiary documents.
- **Worksheet #6 –** Communication Pathways. This worksheet lists the communication pathways for many key administrative and field communication drivers to include responsibility, affiliation, name of person responsible, contact number, and procedure.
- **Worksheet #9 –** Project Scoping Session Participants Sheet. This worksheet provides information on the project meetings conducted for the TCRA. The information includes name/information on the participants, comments/decisions, action items, and consensus decisions made.
- **Worksheet #10 –** Conceptual Site Model. This worksheet presents the site CSM.
- **Worksheet #11 –** Project Data Quality Objectives. This worksheet details the project data quality objectives (DQOs) and systematic planning process statements for the TCRA
- **Worksheet #12 –** Measurement Performance Criteria. This worksheet lists and describes the measurement performance criteria [e.g., project performance metrics along with the quality control (QC) sample or activity used to assess the performance. It also describes the auditing procedures for the definable features of work (DFWs) for the TCRA.
- **Worksheet #13 –** Secondary Data Uses and Limitations. This worksheet lists the secondary data used to support the TCRA. It also provides the source of the data, how data will be used to support this project, and the data limitations.
- **Worksheet #14 & 16 –** Project Tasks and Schedule. This worksheet presents a list of the DFWs and all supporting subtasks, and the general project schedule for the TCRA.
- **Worksheet #15 -** Project Action Limits and Laboratory-Specific Detection / Quantitation Limits. This worksheet applies to MC-Related tasks only and provides the parameters to be analyzed and their associated detection limits, limits of detection, and limits of quantitation in order to satisfy the overall data quality objectives.
- **Worksheet #17 –** Sampling Design and Rationale. The TCRA will cover 100% of the land portions of the MRS and remove all MEC encountered. No sampling is required for MEC-related tasks. For MC-related tasks, this worksheet describes the rationale for post-detonation sampling.
- **Worksheet 18 –** This worksheet applies to MC-Related tasks only and lists the proposed samples to be collected, their proposed locations, and methods of collection.
- **Worksheet #19 & 30 –** Sample Containers, Preservation, and Hold Times. This worksheet applies to MC-Related tasks only and summarizes the analytical methods for each sampling matrix, including the required sample volume, containers, preservation, and holding time requirements.
- **Worksheet #20 –** Field Quality Control. This worksheet provides a summary of the field QC for the TCRA.
- **Worksheet #21 –** Field Standard Operating Procedures (SOPs). This worksheet directs the reader to Appendix G where all field SOPs are listed on the coversheet, followed by the actual SOPs. Note: Laboratory SOPs are included in Appendix H.
- **Worksheet #22 –** This worksheet lists field equipment for the MEC-Related tasks that require calibration, maintenance, testing, and inspection. This worksheet also documents the frequency of activity, acceptance criteria, and Corrective Action (CA) requirements for the field equipment.

- **Worksheet #23 –** Analytical Standard Operating Procedures. This worksheet lists the applicable laboratory SOPs to be used for analysis of samples. The laboratory SOPs are included in Appendix H.
- **Worksheet #24 –** Analytical Instrument Calibration. This worksheet describes the calibration procedures for the laboratory analytical instruments.
- **Worksheet #25 –** Analytical Instrument and Equipment Maintenance, Testing, and Inspection. This worksheet provides information on maintenance, testing, and inspection procedures for laboratory analytical instruments and equipment.
- **Worksheet #26 & 27 –** Sample Handling, Custody, and Disposal. This worksheet describes the methodology behind the sample identification numbers, and procedures for sample handling, custody, and disposal.
- **Worksheet #28 –** Analytical Quality Control and CA. The tables in this worksheet are for MC-Related tasks only, and information on the QC samples, frequency of samples, method or SOP QC acceptance limits, corrective action procedures, and measurement performance criteria.
- **Worksheet #29 –** Project Documents and Records. This worksheet identifies the documents and records that will be generated for all aspects of the TCRA.
- **Worksheet #31, 32 & 33 –** Assessments and CAs. This worksheet provides information on the required periodic assessments that will be performed during the course of the project to ensure that the planned project activities are implemented IAW this QAPP.
- **Worksheet #34 –**Data Verification & Validation Inputs. This worksheet lists the inputs that will be used during data verification and validation for the TCRA.
- **Worksheet #35 –**Data Verification Procedures. This worksheet describes the verification process that will be performed prior to the data review process for the TCRA.
- **Worksheet #36 –** This worksheet describes the validation process and the data inputs required for the validation that will be conducted for the TCRA.
- **Worksheet #37 –** Data Usability Assessment. This worksheet provides the final usability assessment criteria that will be used to verify that the work has been completed and is acceptable.

The QAPP is supported by the following appendices:

- Appendix A – Performance Work Statement
- Appendix B – Site Maps
- Appendix C – Accident Prevention Plan
- Appendix D – Forms
- Appendix E – Minimum Separation Distance (MSD) Data Sheets
- Appendix F – Personnel Qualifications
- Appendix G – Standard Operating Procedures
- Appendix H – Laboratory SOPs and Certification, Permit to Receive Soil
- Appendix I – Licenses and Permits
- Appendix J – Chemical Composition of Munitions.
- Appendix K – Explosives Safety Submission

In addition to the above QAPP and appendices, the TCRA is supported by the following standalone project plans:

- **Project Management Plan (PMP)** – Provides the basic requirements and strategies to be followed by USA Environmental, Inc., to achieve USACE approval of the TCRA objectives for Cayo del Agua. The PMP is an operating document that is internal to the USACE and Contractor therefore is not included within the QAPP.

- **Explosives Safety Submission** – Explosives safety for the project (see Appendix K: ESS).
- **Quality Assurance Surveillance Plan** (QASP). This plan sets forth procedures and guidelines USACE will use in evaluating the technical and safety performance of USA Environmental. The QASP Forms evaluating the Contractor's performance will be provided as an appendix within the TCRA Site Specific Final Report (SSFR). The QASP is a USACE internal document and is not included in the QAPP.

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LIST OF ACRONYMS

°C	degree Celsius
°F	degree Fahrenheit
ACDEC	Autoridad de Conservacion y Desarrollo de Culebra
ADR	Automated Data Review
AHA	Activity Hazard Analysis
AM	Action Memorandum
APP	Accident Prevention Plan
ARAR	Applicable or Relevant and Appropriate Requirement
ASR	Archive Search Report
ASTM	American Society for Testing and Materials
ATS	Analog Test Strip
BAFTE	Bureau of Alcohol, Tobacco, Firearms and Explosives
bgs	below ground surface
BIP	blow in place, blown in place
BSI	Blind Seed Item
CA	Corrective Action
CAS	Chemical Abstract Service
CCV	Continuing Calibration Verification
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CESAJ	USACE, Jacksonville District
CFR	Code of Federal Regulations
cm	centimeter, centimeters
CMS	Caribbean Marine Services
CoC	Chain of Custody
CONUS	Continental United States
COPC	Constituent of Potential Concern
COR	Contracting Officer's Representative
CRREL	Cold Regions Research and Engineering Laboratory
CSM	Conceptual Site Model
DDESB	Department of Defense Explosives Safety Board
DERP	Defense Environmental Restoration Programs
DFW	Definable Feature of Work
DGM	Digital Geophysical Mapping
DGPS	Differential Global Positioning System
DID	Data Item Description
DL	Detection Limit
DoD	Department of Defense
DQCR	Daily Quality Control Report
DQI	Data Quality Indicator
DQO	Data Quality Objective
DTL	Demolition Team Leader

DVR	Data Validation Report
EBS	Environmental Baseline Survey
EcoSSL	Ecological Soil Screening Levels
EDD	Electronic Data Deliverable
EE/CA	Engineering Evaluation/Cost Analysis
EEG	Ellis Environmental Group
EM	Engineer Manual
EMCX	Environmental and Munitions Center of Expertise
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESE	Environmental Science & Engineering
ESS	Explosives Safety Submission
ESV	Ecological Screening Value
FAA	Federal Aviation Administration
FD	Field Duplicate
FDE	Findings and Determination of Eligibility
FLEX	Fleet Landing Exercise
ft	foot, feet
ft^2	square foot, square feet
FUDS	Formerly Used Defense Site
GIS	Geographic Information Systems
GPS	Global Positioning System
GSV	geophysical system verification
H&S	Health & Safety
HE	high explosive
HQ	Hazard Quotient
IAW	in accordance with
ICAL	Initial Calibration
ICV	Initial Calibration Verification
ID	identification
INPR	Inventory Project Report
ISO	Industry Standard Object
IVS	Instrument Verification Strip
kg	kilogram
LANL	Los Alamos National Laboratory
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LIMS	Laboratory Information Management System
LOD	Limit of Detection
LOQ	Limit of Quantitation
m	meter, meters
MB	Method Blank
MC	Munitions Constituents

MD	Munitions Debris
MDAS	Material Documented as Safe
MDEH	Material Documented as an Explosive Hazard
MEC	Munitions and Explosives of Concern
mg	milligram
MGFD	Munition with the Greatest Fragmentation Distance
MK	Mark
mm	millimeter, millimeters
MMPA	Marine Mammal Protection Act
MMRP	Military Munitions Response Program
MPC	Measurement Performance Criteria
mph	miles per hour
MPPEH	Material Potentially Presenting an Explosive Hazard
MRS	Munitions Response Site
MS/MSD	Matrix Spike/Matrix Spike Duplicate
MSD	Minimum Separation Distance
n/a	Not Applicable
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEW	net explosive weight
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRIS	National Register Information System
NTCRA	Non-Time-Critical Removal Action
NWR	National Wildlife Refuge
OE	Ordnance and Explosives
OESS	OE Safety Specialist
PDF	Portable Document Format
PDT	Project Delivery Team
PETN	Pentaerythritol tetranitrate
PFD	Personal Flotation Device
PgM	Program Manager
PLS	Professional Land Surveyor
PM	Project Manager
PMP	Project Management Plan
POC	Point of Contact
PPE	Personal Protective Equipment
PQO	Project Quality Objective
PRDNER	Puerto Rico Department of Natural and Environmental Resources
PREQB	Puerto Rico Environmental Quality Board
PTFE	polytetrafluoroethylene
PWS	Performance Work Statement
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QASP	Quality Assurance Surveillance Plan

QC	Quality Control
QSM	Quality Systems Manual
RDX	Hexahydro-1,3,5-trinitro-1,3,5-triazine
RPD	Relative Percent Difference
RRD	Range-Related Debris
RSD	Relative Standard Deviation
RSL	Regional Screening Levels
RT	Retention Time
RTK	Real-Time Kinematic
S&A	Sampling and Analytical
SD	Sample Duplicate
SERCC	Southeast Regional Climate Center
SI	Site Inspection
SM	Site Manager
SOP	Standard Operating Procedure
SRM	Solid Reference Material
SSFR	Site Specific Final Report
SUXOS	Senior UXO Supervisor
TBD	To Be Determined
TCRA	Time Critical Removal Action
TP	Technical Paper
TPP	Technical Project Planning
U.S.	United States
UFP	Uniform Federal Policy
UFP-QAPP	Uniform Federal Policy - Quality Assurance Project Plan
USA	USA Environmental, Inc.
USACE	U.S. Army Corps of Engineers
USAESCH	U.S. Army Engineering & Support Center Huntsville
USC	United States Code
USCG	U.S. Coast Guard
USEPA	U.S. Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
UXO	Unexploded Ordnance
UXOQCS	UXO Quality Control Specialist
UXOSO	UXO Safety Officer
UXOTII	UXO Technician II
VHF	Very High Frequency
WS	Worksheet
yd	yard

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WORKSHEET #1, 2: TITLE AND APPROVAL PAGE

(UFP-QAPP Manual, Section 2.1)
(EPA QA/G-5 Section 2.1)

Project Name	Worldwide Environmental Remediation Services Time Critical Removal Action (TCRA)
Site Location:	Cayo del Agua, Culebra, Puerto Rico
Contract Number:	W912DY-10-D-0026; Task Order No. 0027
Document Title:	Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP) Time Critical Removal Action (TCRA) Cayo del Agua, Culebra, Puerto Rico FUDS Project No.: I02PR006802
Lead Organization:	United States Army Corps of Engineers
Preparer's Contact Information:	USA Environmental, Incorporated 720 Brooker Creek Boulevard Oldsmar, FL 34677 Telephone: (813) 343-6336
Preparation Date:	November 2016
Revision Number:	0
Revision Date:	NA

Signature:

Rebecca Terry, Contracting Officers Representative
U.S. Army Corps of Engineers
Lead Agency

Date

Signature:

Thomas Bourque
USA Environmental Project Manager

11/19/2016
Date

Signature:

Robert Crownover
Director of Safety and Quality

11/19/2016
Date

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This Quality Assurance Project Plan (QAPP) was prepared in accordance with (IAW) the requirements of the Uniform Federal Policy – QAPP Manual (United States [U.S.] Environmental Protection Agency [EPA], 2005), EPA Guidance for QAPPs,, EPA QA/G-5, December 2002 (EPA, 2002) and Technical Guidance for Military Munitions Response Actions, Engineer Manual (EM) 200-1-15 [U.S. Army Corps of Engineers (USACE), 2015].

The Time Critical Removal Action (TCRA) is conducted under the following Regulatory Programs: Military Munitions Response Program (MMRP), Defense Environmental Restoration Programs (DERP), Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, and Department of Defense (DoD), Army, and USACE Regulations and Guidance to include Interim Guidance and Data Item Descriptions (DIDs).

Representatives from the following Organizational partners (stakeholders) comprise the Project Delivery Team (PDT). Table 1, below, lists the stakeholders and their roles in the TCRA. Table 2 presents a crosswalk of Worksheets to support documents.

Table 1: Organizational Partners (Stakeholders)

Organization Partners/Stakeholders	Connection
U.S. Army Corps of Engineers, Jacksonville District (CESAJ)	Lead Agency
U.S. Army Engineering & Support Center, Huntsville (USAESCH)	Contracting Officer's Representative (COR)
Puerto Rico Environmental Quality Board (PREQB)	Commonwealth of Puerto Rico, Lead Regulatory Agency
U.S. Environmental Protection Agency (USEPA)	Supporting Regulatory Agency to PREQB
U.S. Fish and Wildlife Service (USFWS)	Primary Property Manager, Trustee for Cayo del Agua conservation and protection
Puerto Rico Department of Natural and Environmental Resources (PRDNER)	Trustee for Cayo del Agua conservation and protection
National Oceanic and Atmospheric Administration (NOAA)	Trustee enforcing federal laws and regulations related to endangered species
National Marine Fisheries Service (NMFS)	Trustee enforcing Federal laws and regulations related to endangered species
Autoridad de Conservacion y Desarrollo de Culebra (ACDEC)	Municipality of Culebra
USA Environmental (USA)	Contractor
Caribbean Marine Services (CMS)	Subcontractor to USA

Table 2: Crosswalk between Worksheets, Support Documents and UFP-QAPP Required Elements

Optimized UFP-QAPP Worksheets		EPA 2106-G-05 UFP QAPP Guidance, Sept. 2011	Required QAPP Element	Crosswalk to Support Documents
1 & 2	Title and Approval Page	2.2.1	Title, Version, and Approval/Sign-Off	
3 & 5	Project Organization and QAPP Distribution	2.2.3	Distribution List	
		2.2.4	Project Organization and Schedule	
4, 7 & 8	Personnel Qualifications and Sign-Off Sheet	2.2.1	Title, Version, and Approval/ Sign-Off	
		2.2.7	Special Training Requirements and Certification	
6	Communication Pathways	2.2.4	Project Organization and Schedule	
9	Project Planning Session Summary	2.2.5	Project Background, Overview, and Intended Use of Data	No formal Technical Project Planning (TPP) Data for TCRA. Minutes of PDT Kickoff meeting, and QAPP review meeting if conducted will be provided here.
10	Conceptual Site Model	2.2.5	Project Background, Overview, and Intended Use of Data	TCRA AM for Cayo del Agua dated 7 June 2016
11	Project/Data Quality Objectives	2.2.6	Project/Data Quality Objectives (DQOs) and Measurement Performance Criteria	
12	Measurement Performance Criteria	2.2.6	Project/DQOs and MPC	
13	Secondary Data Uses and Limitations	Chapter 3	QAPP Elements for Evaluating Existing Data	
14 & 16	Project Tasks & Schedule	2.2.4	Project Organization and Schedule	Schedule is located in the Project Management Plan (PMP)
15	Project Action Limits and Laboratory-Specific Detection / Quantitation Limits	2.2.6	Data/Project Quality Objectives and Measurement Performance Criteria	
17	Sampling Design and Rationale	2.3.1	Sample Collection Procedure, and Sampling Tasks	
18	Sampling Locations and Methods	2.3.1	Sample Collection Procedure, Experimental Design, and Sampling Tasks	
		2.3.2	Sampling Procedures and Requirements	App. D Forms : Chain of Custody (CoC), Daily Quality Control Report (DQCR) App G Field Standard Operating Procedures (SOPs)

Optimized UFP-QAPP Worksheets		EPA 2106-G-05 UFP QAPP Guidance, Sept. 2011	Required QAPP Element	Crosswalk to Support Documents
19 & 30	Sample Containers, Preservation, and Hold Times	2.3.2	Sampling Procedures and Requirements	App. G, Field SOPs
20	Field Quality Control (QC)	2.3.5	QC Requirements	App. D, Forms: DQCR template App. G, DQCR SOP:
21	Field SOPs	2.3.2	Procedures and Requirements	App G, Field SOPs
22	Field Equipment Calibration, Maintenance, Testing, and Inspection	2.3.6	Instrument/Equipment Testing, Calibration and Maintenance Requirements, Supplies and Consumables	App. G, Field SOPs
23	Analytical SOPs	2.3.4	Analytical Methods Requirements and Task Description	Appendix H
24	Analytical Instrument Calibration	2.3.6	Instrument/Equipment Testing, Calibration and Maintenance Requirements, Supplies and Consumables	
25	Analytical Instrument and Equipment Maintenance, Testing, and Inspection	2.3.6	Instrument/Equipment Testing, Calibration and Maintenance Requirements, Supplies and Consumables	App. H, Analytical SOPs
26 & 27	Sample Handling, Custody, and Disposal	2.3.3	Sample Handling, Custody Procedures, and Documentation	App, G, Field SOPs App. D, CoC Forms
28	Analytical QC and Corrective Action (CA)	2.3.5	Quality Control Requirements	
29	Project Documents and Records	2.2.8	Documentation and Records Requirements	
31, 32 & 33	Assessments and CA	2.4	Assessments and Data Review (Check)	PMP
		2.5.5	Reports to Management	PMP
34	Data Verification and Validation Inputs	2.5.1	Data Verification and Validation Targets and Methods	
35	Data Verification Procedures	2.5.1	Data Verification and Validation Targets and Methods	
36	Data Validation Procedures	2.5.1	Data Verification and Validation Targets and Methods	
37	Data Usability Assessment	2.5.2	Quantitative and Qualitative Evaluations of Usability	
		2.5.3	Potential Limitations on Data Interpretation	
		2.5.4	Reconciliation with Project Requirements	PMP

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WORKSHEET #3, 5: PROJECT ORGANIZATION AND QAPP DISTRIBUTION

(UFP-QAPP Manual Section 2.3 and 2.4)
(EPA QA/G-5 Section 2.1.3)

This worksheet identifies key project personnel for the TCRA, as well as lines of authority and lines of communication among the lead agency, prime contractor, subcontractors, and regulatory agencies. The organizational chart in Figure 1 presents the PDT. Figure 2 presents further details on the USA Project Team Organization.

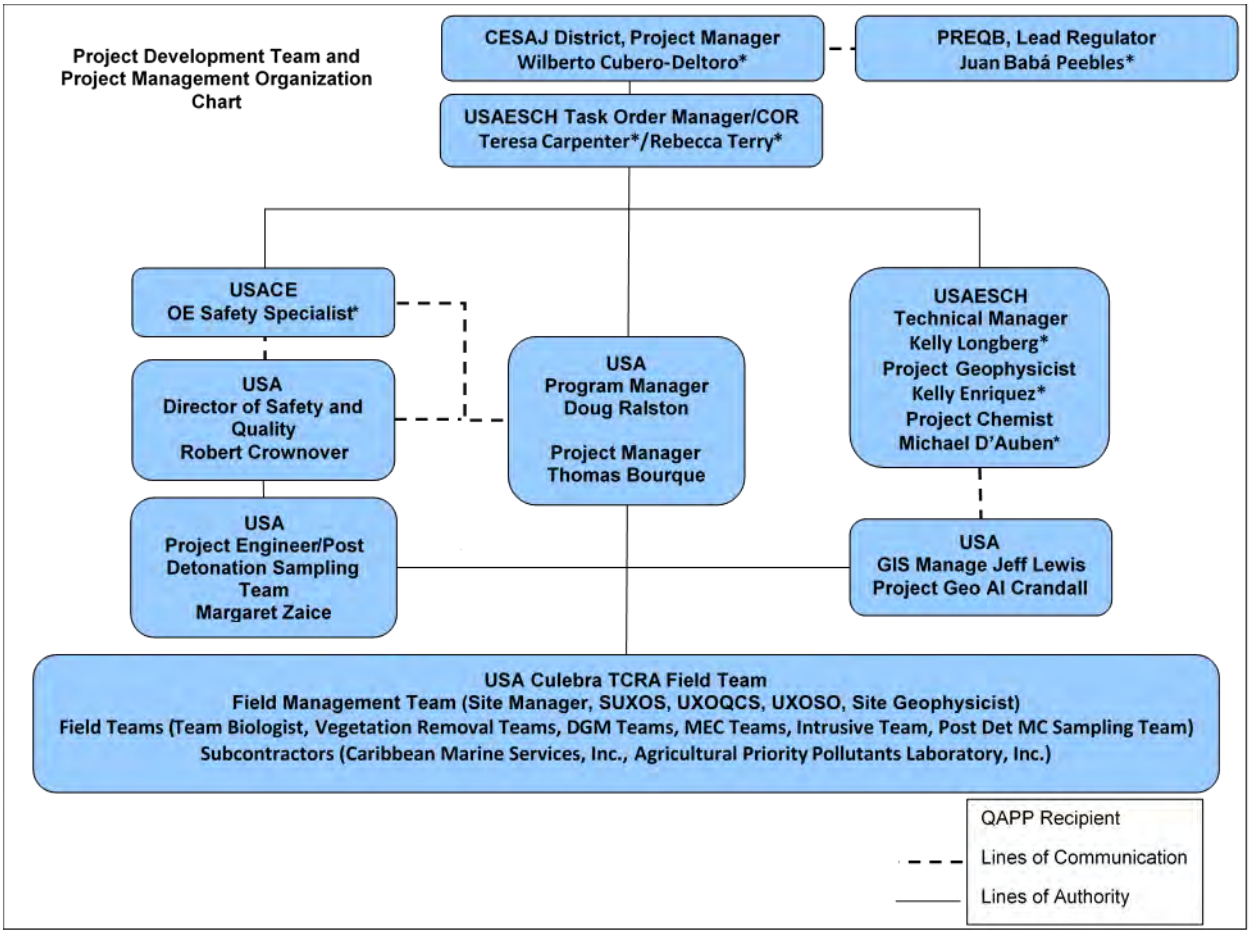

Figure 1: Project Development Team and Project Management Organization Chart

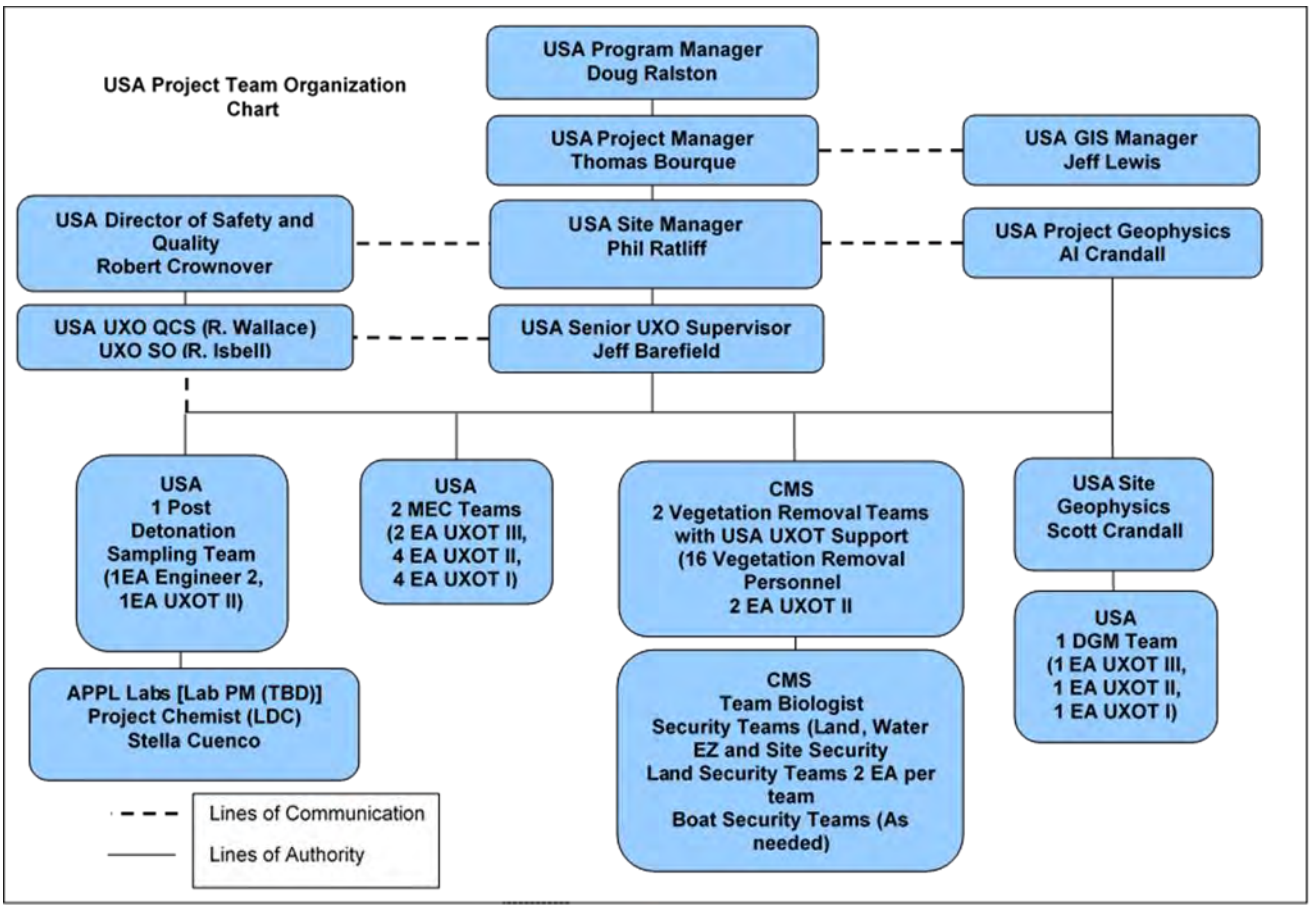

Figure 2: USA Project Team Organization Chart

WORKSHEET #4, 7, & 8: PERSONNEL QUALIFICATIONS AND SIGN-OFF SHEET

(UFP-QAPP Manual Sections 2.3.2 – 2.3.4)
(EPA QA/G-5 Section 2.1.4)

This worksheet is used to identify key project personnel for each organization performing tasks defined in this QAPP. These organizations include the prime contractor, and Laboratory. Individuals' project titles or roles; qualifications; and any specialized/non-routine training, certifications, or clearances required by the project.

This Worksheet is organized into the following tables:

Table 3: Sign off Sheet

Table 4: Responsibilities

Table 5: Personnel Qualification Table

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Table 3: Sign off Sheet

Signatures indicate personnel have read and agree to implement this QAPP as written.

Name	Title/Role	Organization	Telephone Number	Signature/E-mail Receipt	QAPP Section Reviewed	Date QAPP Read
Rebecca Terry	Task Order Manager/COR	U.S. Army Engineer Center, Huntsville 4820 University Square Huntsville, AL 35816-1822	(256) 698-2532 (256) 895 1788 c	Rebecca.K.Terry@usace.army.mil		
Wilberto Cubero-Deltoro	District Project Manager (PM)	U.S. Army Corps of Engineers, Jacksonville District (CESAJ) 701 San Marco Blvd. Jacksonville, FL 32207-0000	(904) 232-1426 (904) 316-8248 c	Wilberto.Cubero-Deltoro@usace.army.mil		
To Be Determined (TBD)	USACE OE Safety Specialist (OESS)	USACE	TBD	TBD		
Kelly Longberg	Technical Manager	U.S. Army Engineer Center, Huntsville CEHNC-EDC-E 4820 University Square Huntsville, AL 35816	(256) 895-1408 (256) 541-0907 c	Kelly.D.Longberg@usace.army.mil		
Kelly Enriquez	Project Geophysicist	U.S. Army Engineer Center, Huntsville CEHNC-EDC-G 4820 University Square Huntsville, AL 35816	(256) 895-1373	Kelly.D.Enriquez@usace.army.mil		
Mike D'Auben	Project Chemist	U.S. Army Engineer Center, Huntsville CEHNC-EDC-E 4820 University Square Huntsville, AL 35816	(256) 895-1460	Michael.J.D'Auben@usace.army.mil		
Paul DeMarco	USACE Biologist	U.S. Army Corps of Engineers, Jacksonville District (CESAJ) 701 San Marco Blvd. Jacksonville, FL 32207-0000	(904) 232-1897 (904) 521-5627	Paul.M.DeMarco@usace.army.mil		

Name	Title/Role	Organization	Telephone Number	Signature/E-mail Receipt	QAPP Section Reviewed	Date QAPP Read
Tom Bourque	PM	USA Team	(808) 255-2320	Tbourque@usatampa.com		
Robert Crownover	Director of Safety and Quality	USA Team	(813) 343-6364	Rcrownover@usatampa.com		
Phil Ratliff	Site Manager (SM)	USA Team	(336) 314-1692	pwratliff@hotmail.com		
Jeff Barefield	USA Senior Unexploded Ordnance (UXO) Supervisor (SUXOS)	USA Team	(919) 221-4840	bombkiller2003@yahoo.com		
Al Crandall	USA Project Geophysicist	USA Team	(813) 343-6362	acrandall@usatampa.com		
Diane Anderson	APPL Project Manager	APPL	(559) 275-2175	danderson@applinc.com		
Sharon Dehmlow	APPL Quality Assurance (QA) QA Officer	APPL	(559) 275-2175	sdehmlow@applinc.com		
Stella Cuenco	Laboratory Data Consultants Project Chemist/Data Validator	LDC	(760) 827-1100	scuenco@lab-data.com		
Rolando Soler	Project Biologist	CMS	(787) 220-1185	ericulebra@hotmail.com		

Table 4: Responsibilities

Name	Title	Organizational Affiliation	Responsibilities
Rebecca Terry	Task Order Manager/COR	USAESCH	Provides administrative and program support and oversight to USA Team. Reviews and approves deliverables and amendments to the QAPP. Only Authority other than the Contracting Officer allowed to direct USA Team on contract matters that will result in a change in budgeted cost or performance of the contract.
Wilberto Cubero	PM	CESAJ	Provides administrative and program support and oversight to USA Team. Reviews and approves deliverables and amendments to the QAPP.
Kelly Longberg	Technical Manager	USACE	Supports USACE PM in providing administrative and program support and oversight to USA Team. Reviews and approves deliverables and amendments to the QAPP.
Kelly Enriquez	Geophysicist	USACE	Supports USACE PM in providing geophysical oversight to USA Team. Reviews and approves deliverables and amendments to the QAPP.
Michael D'Auben	Chemist	USACE	Supports USACE PM in providing oversight to USA Team on issues related to MC post-detonation sampling. Reviews and approves deliverables and amendments to the QAPP.
Tom Bourque	PM	USA Team	Has the overall responsibility for all technical, contractual, safety, and administrative matters for USA under this contract. Mr. Bourque will serve as the focal point for coordination of all contracts-related issues with USACE, and will facilitate the USA Team's ability to consistently deliver a high-quality work product, on time and within budget. Oversees project administration, monitors project performance, and directs and oversees project staff for the USA Team.
Robert Crownover	Director Safety & Quality	USA Team	Oversees compliance with program and project specific safety requirements.
Cheryl Riordan	Health & Safety (H&S) Officer	USA Team	Responsible for H&S performance. Interacts with H&S Director to ensure project-specific safety of field personnel.
Phil Ratliff	SM	USA Team	Directs and manages the execution of all field activities, beginning with mobilization. Responsible for scheduling daily safety meetings, scheduling and coordinating field team activities, and submitting a daily progress report to the USA PM. Has direct oversight of all field activities during the project and will identify the on-site personnel to accomplish specific project tasks. Will coordinate with the USA PM and other project personnel, as necessary, to take Corrective Actions (CAs) to ensure that all project requirements are met.
Jeff Barefield	SUXOS	USA Team	Plans, coordinates, and supervises all Munitions and Explosives of Concern (MEC)--related operations. Supervises all on-site MEC personnel.

Name	Title	Organizational Affiliation	Responsibilities
Robert Wallace	UXO Safety Officer (UXOSO)	USA Team	Ensures that all safety processes and procedures are implemented in the field. Conducts daily safety briefings and ensures that appropriate safety equipment is available and properly deployed. Reports directly to the USA Director of Safety and Quality, but coordinates closely with the SM, SUXOS, and other project staff.
Rodney Isbell	UXO Quality Control Specialist (UXOQCS)	USA Team	Provides oversight of on-site QC for the project in accordance with the QAPP, USA corporate quality polices, and pertinent U.S. DoD guidance. Reports directly to the USA Program QA/QC Officer, but coordinates closely with the SM, SUXOS, and other project staff.
Al Crandall	Project Geophysicist	USA Team	Provides oversight and coordination of geophysical data collection and processing, and assures that geophysical investigations are conducted IAW the QAPP. Reports to the USA PM, but coordinates closely with the Site Manager, SUXOS, UXOQCS, and other project staff.
TBD	Sampling Team Leader	USA Team	Conducts sampling operations in accordance with the QAPP and supporting SOPs. Coordinates with Project Chemist.
Stella Cuenco	USA Project Chemist/Data Validator	USA Team	Ensures that Munitions Constituents (MC) sampling and analysis is conducted IAW the MC-QAPP. Reports to the USA Technical Manager. Coordinates closely with the project laboratories and sampling field team. Oversees validation of all analytical data produced by the laboratory IAW with this MC-QAPP.

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Table 5: Personnel Qualification Table

This worksheet identifies key project personnel for each organization performing tasks defined in this QAPP. These organizations include the prime contractor, primary laboratory, and QA Laboratory.

Signatures indicate personnel have read and agree to implement this QAPP as written

Title/Role	Name/ Organization	Contact Information Telephone/Email	Experience (1)	Specialized Training/ Certifications (2)	Signature/Date (3)
Formerly Used Defense Site (FUDS) Program Manager (PgM)	John Keiser	(904) 232-1758 John.E.Keiser@usace.army.mil	N/A	N/A	
Task Order Manager/COR	Rebecca Terry/ USAESCH	(256) 698-2532 (256) 895-1788 Rebecca.K.Terry@usace.army.mil	N/A	N/A	Signature on WS #1 & 2
PM	Wilberto Cubero CESAJ	(904) 232-1426 Wilberto.Cubero-Deltoro@usace.army.mil	N/A	N/A	
Technical Manager	Kelly Longberg/ USAESCH	(256) 895-1408 Kelly.D.Longberg@usace.army.mil	N/A	N/A	
Geophysicist	Kelly Enriquez/ USAESCH	(256) 895-1343 Kelly.D.Enriquez@usace.army.mil	N/A	N/A	
Project Chemist	Mike D'Auben/ USAESCH	(256) 895-1460 Michael.J.D'Auben@usace.army.mil	N/A	N/A	
Lead Regulator	Mr. Juan Babá Peebles Federal Facilities Coordinator Emergencies Response Area PREQB	(787) 767-8181 ext 3236, 3234 juanbaba@jca.pr.gov	N/A	N/A	
OESS	TBD USAESCH	TBD	TBD	TBD	
Project Biologist	Paul DeMarco CESAJ	(904) 521-5627 Paul.M.DeMarco@usace.army.mil	N/A	N/A	
Contractor PM	Tom Bourque USA Team	(808) 255-2320 tbourque@usatampa.com	Over 34 yrs.' experience with Explosive Ordnance Disposal (EOD) and Munitions Response Projects	Qualified UXOT III per Department of Defense Explosives Safety Board (DDESB) TP 18	Signature on WS #1 & 2

Title/Role	Name/ Organization	Contact Information Telephone/Email	Experience (1)	Specialized Training/ Certifications (2)	Signature/Date (3)
Director of Quality and Safety	Robert Crownover USA Team	(813) 343-6364 rcrownover@usatampa.com	Over 39 yrs. experience QA/QC with EOD and Munitions Response Projects	Qualified SUXOS and UXOQCS per DDESB TP 18	Signature on WS #1 & 2
SM	Phil Ratliff USA Team	(336) 314 1692 (Cell) pwratliff@hotmail.com	28 yrs of EOD/MEC experience & 8 yrs of MEC supervisory experience	Naval School EOD, 8 Hr OSHA Sprvsr Training, 40 Hr HAZWOPER and current refresher	
SUXOS	Jeff Barefield USA Team	(919) 221-4840 (Cell) bombkiller2003@yahoo.com	21 yrs EOD/11 yrs MEC, 6 yrs MEC supervisory experience	Qualified SUXOS per Department of Defense Explosives Safety Board (DDESB) TP 18	
UXOQCS	Rodney Isbell USA Team	(931) 629-1981 (Cell) Rodney.j.isbell@gmail.com	8 yrs EOD/4.5 yrs MEC; 3 yrs MEC supervisory experience	Qualified UXOQCS per DDESB TP 18	
UXOSO	Robert Wallace USA Team	(508) 274-2398 (Cell) robertwaynewallace@gmail.com	4.5 yrs EOD/15 yrs MEC; 5 yrs MEC supervisory experience	Qualified UXOSO per DDESB TP 18	
Contractor Project Geophysicist	Al Crandall USA Team	(813) 343-6362 Acrandall@usatampa.com	40+ years of Geophysical related experience	B. S., Electrical Engineering, 1973	
Laboratory Project Manager	Diane Anderson/ APPL	(559) 275-2175 danderson@applinc.com	30+ years of environmental laboratory experience.	B.S., 1976	
Laboratory QA Officer	Sharon Dehmlow/ APPL	(559) 275-2175 sdehmlow@applinc.com	25+ years' experience in Laboratory and Industry Standard Object (ISO) ISO and QA experience.	B.S., 1988	
Project Chemist/Data Validator	Stella Cuenco / Laboratory Data Consultants	(760) 827-1100 scuenco@lab-data.com	20+ years of validation experience	B.S., Chemistry 1991	

(1) Experience shown is limited to that relating to Performance Work Statement (PWS) requirements.
(2) Specialized training and certifications shown are those required by the PWS, relevant guidance, or other parts of this UFP-QAPP.
(3) Signatures indicate personnel have read this UFP-QAPP and agree to implement the procedures as written.

WORKSHEET #6: COMMUNICATION PATHWAYS

(UFP-QAPP Manual Section 2.4.2)
(EPA QA/G-5 Section 2.1.4)
(EM 200-1-15 Sections 2.1; 2.2)

Table 6: Communication Pathways

Communication Drivers	Responsible Entity	Name	Title	Phone Number and/or E-mail	Procedure
Communication between USACE and USACE PDT. Communicates with Regulators and Stakeholders	USACE	Wilberto Cubero	PM	(904) 232-1426 Wilberto.Cubero-Deltoro@usace.army.mil	Primary point of contact (POC) for USACE; communicates directly (verbally and/or in writing) with Regulators, Stakeholders and higher echelons of the USACE.
Communication between USACE and USA Team	USACE	Rebecca Terry	COR	(256) 698-2532 (256) 895-1788 Rebecca.K.Terry@usace.army.mil	Assists primary POC for USACE; communicates directly with USA.
Geophysical QA Concerns	USACE	Kelly Enriquez	Project Geophysicist	(256) 895-1343 Kelly.D.Enriquez@usace.army.mil	Communicates directly (verbally and/or in writing) with USA Environmental as directed by the USACE COR identifying discrepancies in collected data that may require additional input from the contractor to resolve concerns.
Regulatory Oversight	PREQB	Mr. Juan Babá Peebles	Lead Regulatory Agency	(787) 767-8181 ext. 3236, 3234 juanbaba@jca.pr.gov	Primary POC for PREQB communicates directly (verbally and/or in writing) with USACE.
Regulatory Oversight	USEPA Region 2	Julio Vazquez	Regulatory Agency	(212) 637-4323 Vazquez.Julio@epa.gov	Primary POC for USEPA communicated directly (verbally and/or in writing) with PREQB

Communication Drivers	Responsible Entity	Name	Title	Phone Number and/or E-mail	Procedure
Regulatory Oversight	PRDNER	Craig Lilyestrom	Resource Agency/ Trustee	(787) 772-2002 craig.lilyestrom@drna.gobierno.pr	Primary POC for PRDNER communicated directly (verbally and/or in writing) with PREQB
Regulatory Oversight	USFWS Culebra Refuge Manager	Ana Roman	Resource Agency/ Trustee	(787) 851-7258 ana_roman@fws.gov	Primary POC for USFWS communicated directly (verbally and/or in writing) with PREQB
Regulatory Oversight	USFWS CESTO	Marelisa Rivera	Resource Agency/ Trustee	(787) 851-7297 marelisa_rivera@fws.gov	Primary POC for USFWS CESTO communicated directly (verbally and/or in writing) with PREQB
Regulatory Oversight	NOAA/ NMFS	Lisamarie Carrubba	Resource Agency/ Trustee	(787) 857-3700 lisamarie.carrubba@noaa.gov	Primary POC for NMFS communicated directly (verbally and/or in writing) with PREQB
Regulatory Oversight	NOAA	Diane Wehner	Resource Agency/ Trustee	(240) 338-3411 Diane.Wehner@noaa.gov	Primary POC for NOAA communicated directly (verbally and/or in writing) with PREQB
Project Management	USA Team	Tom Bourque	Project Manager	(808) 255-2320 Tbourque@usatampa.com	Primary POC for USA Team. Communicates directly (verbally and/or in writing) with USACE and USA Team
Geophysical quality control variances; Data verification issues	USA Team	Alan Crandall	USA Geophysicist	(813) 343-6362 acrandall@usatampa.com	Communicates directly (verbally and/or in writing) with USA Team (and USACE as directed by USA PM). Develops a CA Report for approval.
Site Administration and Logistics; MEC-QAPP Changes prior to Field Work	USA Team	TBD	SM	TBD	Communicates directly (verbally and/or in writing) with PM, Field Team Leader, and field team.

Communication Drivers	Responsible Entity	Name	Title	Phone Number and/or E-mail	Procedure
QAPP Changes in the Field; Oversight of Field Activities	USA Team	TBD	SM	TBD	Communicates directly (verbally and/or in writing) with PM on daily field activities and any QAPP changes in the field.
Field team finds MEC item(s)	USA Team	TBD	SM	TBD	Notifies USA Team PM, USACE
Field CAs	USA Team	TBD	SM	TBD	The need for CA for field issues will be determined by the UXOQCS in consultation with the project QC manager, PM, and/or senior technical support. The Site Manager (SM) will notify the PM of any needed field CAs. The PM will have 24 hours to respond to the request for field CA.
Stop Work due to Safety Issues	USA Team	TBD	UXOSO	TBD	Communicate directly with the PM. Document issues in field logbook.
Implementation of QAPP, Oversight of Field Activities	USA Team	Tom Bourque	Project Manager	(808) 255-2320 Tbourque@usatampa.com	POC between field team and USA Team PM. Monitors daily activities through review of DQCR to ensure implementation of procedures outlined in QAPP, coordinates DQCR distribution with USA Team PM.
Documentation of Daily Field Activities in Sample Log Book and Daily Quality Control Report	USA Field Sampling Team	TBD	Sampling Field Team Leader	TBD	Implementation of QAPP, Oversight of Field Activities

Communication Drivers	Responsible Entity	Name	Title	Phone Number and/or E-mail	Procedure
Sample Receipt Variances	Laboratory PM	Diane Anderson	APPL PM	(559) 275-2175	Laboratory PM will communicate with Project Chemist regarding sample receipt variances. Project Chemist will communicate with Field Team and PMs as necessary.
Analytical Sample Results	Laboratory PM	Diane Anderson	APPL PM	(559) 275-2175	See WS 35 Data Verification Procedures
Analytical CAs	APPL	Sharon Dehmlow	APPL QA Manager	(559) 275-2175 sdehmlow@applinc.com	See WS 31, 32, 33 Assessments and CA, and WS 35 Data Verification Procedures
Laboratory QC Variances	Laboratory QA Officer	Sharon Dehmlow	APPL QA Manager	(559) 275-2175 sdehmlow@applinc.com	See WS 31, 32, 33 Assessments and CA, and WS 35 Data Verification Procedures
Field team finds MEC item(s)	USA Team	TBD	Site Manager, USA Team PM if no Site Manager available.	TBD	UXO escort or Field Team Leader notifies Site Manager or USA Team PM, who will notify USACE.
Data Validation	USA Team and Laboratories	Stella Cuenco	USA Project Data Validator	(760) 827-1100 scuenco@lab-data.com	See WS #36
Data Usability	USA Team	Stella Cuenco	USA Project Data Validator	(760) 827-1100 scuenco@lab-data.com	See WS #37

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WORKSHEET #9: PROJECT SCOPING SESSIONS

Summary
(UFP-QAPP Manual Section 2.5.1 and Figures 9-12)
(EPA QA/G-4 Section 8.1; EPA QA/G-5 Section 1.4)
(EM 200-1-2, Section 1.4.3; EM 200-1-15, Section 2.2)

This worksheet is a placeholder for the minutes of PDT meeting discussing review of QAPP.

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WORKSHEET #10: CONCEPTUAL SITE MODEL

(UFP-QAPP Manual Section 2.5.2)
(EM 200-1-12 CSMs for Environmental and Munitions Projects December 2012; EM 200-1-15 Section 2.2.4.1.3);
EPA 542-F-08-007, December 2008; EPA 542-F-11-011, July 2011.)

Overview

This Worksheet presents the Conceptual Site Model (CSM) for the project for Cayo del Agua.

Location

Culebra is located about 17 miles east of the main island of Puerto Rico. The Culebra property, consisting of Culebra Island and surrounding cayos, was acquired via land transfers, purchases, donations and leases, and was utilized as a coaling and communications station, for aerial bombing, maneuvers, naval gun and artillery firing, and amphibious training by the U.S. Marine Corps and the U.S. Navy during various periods between 1903 and 1975. Appendix B: Figure 1 shows the regional location.

Cayo del Agua, also named Water Key or Agua Cay, is a small 5-acre cayo located 1.5 miles southwest of Culebra Island, and approximately 2,400 ft west of Cayo Luis Peña. Cayo del Agua is part of Culebra Munitions Response Site (MRS) 02. Appendix B: Figure 2 shows the Cayo del Agua TCRA project area.

Land Use

The cayo is part of the Culebra NWR, which protects important habitats for migratory seabirds. Recreational users and boaters visit the area (without permits from USFWS).

USFWS personnel and volunteers access the cayo on a recurring basis to conduct wildlife censuses. Other users include unauthorized recreational users (boaters, snorkelers, etc.), and shellfish harvesters.

Cayo Access

Cayo del Agua is managed by USFWS as a wildlife refuge and is an island accessible by boat; it is undeveloped, with steep cliffs and very rugged terrain. The cayo contains no improved areas, but does contain a coral rubble/beach area that is fully accessible to the boating public from either the North or the South side of the cay. However, the northern side of the cay provides slightly better access to the shoreline. Appendix B: Figure 6 demonstrates the mooring location for either small boat or the CMS barge. Appendix G: SOP OPS 41 Small Boat Operations describes the process for mooring at the Cays.

Human Receptors

Cayo del Agua human receptors include:

- Researchers and commercial workers such as natural resource agencies and other research companies and firms that use the Cay and surrounding waters to conduct ecological research.
- Recreational (boaters, swimmers) users of the beach and waters around the cay. Cayo Luis Peña, which is very near to Cayo del Agua, contains a beach area and moorings where a large number of boats each year visit the area. Possible trespassers may originate from these Cayo Luis Peña visitors.
- Trespassers due to the potential for any unauthorized use of the properties (residents are not present within the boundaries of Cayo del Agua).

Ecological Receptors

Ecological receptors consist of the surrounding coral reef (which includes corals, sponges, and algae), fish and invertebrates, sea turtles, marine mammals, Antillean Manatees, Migratory Seabirds (Audubon's Shearwater and White-tailed Tropicbird) and Resident Seabirds.

The cayo is a common nesting area for several bird populations. This cay is a known nesting area for Bridled Terns, Audubon's Shearwaters, White-Tailed Tropicbird, and Brown Noddy.

A full list of Culebra Ecological Receptors can be found in Final Supplemental Standard Operating Procedures (SOP) for Endangered Species Conservation and their Critical Habitat (Addendum 1-February 2015) (CESAJ, 2015). Although the title of the document indicates "Endangered" species, the document covers other protected species on Culebra that are not listed.

Source: Known or Suspected Contamination

The former military use of Cayo del Agua was for aerial bombing and rocket firing. The U.S. Navy and U.S. Marines conducted fleet maneuvers and Fleet Landing Exercises (FLEX) between 1923 and 1975. Munitions confirmed or suspected to have been used on Cayo del Agua include MK 76 practice bombs with MK 4 spotting charges, MK 80 series bombs, 2.75-inch rockets, and aircraft flares. Recent 2015 RI fieldwork confirmed the presence of more than 60 MK 76 practice bombs (most with cartridges) on the land portion of the cayo, with many in the rocks along the beach. In addition, 2.75-inch rocket motor remnants were also documented. Since there were no discoveries of practice warheads with the 2.75-inch rocket motor remnants, it is assumed High Explosive (HE) warheads may have been used. Mk 44 and Mk 45 aircraft flares have also been listed in historical reports as being used on Cayo del Agua.

The above list of military ordnance is known to be incomplete because the site was used for ordnance training from 1923 through 1975. However, historical documents do not specifically list the munitions used on Cayo del Agua prior to World War II and ordnance from this earlier period of use is also expected.

Topography

Cayo del Agua is a small cayo measuring approximately 450 ft in diameter, with a rocky beach and a mix of level areas and rough rocks. The cayo extends to an elevation of approximately 80 ft. The cayo has a low elevation saddle with a coral rubble and rocky beach that divides the cayo, with the larger portion of land on the eastern side (the location of the target). The saddle is the best option for entry to the cayo.

Site Geology and Soils

Culebra Island and the surrounding cays are part of the Culebra Archipelago. The rocks are predominantly intrusive or extrusive volcanic rocks consisting of andesite lava and tuff.

The soil type for Cayo del Agua was designated as Rock Land (Rs) in the U.S. Department of Agriculture USDA-Natural Resources soil study for the area. The Rs soil type is characterized by areas where rock outcrops on 50 to 70 percent of the surface, with loose stones common on the surface. Very shallow soil material lies between the outcrops and stones that may also be present. Slopes are 60 to 70 percent (NCRS, 2007).

During fieldwork for the 2015 USA RI to complete data gaps from the 2013 RI in which the cays were not accessed due to severe sea conditions, field teams conducting soil sampling observed two additional soil types, which included: Coastal beaches, Cm, in the low elevation saddle that divides the cayo; and soil type Descalabrado clay loam, DeE2, mainly in the flat areas at higher elevations of the cayo.

Soil type Cm is characterized by narrow strips of light-beach colored sand saturated with seawater and containing many seashells and shell fragments throughout.

Soil type DeE2 is characterized by well-drained, moderately permeable soils that are shallow to consolidated volcanic rock. The soils formed in moderately fine-textured residuum derived from volcanic rocks. The surface layer is very dark grayish-brown neutral clay loam about 6 inches thick underlain by a layer of clay loam with volcanic rock fragments.

Vegetation

The vegetation on Cayo del Agua ranges from no vegetation to dense scrub bushes and small trees. Grasses are present on the southern slopes with dense scrub bushes and trees approximately 8 ft high for large areas of the eastern portions of the cay.

Benthic Habitat

According to the NOAA Geographic Information System (GIS) effort (Kendall, M.S., et al., 2001), 26 distinct benthic habitats are located within near shore waters of Puerto Rico and the U.S. Virgin Islands. During the course of completing the Environmental Baseline Survey (EBS) analysis, the benthic habitats identified within the water portions of Cayo del Agua consist primarily of unconsolidated sediments (sand), submerged vegetation (sea grass/macroalgae), and coral reef/hardbottom (colonized and uncolonized pavement) habitats.

Climate

The weather on Culebra Island is generally warm year round due to its tropical marine climate. Based on the Charlotte Amalie HAR, Virgin Islands, weather station (1972 - 2012), located 20 miles to the east, yearly average rainfall is approximately 40.01 inches. The months of August through November are considered the wet season, and the driest months are January through April. Average daily temperatures range from an average maximum of 87.4 °F and an average low of 75.3 °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 average rainfall is provided in Table 7 (SERCC, 2012).

Table 7: Average Rainfall, Culebra, Puerto Rico

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
inches	**2.03**	**1.45**	**1.46**	**2.74**	**3.35**	**2.75**	**2.66**	**3.83**	**5.42**	**5.94**	**5.54**	**2.84**	**40.01**

Source: SERCC, 2012

Significant weather events are also associated with the cold weather fronts that move across the continental U.S. The sea state is often the limiting factor for marine operations. The combination of wave swells and waves generated by winds can create small craft warnings which impact safe operations.

Field operational delays due to inclement weather are possible.

Cultural Resources

According to the National Register Information System (NRIS), no registered cultural resources are located on the Cayo. However, field teams are briefed during the site-specific training on the reporting, and how to identify cultural resources that may be discovered during field activities.

Site History

Cayo del Agua was formerly used for artillery, aerial bombing, and rocket firing. The U.S. Navy and U.S. Marines conducted fleet maneuvers and FLEX between 1923 and 1975. During these exercises the surrounding keys were heavily bombarded with high explosive (HE) bombs, projectiles, and rockets, as well as illumination and practice rounds. Training continued through the 1950s and 1960s, and in the early 1960s aerial bombardment was expanded to most of the cays on the east and west side of Culebra. By 1 January 1972, the U.S. Navy relocated the target at Cayo del Agua to Cayo Lobo (Cross Cay).

In 1969, Cayo del Agua was used as an aircraft bombing and rocket target in the Culebra Complex used for the Vietnam training. In 1970, the U.S. Navy discontinued use of all the targets on the eastern side, as

well as Cayo del Agua. By 1 January 1972, the U.S. Navy relocated the target at Cayo del Agua to Cayo Lobo (Cross Cay). Ordnance operations on the entire Culebra Complex were terminated 1 October 1975. Figure 3 shows the layout of the target area on the cayo.

The historical photo below shows the target areas on a flat area on the eastern side of the cayo. The target consisted of a 3-ft-square at target center, surrounded by two concentric rings of 50- and 100-ft radius. The entire target was center-lighted (flood lights) with marker lights at the 12-, 6-, and 9-o'clock positons on both rings for night operations. The target approach flight path for the cayo was from Cayo Luis Peña, where a marking for run-in was located, resulting in a flight path line from the southeast to northwest.

The Archive Search Report (ASR) noted Range Related Debris (RRD) remaining include a concrete box and numerous tires.

Figure 3: View of Targets on the Cayo looking West

Source: Archives Search Report (USACE-RI, 1995)

Previous Studies/Investigation/Removal

1991 (revised 2005) Inventory Project Report (INPR)

An INPR was signed on 24 December 1991 and revised July 2005 (CESAJ 2005), establishing the Culebra Island site as a FUDS, defining a site boundary, and assigning FUDS Project No. I02PR006800 (USACE, 1991). The Findings and Determination of Eligibility (FDE) concluded that "the site, except for 87.5 acres still under control of the Navy, has been determined to be formerly used by the Department of Defense. It is therefore eligible for the Defense Environmental Restoration Program (DERP)."

The revised INPR completed in June 2005 further defined the military use of the Island of Culebra and divided the original site, Property No. I02PR0068, into 14 separate MRSs (13 MMRP and 1 Installation Restoration Program).

1995 Archive Search Report (ASR)

The Archive Search Report Findings for Culebra Island National Wildlife Refuge, Culebra, Puerto Rico. (USACE 1995) and Supplemental Archives Search Report for Culebra, Puerto Rico. Project No. I02PR0068 (USACE 2005) document historical use of Cayo del Agua as a bombing target. A site visit was made to Cayo del Agua in October 1994. On Cayo del Agua, the ASR team observed several MK 76 practice bombs and HE bomb fragments with suspension lugs. The team noted RRD consisting of a concrete box and numerous tires.

1997 Engineering Evaluation/Cost Analysis (EE/CA)

During the 1997 EE/CA (ESE 1997), two grids were investigated on Cayo del Agua. One 100-ft by 100-ft grid was placed in the main impact area and the second, smaller grid (40 ft by 40 ft) was placed on the western portion of the cay. One hundred of the 570 anomalies detected during the investigation at the larger grid were excavated. Eleven MEC items were encountered on the surface and five MEC items were encountered in the subsurface. The UXO items included 16 MK 76 practice bombs and one 76mm projectile. The 76mm projectile was unfuzed and blown in place, along with the other UXO items. No MEC items were discovered in the smaller grid.

2007 Site Inspection

Parsons completed a Site Inspection (SI) in 2007 for the Culebra Island MRS. It was evaluated for Munitions and Explosives of Concern (MEC) and Munitions Constituents (MC). Cayo del Agua was included in the SI; however, no MC samples were collected at Cayo del Agua during the SI and soil samples from a previous removal action on Cayo Lobo were used as the representative samples for MRS 02 (Adjacent Cayos).

The field team viewed both sides of Cayo Del Agua by boat and observed many MK 76 practice bombs throughout the entire cay. Two aircraft flare trays and debris from an MK 80 series bomb were also observed. The field team observed a large “T” painted in white on the rock on the southeast side of the cay.

2009 Non-Time Critical Removal Action

In 2009, Ellis Environmental Group, LC (EEG), under contract to the USAESCH, provided non-time-critical removal action (NTCRA) operations on Culebra Island and adjacent cayos in Puerto Rico. The areas planned for surface clearance included Cerro Balcon, Culebrita, and the adjacent cays, which included Cayo del Agua. Cayo del Agua, and other cays, were inaccessible due to weather conditions during the execution of the NTCRA.

2011 EOTI Remedial Investigation

The Remedial Investigation conducted by EOTI in 2011 was unable to access Cayo del Agua due to wave action. From a boat, the team observed MD present on the island.

2015 USAE Remedial Investigation

USAE investigated areas originally planned for the 2011 EOTI Investigation that remained as data gaps. Areas investigated included MRS 02 (five cayos and Cerro Balcon), along with portions of MRS 04 and MRS 05.

The investigation included transect investigation of Cayo del Agua. The field team completed the designed analog and dig transect for Cayo del Agua, finding approximately 60 MK 76 practice bombs with MK 4 spotting cartridges. Numerous other MK 76 practice bombs were seen in the rocks outside of the transect and along the beach. The field team also noted 2.75-inch rocket motor remnants outside of the transect. Due to the significant quantities of MEC, the USACE determined that the treatment of the MEC items discovered during the RI would take place during the subsequent removal action.

MC sampling was also conducted on the eastern lobe of Cayo del Agua. Three samples were collected and analyzed for Explosives, Ammonium Picrate (based on evidence of use of Explosives D), MC Metals [aluminum, antimony, barium, chromium (total), copper, lead, mercury, and zinc]. Following comparison to

the BTV for soil type DeE2, and the human health and ecological screening values, it was determined that all three of these samples contained chromium (total) in exceedance of background and screening values. Step-out Sampling is planned in the next field effort for chromium (total), with hexavalent chromium also added to the analyte list.

CSM Summary

Cayo del Agua CSM is summarized in Table 8.

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Table 8: Conceptual Site Model (CSM) Summary

Investigation Area	Known/Suspected Contamination Source(s)	Potential/Suspected Location and Distribution	Source or Exposure Media	Current and Future Receptors
Cayo del Agua	*MEC*: Projectile, 76mm (unspecified) Bomb, Mk 80 Series (including 2000 lb inert series). Bomb, practice, MK 76 Rocket,2.75-inch, [M151, M229 HE; M247 HEDP, M156 WP, M257 Illumination, M261 Multi-purpose sub-munitions (M73)] Flares, MK 44 and MK 45, Aircraft	Concentrated on land portion of cayo, extending out into the water.	Surface and subsurface soil	Natural Resource Agencies (and their volunteers) performing ecological investigations, recreational users (boaters, kayakers, snorkelers), and trespassers. Ecological receptors on the cayo: seabirds and possibly sea turtles, should they nest on the beach area of the Cayo

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WORKSHEET #11: PROJECT QUALITY OBJECTIVES

(UFP-QAPP Manual Section 2.6.1)
(EPA QA/G-4, EPA QA/G-5)
(EM 200-1-15 sections 2.2.4, 5.3, 9.2); EM 200-1-2, section 4.2)

The data quality objectives (DQOs) for the MEC-related and MC-related activities are presented in Table 9 below.

Table 9: MEC and MC Data Quality Objectives

State the Problem	Based on historical data, and previous investigations the area that comprises Cayo del Agua (land and water portions) is confirmed to have been used for DoD training operations using munitions with an explosive potential. MEC (in the form of UXO) remains on the surface and potentially in the subsurface in areas accessible to USFWS employees or other Natural Resource workers and volunteers, and the public. The proximity of UXO items pose hazard to users of Cayo del Agua
Identify the Decision	MEC: Determine if geophysical anomalies require intrusive investigation and are MEC/MPPEH. Determine if the presence of MEC/MPPEH items (excluding small arms ammunition) have been eliminated from the cay or if residual risk is acceptable given current and anticipated future land use scenarios. Where and when will events be performed to treat MEC by detonation that were discovered during the TCRA? MC: Determine if MC is released to surface soil at locations where MEC items are treated by detonation through soil sampling for explosive analytes. What analytes will be evaluated from the detonation? What screening levels will be used to identify COPCs? What laboratory methods will be used to analyze the surface soil? Note: No MC decisions will be made within the scope of the TCRA. The laboratory Data Validation Reports and an Excel table of results will be provided. Summary statistics for results of detections will be reported (# detections, maximum, minimum, average of detections).
Identify Inputs	MEC: Historical information (ASR [USACE, 1995], Supplemental ASR [USACE, 2005), Culebra SI Report (Parsons 2007), Culebra RI field notes, aerial photos, maps, and EE/CA. USFWS wildlife surveys conducted on the cayo to determine seabird nesting periods. Seabird nesting seasons will determine months available for TCRA field work. USFWS determines the sea turtle nesting zone. In coordination with USFWS, it has been determined that Cayo del Agua is a Zone 1 Sea Turtle Nesting Area. No restrictions because sea turtle nesting is not expected within the area (rocky shore, no sand, etc.). No turtle nest monitoring is planned for Cayo del Agua (see Appendix B: Figure 9). This input determines sea turtle nests will not impact how the field work will be conducted nor the schedule. Observations: Geophysical and intrusive investigation results. Visual field MEC confirmation and indicators of MEC Type(s)/location(s) of MEC Accessibility of the site

Identify Inputs (cont.)	The CSM, anticipated MEC type(s), terrain and vegetation, and constraints regarding sensitive species present on the land and in the water). Results from Biological Monitoring Results from Instrument Verification Strip (IVS) Technical Memorandum, intrusive results from DGM and Analog investigations Explosives Safety Submission (ESS) (See Appendix K: ESS) MC: Results from post-detonation surface soil samples will be included in the TCRA SSFR. Samples will be collected from a depth of 0 to 2 inches below ground surface (bgs) at locations where MEC items are treated by detonation. If no soil is present at the location of detonation, no samples will be collected. The samples will be collected after the last detonation event at the location.
Define Boundaries of Study	MEC: Cayo del Agua: 5 terrestrial acres above the low water mark Migratory seabird and resident seabird nesting seasons. [Reference: Supplemental SOP for Endangered Species Conservation and their Critical Habitat (USACE 2015)] Sea turtle nesting seasons [Reference: Supplemental SOP for Endangered Species Conservation and their Critical Habitat (USACE 2015)]. The horizontal boundary of this TCRA will include only the land portions of the cayo starting above the low water mark. Should the SUXOS, UXOQCS, and OE Safety Specialist determine that a high-density area is the result of Cultural Debris or trash pits, the investigation of the high-density area will cease. Exclusive of inaccessible areas. Inaccessible areas include: slopes steeper than 33 degrees; the presence of Listed Threatened or Endangered Species or Critical Habitat (the Team Biologist will be present to identify Listed Species or Critical Habitat as the grids are established); rock and boulder outcroppings that pose a hazard to the field teams if traversed; areas of vegetation that if vegetation is removed the removal will be in violation of the USACE Final Standard Operating Procedure for Endangered Species and Conservation and Their Critical Habitat with Addendum 1, DERP-FUDS Property No. I02PR0068, Culebra Island, Puerto Rico (CESAJ, February 2015); areas that pose an unacceptable risk of injury to the field team if traversed. Vertical extent is based on geophysical detection capabilities per MEC types and depth to bedrock. Approved ROE. MC: The analytes for MC post-detonation samples will be explosives and ammonium picrate. Ammonium Picrate will be analyzed due to the presence of munitions with Explosives D. Ammonium Picrate results will be calculated based on Picric Acid (SW8321A) results multiplied by a molecular weight conversion factor. The screening values for soil are presented only for purposes of comparison to laboratory achievable limits. The screening values presented are applicable human health USEPA Regional Screening Levels (RSL) for residential soil and Ecological Screening Value (ESV). Noncarcinogenic RSLs will be divided by 10 to reflect a Hazard Quotient (HQ) of 0.1 to account for potential cumulative effects. No USEPA Ecological Soil Screening Levels (EcoSSLs) are available for explosives; used Los Alamos National Laboratory (LANL) EcoRisk Database value. Explosives are not naturally occurring, and therefore background values are not applicable.
Develop a Decision Rule	MEC: If the terrain allows for the use of the EM 61 Mk 2 to be used effectively, then DGM will be used. If the terrain or site conditions do not afford the use of DGM, then Analog detection methods will be used.

Develop a Decision Rule (cont.)	If, during ground surface clearance metal debris is located in DGM grids, then the metal debris will be removed prior to DGM data collection. If the surface clearance is over Analog grids, then all MD and RRD greater than 37mm in diameter will be removed. All MEC/MPPEH items will be marked and later treated by detonation. If DGM anomalies meet the criteria for selection IAW the IVS Technical Memorandum, then the DGM anomaly will be adequately resolved per relevant MPCs. If Analog subsurface anomalies are detected, then they will be investigated and all related MPCs will be achieved. If, during intrusive investigation, water intrusion occurs, then dewatering techniques will be employed. However, if ocean waves result in water intrusion or if all dewatering methods cannot manage the inflow of water, the anomaly will be noted and discussed with the PDT. If Trimble RTK DGPS signal meets MPC standards, reacquisition of DGM anomalies will be completed using RTK DGPS. In areas where line and fiducial data need to be collected, those methods will be used for reacquisition. If a DGM anomaly results in a “no find,” further investigation by QC personnel with an EM61 detector will be conducted to resolve the anomaly or provide a rationale for the “no find (e.g., noise). The field QC team will perform acceptance sampling for DGM Anomaly Resolution, using an EM61-MK2 per WS #12. In addition, the QC Geophysicist, or their designee, will assess whether the object(s) removed from each anomaly location provides a rationale for the DGM signal. If a signal above anomaly selection threshold remains, an explanation is documented (e.g., anomaly due to hot rock/bedrock). If an item is deemed unsafe to move, then the item will be Blown In Place (BIP) (see WS #15). If the item is determined to be safe to move, it may be consolidated on the Cayo with other MEC items for a consolidated detonation per the ESS. If an area along the coastline (e.g., cliff face steeper than 33 degrees, rock outcroppings awash with seawater) or in the cayo interior (e.g., rock crevices or cliff face) in which surface or subsurface clearance cannot be conducted or performed safely and consultation with the OESS is in agreement, then the area will be considered inaccessible and will not be investigated. However, all reasonable attempts in clearing the area must take place. The following data will be provided to the USACE PDT for areas determined to be inaccessible: 1) Photos of the inaccessible area; 2) GPS coordinates; 3) Map depicting the area that is inaccessible. Appendix B: Figure 10 demonstrates the potential areas that may be inaccessible. MC: If an explosives analyte is undetected or is detected at concentrations less than the selected screening levels presented in WS #15 of this QAPP, then the area will be considered uncontaminated by that MC analyte. In areas where explosives analytes are detected at concentrations greater than the screening levels as established in this QAPP, the analyte will be identified as a Constituent of Potential Concern (COPC). Any detection of explosives or ammonium picrate will be identified as a COPC. Explosive MC exceedances will be included in the TCRA SSFR.
Specify Tolerable Limits of Decision Error	MEC: Geophysical investigations will achieve applicable Measurement Performance Criteria (MPC) as stated in QAPP WS #12 and confirmed/modified by IVS Technical Memorandum, unless MPC failures can be adequately explained and/or justified. MC: All sampling and analysis will achieve applicable MPCs as stated in the QAPP, unless MPC failures can be adequately explained and/or justified.

Optimize the Design	MEC: The design for fieldwork is based on the known or estimated conditions at the site to perform fieldwork with consideration given to terrain, access which requires a transition from a water craft to the shore, safety for field teams, and protection of the environment (protected and endangered species are present). Field procedures and associated QC measurements are included in the QAPP WS #12, #14, #16, #17, and #20, and Appendix G: SOPs. MC: Collect surface soil samples by Cold Regions Research and Engineering Laboratory (CRREL) 7-point Wheel Method at locations of demolition events. Analyze soil samples for Explosives and Ammonium Picrate. Field procedures and associated QC measurements are included in the QAPP WS #17, #18, #26, and #27, and Appendix G: SOPs.

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WORKSHEET #12: MEASUREMENT PERFORMANCE CRITERIA

(EPA UFP-QAPP Guidance Manual, Section 2.6.2)
(EPA Guidance QA/G-5, Section 2.1.7)

MEC-RELATED TASKS - MEASUREMENT PERFORMANCE CRITERIA

The field operations for this project involve multiple elements, or "definable features of work (DFWs)." These DFWs are listed and associated tasks described on WS #14. The specific field procedures to be used for the activities described in this summary are included in the various field SOPs located in Appendix G. Table 10 summarizes the MPCs that have been established for the DFWs associated with the MEC-related tasks to be conducted during the TCRA. The quality of these procedures and the related results will be evaluated for compliance with the project quality objectives (PQOs) through a review of the procedures described in WS #37. (*Note that MPCs are required to indicate that the relevant data are of adequate quality to support project decisions; however, not all DFWs are related to project decisions and for this reason not all DFWs have related MPCs.*). Table 11 summarizes the Data Quality Indicators (DQIs) and MPC for the DFWs associated with the MEC-related tasks to be conducted during the TCRA and identifies CAs for performance failures.

Table 10: MEC-Related Definable Features of Work

Definable Feature of Work (DFW)	Description	SOP
Site-Specific Training	Field teams receive training on MEC-QAPP and sub-plan elements, objectives, and safety. In addition, the field teams are briefed on the ecological concerns for the work site and Culebra. Site Specific Training will also include a site visit for selected FMT and the USA Team Biologist to the Cayo with a USFWS Representative. The USFWS Representative will identify examples of habitat that requires protection. The FMT will identify and document a means to complete the TCRA objectives while meeting the USFWS concerns."	Final Supplemental SOP for Endangered Species Conservation and their Critical Habitat (Addendum 1 – February 2015)
Vegetation Removal	Vegetation removal to allow for DGM surveys and analog and dig of Cayo del Agua in areas that intrusive investigations are possible.	SOP-OPS-21: Vegetation Removal Final Supplemental SOP for Endangered Species Conservation and their Critical Habitat (CESAJ 2015)

Definable Feature of Work (DFW)	Description	SOP
Establish Instrument Verification Strip (IVS) and deliver the IVS Technical Memorandum	A Geophysical System Verification (GSV) is performed, using an IVS located on Culebra, to document geophysical systems are performing as designed, finalize geophysical performance metrics, and document initial anomaly selection criteria, and a blind seed program. The geophysical data are positioned by RTK DGPS.	SOP-OPS-05A: Digital Geophysical Mapping SOP-OPS-05B: Geophysical Data Processing and Interpretation SOP-DGM-01: Instrument Verification Strip (IVS) and Analog Test Strip (ATS)
Biological Monitoring	Sea turtle beach monitoring to determine the presence of sea turtle nests occurs prior to field work commencing in which beaches known for turtle nests occur. Sea turtle nesting zones determine length and periodicity of sea turtle beach monitoring to determine the presence of sea turtle nests. During field work, sea turtle beach monitoring continues as required. In addition to sea turtle beach monitoring, the team biologist will monitor field teams' efforts ensuring the protection, recording and reporting of protected species. Cayo del Agua is a Zone 1 Sea Turtle Nesting Area and does not require sea turtle beach Monitoring to determine the presence of sea turtle nests on the shores of Cayo del Agua.	Final Supplemental SOP for Endangered Species Conservation and their Critical Habitat (CESAJ 2015)
Surface Clearance of Munitions Debris (MD) and Range Related Debris (RRD)	Surface clearance of Cayo del Agua is conducted by MEC teams. In areas in which DGM is conducted all metal should be removed from the surface (MD, RRD and cultural debris). In areas in which analog and dig will be used MD, RRD will be removed (MD, RRD smaller than 37 mm in diameter and width and small arms ammunition 50 cal. and smaller are excluded). Any MEC discovered during the surface clearance is marked, GPS coordinates collected and left in place until demolition operations can be coordinated.	SOP-OPS-15: MEC Avoidance SOP-OPS-17: MEC Surface Sweeps SOP-OPS-41: Small Boat Operations
Geophysical Investigation	Digital geophysical mapping (DGM) survey of Cayo del Agua by EM61-MK2 and analog instruments (Minelab ETRAC or other equivalent all-metals detector).	SOP-OPS-04: DGM Anomaly Investigations SOP-OPS-05A: Digital Geophysical Mapping SOP-OPS-05B: Geophysical Data Processing and Interpretation SOP-OPS-14: MEC Analog Detect and Removal SOP-DGM-01: Instrument Verification Strip (IVS) and Analog Test Strip (ATS)

Definable Feature of Work (DFW)	Description	SOP
Intrusive investigation	Trimble RTK DGPS is used to establish 50-ft by 50-ft grids for the reacquisition of DGM anomalies and intrusive investigation. For areas in which DGM was not possible, analog and dig is performed in 50-ft by 50-ft grids.	SOP-OPS-04 DGM Anomaly Investigations SOP-OPS-14: MEC Analog Detect and Removal SOP-OPS-40: Location Surveys SOP-DGM-01: Instrument Verification Strip (IVS) and Analog Test Strip (ATS)
Treatment of discovered MEC	Treatment of MEC by detonation is performed on Cayo del Agua per the PWS	SOP-OPS-03: Demolition Operations SOP-OPS-07: Explosives Storage and Accountability SOP-OPS-08: Explosives Transportation SOP-OPS-29: Explosives Transportation by Vessel
Post Detonation Soil Samples	Soil sampling is performed to collect analytical data to evaluate whether the munitions disposal treatment resulted in a release of MC to site soil. Upon completion of the MEC treatment operations, the team collects post-detonation composite soil samples using the CRREL 7-Point Wheel sampling approach	SOP-OPS-15: MEC Avoidance
Material Documented as Safe (MDAS) Management	All RRD and MD is inspected and certified as MDAS prior to shipment for disposal.	SOP-OPS-13: MPPEH Management SOP-OPS-41: Small Boat Operations

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Table 11: Data Quality Indicators and Measurement Performance Criteria

Definable Feature of Work *(Data Type)*	Data Quality Indicator(s)/ QC Surveillance Form #(1)	Activity to Assess Measurement Performance and/or QC Sample	Measurement Performance Criteria	Frequency	Action in Event of Failure
Biological Monitoring	None/NA	Review of Daily Observation Report	Daily Observation	Daily	Retrain Team Biologist
Site Preparation/Identify or Establish Site Survey Control	Accuracy/Form #1	Existing Site Survey Control Points are confirmed; establish Site Survey Control Points as needed. Confirmed Survey Control Points may be used to bring Survey Control onto the Cayo	Project control points must be repeatable to within 10 cm	Beginning of Field Work and Monthly (for frequently used points) or before re-use (if used infrequently)	Site Survey Control Points will be re-established
Site Preparation/ Set up IVS(s)	Accuracy/Form #1	IVS(s) set up IAW SOP-05_DGM SOPs and Checklists	Background survey(s) documents acceptable IVS location(s), IVS seed items placed at required depths, orientations, inclina-tions, IVS seed items photographed, and locations measured with RTK DGPS Government Approval of IVS Technical Memorandum	Beginning of Field Work and any time a new IVS is required	IVS setup is repeated
Site Preparation/ Grid Layout (*positional data*)	Accuracy/Form #1	GIS Manager or designee checks recorded coordinates of placed grids against planned locations	Grid corner measure-ments are within 0.3 meter (m) of planned locations	After placement	Reposition grids
Site Preparation/ Grid Layout *(Vegetation Removal)*	Completeness/Form #1	UXOQCS and Site Geophysicist inspect grid vegetation removal to ensure sufficient access for DGM or Analog and dig	Vegetation removal is sufficient to allow DGM team access or MEC teams for Analog and dig	After vegetation removal.	Retrain vegetation removal teams on DGM access requirements and redo vegetation removal on grids that fail inspec-tion

Definable Feature of Work *(Data Type)*	**Data Quality Indicator(s)/ QC Surveillance Form #(1)**	**Activity to Assess Measurement Performance and/or QC Sample**	**Measurement Performance Criteria**	**Frequency**	**Action in Event of Failure**
Analog and Dig or UXO Avoidance (*detection instrument function*)	Sensitivity/Form #2 and #8	Operator checks analog instrument to confirm response to subsurface "ISOs in ATS (function test)	Audible response to presence of subsurface metallic test item	Start of each survey day in which Analog instruments are used	Repair or replace instrument, then repeat test
Analog and Dig or UXO Avoidance *(performance)*	Accuracy/bias/Form #2	UXOQCS or designee checks operators' use of analog instrument ensuring scanning practices with instrument meet performance requirements	No interfering metallic objects detected, Proper use of equipment. All analog grid blind seed items are recovered	Start of each survey day At least 1 small/ shallow BSI and 1 large/deep BSI per analog grid/lot per operator. BSI depths are consistent with the depths used in the Analog Test Strip specified in SOP06_DGM-01	Repeat analog test strip under UXOQCS observation, retrain operator if necessary Repeat Analog and Dig grid/lot.
Surface Removal (*analog detection instrument function*)	Sensitivity/Form #2	Operator checks analog instrument to confirm response to surface metallic object (function test) on cayo	Audible response to presence of surface metallic test item	Start of each survey day	Repair or replace instrument and then repeat test
Surface Removal: (*coverage*)	Completeness/Form #2	Sweep team personnel clear surface metal and mark MEC for avoidance.	No metal objects equal to or greater than a 37mm in diameter or width on the surface. Any UXO is clearly marked for avoidance. Note: this requirement does not include small arms ammunitions (.50 cal and smaller).	Each grid	Repeat grid surface removal of grid
Surface Removal (*confirm removal*)	Completeness/Form #2	UXOQCS or designee performs resurvey over 10% of cleared Grid	No metal objects equal to or greater than a 37mm projectile in size are found in grid surface	Following completion of grid surface removal	Repeat Grid surface removal; prepare and submit Root Cause Analysis

Definable Feature of Work *(Data Type)*	**Data Quality Indicator(s)/ QC Surveillance Form #(1)**	**Activity to Assess Measurement Performance and/or QC Sample**	**Measurement Performance Criteria**	**Frequency**	**Action in Event of Failure**
Identified MEC Location (Handheld DGPS Geodetic Accuracy)	Functionality/Form #3	Handheld DGPS Operator records coordinates at a known point or monument	Recorded positions should be within 5 m of known position	Once daily per instrument	Perform root cause analysis and determine if data are usable; re-collect unusable data
Grid Surveys positioned with Line and Fiducials *(Geodetic Internal Consistency)*	Precision/Form #3	Team setting line and fiducial positioned grid corners measures each point using RTK DGPS or Professional Land Surveyor (PLS) or Tape Measures	Line and fiducial positioned grid corner measurements are within 0.3 m of planned locations	One corner per line and station positioned grid	Re-set line and station positioned grid corners, recollect or reprocess, if necessary.
DGM Surveys (*GSV blind seeding*)	Accuracy/NA	UXOQCS or designee places blind seeds in DGM grids; blind seeds will be small ISOs at a frequency such that 1 seed should be mapped per grid. After survey, QC Geophysicist checks processed response and interpreted location of blind seed items	All blind seeds detected with at least 75% of minimum expected response at maximum horizontal offset for DGM, based on 0.76m line spacing; 90% positioning offset ≤ 0.63 m and 100% is <=35cm + ½ line/sensor (73 cm) for RTK DGPS positioned data and ≤ 0.88 m for line and fiducial positioned data.	At least one BSI per Grid	Dataset submittal fails. Perform root cause analysis and determine CA.
DGM Surveys (RTK DGPS *Geodetic Functionality*)	Accuracy/Form #3	Operator records coordinates at a known point or monument	Recorded positions should be within 10 centimeters (cm) of known position	Once daily per instrument	Perform root cause analysis and determine if data are usable; re-collect unusable data
DGM Surveys (detection instrument function – static repeatability)	Accuracy/Form #3	DGM operator collects static test data over a small ISO at least once daily and compares measured response with expected response	Daily response (mean static spike minus mean static background) should be within ±10% of the value measured at project startup	Once daily per instrument	Day's data fails unless a blind-seeded test item is mapped with repeatable characteristics (see GSV Blind Seeding MPC above) or IVS

Definable Feature of Work *(Data Type)*	**Data Quality Indicator(s)/ QC Surveillance Form #(1)**	**Activity to Assess Measurement Performance and/or QC Sample**	**Measurement Performance Criteria**	**Frequency**	**Action in Event of Failure**
					response meets response criteria (see IVS data collection MPC below)
DGM Surveys (*IVS data collection)*	Precision/NA	DGM operator collects data over IVS and background noise line	Measured IVS seed item responses are repeatable to +/- 25% of the expected response and location accuracies are ≤25 cm	Twice per day	Day's data fail unless a blind-seeded test item is mapped with repeatable characteristics
DGM Surveys (*along line measurement spacing*)	Completeness/NA	DGM processor measures the spacing between data points in DGM data	98% along line measurement spacing's ≤0.25 m	Once per dataset	Dataset submittal fails; re-collect unusable data
DGM Surveys (*velocity*)	Precision/NA	DGM processor evaluates velocity and sample separation using Geosoft QC tools	95% ≤ 3.4 mph (or maximum velocity demonstrated during IVS).	Once per dataset	Dataset submittal fails; recollect unusable data
DGM Grid Surveys (*coverage RTK DGPS positioning*)	Completeness/NA	Electronic Positioning System: DGM processor evaluates coverage using Geosoft Coverage Calculation QC tool	Electronic Positioning System 90% positioning offset is <=25 cm + ½ line/sensor spacing (63 cm) and 100% is <=35cm + ½ line/sensor (73 cm) for RTK DGPS positioned data	Electronic Positioning System; once per dataset Fiducial Positioning; once per day	Dataset submittal fails: Collect additional data to fill in gaps or recollect dataset, or designate gaps for analog removal if inaccessible
DGM Grid Surveys (*coverage Line and Fiducial positioning*)	Completeness/NA	Fiducial Positioning: UXOQCS or designee observes that DGM team is using guidance ropes/flags to ensure complete coverage	90% positioning offset is <=50cm + 1/2 line spacing (88 cm) for fiducially positioned data. All blind seeds detected at their emplacement location	All Line and Fiducial positioned grids have range markers (pin flags) at a maximum of 25-ft, visual observation at least once per day.	Dataset submittal fails, recollect dataset.

Definable Feature of Work *(Data Type)*	**Data Quality Indicator(s)/ QC Surveillance Form #(1)**	**Activity to Assess Measurement Performance and/or QC Sample**	**Measurement Performance Criteria**	**Frequency**	**Action in Event of Failure**
			within the dynamic positioning repeatability metric.		
DGM Grid Anomaly Selection	Completeness/NA	Project and QC Geophysicists review data processing and anomaly selections are IAW the IVS Technical Memorandum	Grid anomalies are selected at a threshold of 5 to 6 times the IVS noise value, established in the IVS Technical Memorandum	Per Grid	Reselect Grid Anomalies
DGM Anomaly Reacquisition (*detection instrument function – detectability)*	Accuracy/Form #4	Operator checks their analog instrument over the Analog Test Strip. Team leader records 100% IVS seed item detection in their logbook.	Daily detection of 100% IVS seed items	Once daily per instrument	Day's reacquisition responses are unreliable and must be re-measured. If anomalies have already been investigated they must be revisited to confirm they have been resolved
DGM Anomaly Reacquisition (*reacquisition response and offset*)	Precision/Form #4	Team Leader reviews reacquisition location to confirm they are consistent with selected anomaly	Anomalies have reacquisition response and extent similar to selected anomaly. Response peak offset is ≤ 0.65m for RTK DGPS positioned grids and ≤ 0.8 m for line and station positioned grids. No Finds are marked for 100% check by the field QC team with an EM61-MK2.	Weekly, at minimum	Review anomalies not meeting MPC to determine why original response not reacquired; if necessary, reassign anomaly to field team for verification

Definable Feature of Work *(Data Type)*	**Data Quality Indicator(s)/ QC Surveillance Form #(1)**	**Activity to Assess Measurement Performance and/or QC Sample**	**Measurement Performance Criteria**	**Frequency**	**Action in Event of Failure**
Subsurface Removal: DGM Anomalies (*anomaly investigation*)	Completeness/Form #5	Removal team checks post excavation anomaly response using Analog sensor	Resolved anomalies have no remnant anomaly response	After investigating DGM anomaly	Intrusively investigate anomaly source further; if source remains beyond max. removal depth, make note on dig sheet that anomaly source remains
Subsurface Removal: DGM Anomalies (anomaly resolution, *confirm removal (3)*)	Completeness/Form #5	UXOQCS or designee checks 100% of reported no finds in each lot with an EM61-MK2 to ensure response values are below anomaly selection threshold. The field QC team follows the Acceptance Sampling Table (90% confidence <1% unresolved per lot (2) to confirm they have been adequately resolved (2). No finds are subtracted from the number of anomalies per lot for resolution purposes.	All checked anomalies are adequately resolved (EM61-Mk2 response is below anomaly selection threshold. Accept on zero	Following lot (2) completion	Reinvestigate all anomalies in affected lot (2); prepare and submit Root Cause Analysis
Subsurface Removal: DGM Anomalies (*geophysical feed-back*)	Accuracy and completeness/NA	QC Geophysicist or their designee reviews and compares excavation results with geophysical anomaly data	Any “no contact” results for anomalies at or above the anomaly selection threshold established at the IVS or inconsistent excavation results.	Weekly, at minimum	Review anomalies not meeting MPC to determine why nothing was found, or recheck inconsistent anomalies.

Definable Feature of Work *(Data Type)*	**Data Quality Indicator(s)/ QC Surveillance Form #(1)**	**Activity to Assess Measurement Performance and/or QC Sample**	**Measurement Performance Criteria**	**Frequency**	**Action in Event of Failure**
Analog Surveys (*blind seeding*)	Accuracy/Form #2	UXOQCS or designee places blind and coverage seeds in all Analog grids; blind seeds will be small and large ISOs, at depths and inclinations that match the analog test strip	All blind and coverage seeds detected	Per operator per lot: variable 1-2 large/deep and 1-3 small/shallow. Note: in rocky soils, variable coverage seeds may be used	Redo lot; Perform root cause analysis and determine CA
Subsurface Removal: Analog Anomalies (*analog repeatability*)	Sensitivity/Form #5	Operator checks instrument to confirm response to subsurface ISOs in analog test strip (function test)	Detection of all subsurface metallic test items	Start of each survey day	*Operator failure*: Remedial training and removal from survey for one day *Instrument failure*: Replacement of faulty equipment
Subsurface Removal: Analog Anomalies (*detection*)	Completeness/Form #5	UXOQCS reviews the intrusive results for each grid	Removal teams recover all blind and coverage seeds	Per grid	Repeat subsurface removal; prepare and submit Root Cause Analysis
Subsurface Removal: Analog Anomalies (*anomaly resolution*)	Completeness/Form #5	UXOQCS or designee follows the Acceptance Sampling Table (90% confidence <1% unresolved per lot (1) to confirm they have been adequately resolved (2).	All checked anomalies are adequately resolved. Accept on zero.	Rate varies depending on lot size (2)	Repeat subsurface removal across 100% of failed lot (1); prepare and submit Root Cause Analysis
MPPEH Handling, Certification, and Disposal (*MPPEH/MEC identification*)	Accuracy/Form #6	UXOQCS verifies identification of MEC items using review of photographs	MEC item correctly identified	Daily	Revise dig sheet records; re-brief field personnel

Definable Feature of Work *(Data Type)*	**Data Quality Indicator(s)/ QC Surveillance Form #(1)**	**Activity to Assess Measurement Performance and/or QC Sample**	**Measurement Performance Criteria**	**Frequency**	**Action in Event of Failure**
MPPEH Handling, Certification, and Disposal [*Material Documented as an Explosive Hazard (MDEH) certification*]	Completeness/Form #6	UXOQCS audits MPPEH management	MDEH is assigned a unique identification (ID) and segregated from other materials, and accounted for; CoC and final disposition accounted for on Daily Operations Report	Daily, when MDEH identified	Rectify non-conformance immediately; re-brief and retrain, or replace, personnel
MPPEH Handling, Certification, and Disposal (*MDEH accountability*)	Accuracy/Form #6	UXOQCS reconciles entries on reports through physical count	Quantity and type of MDEH encountered	Daily, when MDEH reclassified MDAS or destroyed	Correct entry
MPPEH Handling, Certification, and Disposal (*MDEH disposal*)	Completeness/Form #6	UXOQCS records all MDEH items processed in daily logs	All MDEH disposed of by detonation or reclassified MDAS	Per event	Correct entry or report discrepancies to SUXOS, Site Manager, and USA PM
MPPEH Handling, Certification, and Disposal (*MDEH/MEC disposal complete*)	Completeness/Form #6	SUXOS verifies complete destruction of item(s)	All explosive materials (donor explosives and MDEH/MEC) in disposal shot are consumed by the explosion and there are no kick-outs	Per event	Perform additional disposal of any remaining materials
MPPEH Handling Certification and Disposal (MPPEH processing to RRD/MD)	Completeness/Form #6	SUXOS ensures QAPP and associated plans specify responsibilities and processing of MPPEH for final disposition as MD or RRD	Required approved Plans describing the processing of MPPEH for final disposition as MD and RRD are in place and approved. These plans are readily available to the Field Team	The start of field work. Monthly to ensure Field Team has access to Plans	Correct deficiencies within the plans/or Field Team access to plans.

Definable Feature of Work *(Data Type)*	**Data Quality Indicator(s)/ QC Surveillance Form #(1)**	**Activity to Assess Measurement Performance and/or QC Sample**	**Measurement Performance Criteria**	**Frequency**	**Action in Event of Failure**
MPPEH Handling Certification and Disposal [Material Documented as Safe (MDAS) certified]	Accuracy/Form #6	SUXOS confirms DD Form 1348-1A is complete for all MD/RRD prior to transfer	1348-1A reflects the contents in the associated containers.	Prior to security seal placed on the individual MDAS container and following the replacement of a broken security seal	Rectify non-conformance immediately, re-brief and retrain, or replace personnel
MPPEH Handling Certification and Disposal (MDAS certified)	Completeness/Accuracy/ Form #6	SUXOS performs random checks of MD/RRD is free of explosive hazards	No MPPEH or explosives discovered	Prior to security seal placed on the individual MDAS container and following the replacement of a broken security seal	Rectify non-conformance immediately, re-brief and retrain, or replace personnel
MPPEH Handling Certification and Disposal (MDAS certified)	Completeness/Accuracy/ Form #6	SUXOS certifies RRD and MD is free of explosive hazards, engine fluids, illuminating dials and visible liquid Hazardous, Toxic, or Radioactive Waste materials	All RRD and MD is free of listed hazards and documentation reflects the certification on the 1348-1A as such with SUXOS signature	Prior to security seal placed on the individual MDAS container and following the replacement of a broken security seal	Rectify non-conformance immediately, re-brief and retrain, or replace personnel
MPPEH Handling Certification and Disposal (MDAS Packaging)	Completeness/Form #6	SUXOS ensures MDAS Certified material is properly sealed in its container, labeled and possesses the proper documentation	All drums are properly sealed with proper documentation	Per Event	Rectify non-conformance immediately, re-brief and retrain, or replace personnel
MPPEH Handling, Certification, and Disposal*(MDAS certified*)	Completeness/Form #6	UXOQCS audits MPPEH management	MDAS is segregated from other materials, stored in locked con-tainer, and accounted for by weight; CoC and final disposition accounted for on DD Form 1348-1A	Daily	Rectify non-conformance immediately; re-brief and retrain, or replace, personnel

Definable Feature of Work *(Data Type)*	**Data Quality Indicator(s)/ QC Surveillance Form #(1)**	**Activity to Assess Measurement Performance and/or QC Sample**	**Measurement Performance Criteria**	**Frequency**	**Action in Event of Failure**
MPPEH Handling, Certification, and Disposal (*MDAS disposal complete*)	Completeness/NA	USA PM confirms MDAS containers shipped to approved facility for proper disposal	Disposal documentation received and on file for all MDAS transported off site	After each shipment of MDAS off site	Contact disposal facility to confirm destruction; request copies of disposal documentation
Donor Explosives Management (*appropriate explosives delivered*)	Accuracy/Form #7	Demolition Team Leader (DTL) reconciles delivery documents with explosives ordered and received	Quantity of explosives ordered and received matches delivery documents	Each explosives delivery	Immediately report discrepancies to SUXOS, Site Manager, and USA PM USA PM notifies USACE PM and contacts explosives distributor to reconcile differences
Donor Explosives Management (*all explosives accounted for*)	Accuracy/Form #7	DTL and UXOQCS reconcile entries on Explosives Usage Record(s) through physical count	Quantity of explosives used correctly entered	End of each MEC disposal	Correct entry
Donor Explosives Management (*all explosives consumed or returned*)	Completeness/Form #7	DTL or UXOQCS record all returned or transferred items on Explosives Usage Record(s)	All unused explosives either disposed of by detonation or custody and accountability have been transferred back to the distributor	End of project	Correct entry or report discrepancies to SUXOS, Site Manager, and USA PM

(1) Three Phase Control (TPI) QC Surveillance Forms located in Appendix D.

(2) Lot size is one 50-ft by 50-ft grid.

MC-RELATED TASKS

The below table summarizes the MPCs that have been established for the MC-related tasks for the TCRA. The quality of the sampling procedures and laboratory results will be evaluated for compliance with DQOs through a review IAW the procedures described in WS #37. The results will be summarized in a Data Validation Report (DVR). Sample collection procedures and analytical methods/SOPs are summarized on WS #21 and WS #23, respectively.

This Worksheet contains the following tables:

Table 12: Measurement Performance Criteria for Sample Collection

Table 13: Measurement Performance Criteria for Explosives in Soil

Table 14: Measurement Performance Criteria for Ammonium Picrate in Soil

Table 12: Measurement Performance Criteria for Sample Collection

Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
Completeness	Planned no. of samples matches no. of samples collected.	Project Chemist reviews CoCs vs. plan	S
Completeness	Planned QC samples matches no. of QC samples collected	Project Chemist reviews CoCs vs. plan	S
Completeness	CoC form lists correct samples and analyses	Project Chemist reviews CoCs vs. plan	S&A
Accuracy	CoC form correctly filled out and signed	Project Chemist reviews CoCs	S&A

Table 13: Measurement Performance Criteria for Explosives in Soil

Matrix: Soil/Sediment
Analytical Group: Explosives

Sampling Procedure	Analytical Method/SOP	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
Composite	8330B See WS #19 for SOP numbers	Accuracy/Bias	<1/2 Limit of Quantitation (LOQ)	Method Blank	A
		Accuracy/Bias	See WS #28	Laboratory Control Sample (LCS)	A
		Precision	RPD≤50% when target compound detected above the LOQ for both parent and field duplicate samples	Field Duplicate*	S&A
		Accuracy/Bias	See WS #28	Matrix Spike**	A
		Precision	See WS #28	Matrix Spike Duplicate**	S&A
		Accuracy/Bias	See WS #28	Surrogate Spike	A
		Completeness	>90% collection, >90% laboratory analysis	Data Completeness Check	S & A

* Field Duplicates: For all samples, field duplicates will be collected at the frequency of one per every ten field samples per matrix per analytical method. Field duplicate samples are samples collected simultaneously from the same media source under identical conditions. Field duplicates sent to the laboratory will be labeled with different sample collection time and sample identification so analysts performing laboratory analyses cannot distinguish duplicates from other samples.

** Matrix Spikes / Matrix Spike Duplicates: For the laboratory analyses, MS/MSDs are used to assess interferences in analytical results caused by the sampled matrix. The analytical laboratory spikes the MS/MSDs with known concentrations of representative target compounds, and then analyzes the MS/MSDs. The percent recovery is calculated and used to evaluate interference effects. One set of MS/MSD will be collected per every 20 field samples per matrix per analytical method. The MS/MSD samples will be collected and labeled the same as the parent sample with the addition of “MS/MSD” noted on the sample label and on the chain-of-custody (CoC) form.

Table 14: Measurement Performance Criteria for Ammonium Picrate in Soil

Matrix: Soil/Sediment
Analytical Group: Picric Acid

Sampling Procedure	Analytical Method/SOP	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A), or Both (S&A)
Composite	EPA 8321 See WS #19 for SOP numbers.	Precision	RPD≤40% for water matrix and RPD≤50% for soil matrix when picric acid detected above the LOQ for both parent and field duplicate samples	Field Duplicate	S&A
		Accuracy/Bias	< ½ LOQ	Method Blank	A
		Accuracy/Bias	See WS #28	Matrix Spike, LCS	A
		Precision	See WS #28	Matrix Spike Duplicate	S&A
		Accuracy/Bias	See WS #28	Surrogate Spike	A
		Completeness	>90% collection, >90% laboratory analysis	Data Completeness Check	S&A

Ammonium Picrate results will be calculated based on Picric Acid results multiplied by a molecular weight conversion factor.

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WORKSHEET #13: SECONDARY DATA USES AND LIMITATIONS

(UFP-QAPP Manual Section 2.7)
(EPA 2106-G-05 Chapter 3: QAPP Elements for Evaluating Existing Data)

Table 15: Secondary Data Uses and Limitations

Data Type	Source	Data uses relative to current project	Factors affecting the reliability of data and limitations on data use
Climate and weather Data	National Weather Service	Estimations of rainfall amounts, cyclical sea conditions.	Unexpected storms may arise.
Topographic Data	USGS Maps	Location to access the cayo.	
Bathymetric Surveys	Environmental Baseline Survey Report, Underwater Portions of MRSs 07 AND 02, Culebra PR (Parsons March 2014)	Valuable information on underwater conditions relevant to accessing the cayo.	Underwater bottom conditions altered due to weather or tide.
Historical Data	Archives Search Report, Archives Search Report Supplement, 1997 Engineering Evaluation/Cost Analysis 2016 EOD Response	Provide information on historical site use, range locations, and types of munitions.	All types of munitions used onsite may not be reported.

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WORKSHEET #14 & 16: PROJECT TASKS & SCHEDULE

(UFP-QAPP Manual Section 2.8.2)
(EPA 2106-G-05 Section 2.2.4)

The field operations involve multiple elements, or "DFWs, that will be required to achieve the DQOs/PQOs. This worksheet provides a summary of these DFWs and the associated component tasks. A detailed discussion of each of the DFWs is included on WS #17, #18 and the specific field procedures to be used for the activities described in this summary are included in the various SOPs listed in WS #21 & #22, and appended to this UFP-QAPP. Table 16 summarizes the DFWs.

The initial project schedule is detailed in Section 6 of the Project Management Plan (PMP) and will be routinely updated and distributed as directed by the COR, primarily as part of the monthly status reports.

Table 16: Definable Features of Work and Associated Tasks

Definable Feature of Work	Associated Tasks
Cayo del Agua Turtle Nest Monitoring	Cayo del Agua is a Zone 1 Turtle Nesting Area and does not require sea turtle beach monitoring to determine the presence of sea turtle nests.
Mobilization	Preparation (review plans, make travel arrangements, etc.) Arrange for equipment and vehicles, and have them delivered to the site Set up site communications Conduct site-specific training and briefing for required field personnel
Site Specific Training	Field teams receive training on MEC-QAPP and sub plan elements, objectives and safety. In addition the field teams are briefed on the ecological concerns for the work site and Culebra. Site Specific Training will also include a site visit for selected FMT and the USA Team Biologist to the Cayo with a USFWS Representative. The USFWS Representative will identify examples of habitat that requires protection. The FMT will identify and document a means to complete the TCRA objectives while meeting the USFWS concerns."
Biological Monitoring	Perform daily Biological Monitoring prior to vegetation removal or intrusive activity according to the SOP for Endangered Species Conservation, USACE Jacksonville District (Appendix G). The biologist will maintain a log detailing sightings. The log will 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.

Definable Feature of Work	Associated Tasks
Vegetation Removal	Vegetation removal of vegetation for DGM surveys and analog and dig in Cayo del Agua grids. Vegetation removal will be per the MEC-QAPP and associated plans and additional applicable guidance such as the Final Supplemental Standard Operating Procedure (SOP) for Endangered Species Conservation and their Critical Habitat (CESAJ 2015)
Geographic Information System (GIS) Data Management	Establish grid points Prepare maps and GIS for field use and final reports Prepare GIS deliverable
Site Preparation	Establish Site Survey Controls Set up IVS and analog test strip Lay out grids Conduct vegetation removal where needed and allowable in grids Prepare the MDAS processing area by vegetation removal and installing a temporary plastic fence to identify the site perimeter
Surface Clearance	Surface clearance of Cayo del Agua is conducted by MEC teams, removing MD, RRD and cultural debris when applicable. Any MEC discovered during the surface clearance is marked, by GPS coordinates collected and left in place until demolition operations can be coordinated. (Trimble GEOXT, Tablet GPS if tablets are used or DGPS Prior to MEC treatment coordinates may be updated with RTK DGPS)
DGM Geophysical Investigation and Collect Daily IVS , Dynamic Checks and Cayo Daily Static Checks	DGM survey of Cayo del Agua by EM61-MK2 is conducted in all DGM accessible areas. In addition to the daily IVS dynamic check, the DGM team performs a daily Static check on the Cayo
DGM Data Processing and Anomaly Selection	Process DGM grid data and generate dig list
Reacquisition and Intrusive Investigation	Trimble RTK DGPS is used to establish 50-ft by 50-ft grids and for the reacquisition of DGM anomalies for intrusive investigation. For areas in which DGM was not possible analog and dig is performed within the 50-ft by 50-ft grids. Verification that MPCs have been met
Analog Geophysical Investigation and Daily Instrument Checks	Analog instruments (Minelab ETRAC or other equivalent all-metals detectors) are used in areas inaccessible to DGM in 50 ft x 50 ft grids. Daily Analog instrument checks will be conducted at the analog test strip.
Treatment of discovered MEC	Treatment of MEC by detonation is performed on Cayo del Agua if item is deemed unsafe to move.

Definable Feature of Work	Associated Tasks
MPPEH/MEC Handling, Certification, and Disposal	All RRD and MD is inspected and certified as MDAS prior to shipment for disposal. Conduct demolition operations IAW approved ESS Perform any necessary site restoration Inspect, certify, and verify MPPEH Package MDAS and store in secure location pending disposal Ship MDAS offsite to approved disposal facility and obtain necessary disposal documentation Prior to demobilization the MDAS processing site will be cleaned of all trash, equipment and inspected.
Donor Explosives Management	Document delivery of demolition explosives Explosives are stored in magazine between delivery and demolition event Maintain 24 hour security when explosives are in magazine Track and document use of demolition explosives through project completion
Post-Detonation Soil Sampling	Collect surface soil samples at locations where demolition is conducted. Package and ship samples to laboratory Prepare Sampling DQCR on days of sampling events.
Demobilization	Upon completion of field activities all personnel, equipment and materials will be removed from the sites

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WORKSHEET #15: PROJECT ACTION LIMITS AND LABORATORY-SPECIFIC DETECTION / QUANTITATION LIMITS

(EPA UFP-QAPP Guidance Manual, Section 2.8.1)

MEC-RELATED TASKS

This worksheet is not relevant to MEC-Related Tasks.

MC-RELATED TASKS

This worksheet provides the parameters to be analyzed and their associated detection limits (DLs), limits of detection (LODs), and LOQs in order to satisfy the overall DQOs. The screening values, as referenced in the DQOs, are also included for comparison with laboratory achievable DLs, LODs, and LOQs.

The Human Health screening values provided were derived from the May 2016 USEPA Regional Screening Levels for Residential Soil (target risk = 1E-06; target hazard quotient = 0.1).

There are no EcoSSLs for explosive compounds. Therefore, the ESVs for explosive compounds were derived from the LANL, EcoRisk Database v.3.3, 2015. No screening value is available for ammonium picrate.

This Worksheet contains the following tables:

Table 17: Screening Values and Reference Limits for Explosives in Soil - APPL, Inc.

Table 18: Screening Values and Reference Limits for Ammonium Picrate in Soil - APPL, Inc.

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Table 17: Screening Values and Reference Limits for Explosives in Soil - APPL, Inc.

Method: Explosives using SW846 8330B

Analyte	Chemical Abstract Service (CAS) Number	USEPA RSL Resident Soil (mg/kg)	LANL ESV (mg/kg) (2)	Achievable Laboratory Limits		
				LOQ (1) (mg/kg)	LOD (mg/kg)	DL (mg/kg)
2-Amino-4,6-dinitrotoluene	35572-78-2	15	14	0.50	0.20	0.075
4-Amino-2,6-dinitrotoluene	19406-51-0	15	12	0.50	0.20	0.075
1,3-Dinitrobenzene	99-65-0	0.63	0.073	0.45	0.20	0.063
2,4-Dinitrotoluene	121-14-2	1.7	0.29	0.50	0.20	0.083
2,6-Dinitrotoluene	606-20-2	0.36	4.1	0.50	0.20	0.083
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	6.1	2.3	0.50	0.20	0.080
Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	479-45-8	16	1.5	0.50	0.20	0.091
Nitrobenzene	98-95-3	5.1	2.2	0.50	0.20	0.075
Nitroglycerin	55-63-0	0.63	13	0.50	0.20	0.085
2-Nitrotoluene	88-72-2	3.2	9.9	0.50	0.20	0.066
3-Nitrotoluene	99-08-1	0.63	12	0.50	0.20	0.071
4-Nitrotoluene	99-99-0	25	22	0.50	0.20	0.080
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0	390	16	0.50	0.20	0.080
Pentaerythritol tetranitrate (PETN)	78-11-5	13	100	2.5	1.0	0.579
1,3,5-Trinitrobenzene	99-35-4	220	10	0.50	0.20	0.079
2,4,6-Trinitrotoluene	118-96-7	3.6	7.6	0.50	0.20	0.083

(1) Yellow highlighted values indicate that the value is greater than a screening level. Refer to WS #37 for discussion of data usability when laboratory limits are greater than a screening level.

Reference:

(1) USEPA Regional Screening Level (RSL) Summary Table, resident soil, TR=10^{-6}, HQ=0.1, May 2016.
(2) No USEPA EcoSSL available. Used Los Alamos National Laboratory (LANL), EcoRisk Database v.3.3, 2015.

Table 18: Screening Values and Reference Limits for Ammonium Picrate in Soil - APPL, Inc.

Analyte	CAS Number	USEPA RSL Resident Soil (mg/kg)	LANL ESV (mg/kg)	Achievable Laboratory Limits Milligram/kilogram (mg/kg)		
				LOQ	LOD	DL
Matrix: Soil						
Picric Acid (SW8321A)						
Picric Acid	131-74-8	5.7 mg/kg (1)	NA	0.2	0.12	0.06

N/A - No screening values available,

(1) Screening value is for Picric Acid (2,4,6-trinitrophenol), no RSL is available for Ammonium Picrate. Ammonium Picrate results will be calculated based on Picric Acid results multiplied by a molecular weight conversion factor. There is no RSL for ammonium picrate.

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WORKSHEET #17: SAMPLING DESIGN AND RATIONALE

(EPA UFP-QAPP Manual, Section 3.1.1)

MEC-RELATED ACTIVITIES

This worksheet summarizes the project design for the MEC-related tasks that will be required to successfully complete field operations during this project and achieve the DQOs described in WS #11.

General TCRA Technical Approach

During the TCRA, field teams will identify the locations of munitions [visually, through DGM, and through analog detection techniques] and remove MEC, Material Potentially Presenting an Explosive Hazard (MPPEH), and explosive hazards from the land portions of Cayo del Agua. Range-related debris equal to and greater than 37mm in diameter will be removed and is anticipated to also include tires used to define the target area. Due to the presence of sensitive species on the land and in the water, biological monitoring will be conducted prior to and during field operations. At locations of any demolition operations, environmental sampling will be conducted to evaluate if the TCRA munitions treatment by detonation resulted in a release of MC to surface soil.

Further details are provided in the DFWs below.

Biological Monitoring and Sea Turtle Beach Monitoring

Due to the known presence of Threatened and Endangered Species within the land and water portions of Cayo del Agua, the team will include a Biologist to maintain a daily record of sightings for Listed as Threatened or Endangered Species and/or protected species. The Biologist also will make recommendations on how to avoid and protect these species during the field work.

Cayo del Agua is a Zone 1 sea turtle nesting area and does not require sea turtle beach monitoring to determine the presence of sea turtle nests.

Protected plant species may be present on the Cay. The team biologist will monitor field work to ensure protected plant species are identified and documented; the biologist will also provide recommendations to the field teams on how to protect the identified species.

General Ecological Conservation Measures

For general conservation measures as they apply to the cayos and the marine habitat see Appendix G, *Supplemental Standard Operating Procedures for Endangered Species Conservation and their Critical Habitat* (Section 4.1).

Anchoring

Anchoring on established seagrass beds and coral is prohibited IAW Appendix G: *Final Supplemental SOP for Endangered Species Conservation and their Critical Habitat (Addendum 1)* (CESAJ, February, 2015), Section 4.3.8. USA field teams will anchor small boats in areas with sand bottoms or will use multiple mooring points with anchors on shore and in sand areas to allow the vessel/barge to be positioned in a manner in which the work force and equipment can be brought ashore but avoids impacting coral and seagrass. The site selected for mooring the transport vessel and barge is devoid of corals and consists of rocks over a consolidated hard bottom.

If during the field work the vessel or barge is grounded and corals are suspected of being injured whatever activity causing the damage will be stopped, the injured coral will be photographed if possible and left in place and the USACE PM, U. S. Coast Guard (USCG), NMFS Boquerón Office and PR DNER should be immediately notified. If listed corals are known to have been injured, the USACE will also contact 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 will perform the following:

- Turn off the engine.
- Do not try to use the engine to power off the reef, hardbottom or seagrass.
- Raise the propeller, and allow the boat to drift free.
- Radio the Coast Guard, Marine Patrol or Very High Frequency (VHF) Channel 16 for assistance.

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

Marine Mammals, Turtles and Manatee

Marine mammals and sea turtles are federally protected and are known to occur or have the potential to occur in the waters around Culebra Island and the adjacent Cays. Species include:

Trichechusmanatus mantus (Antillean Manatee)
Caretta Caretta (Loggerhead Sea Turtle)
Cheloniamydas (Green Sea Turtle)
Dermochelyscoriacea (Leatherback Sea Turtle)
Eretmochelys imbricate (Hawksbill Sea Turtle)
Magapteranovaiangliae (Humpback Whale)
Balaenopteraphysalus (Finback Whale)
Balaenoptera borealis (Sei Whale)
Physetermacrocephalus (Sperm Whale)
Balaenopteramusculus (Blue Whale)

Marine Mammals and Sea Turtles Avoidance Measures

Vessel strike avoidance measures are provided in Appendix G, Final Supplemental SOP for Endangered Species Conservation and their Critical Habitat (Addendum 1) (CESAJ, February, 2015) Appendix A, page 12, items 1-6.

All personnel associated with the TCRA will be instructed 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 TCRA work 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 in the above mentioned SOP.

All vessels associated with the TCRA 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.

Mooring bumpers shall be placed on all vessels or barge wherever and whenever there is a potential for marine mammal or sea turtle to be crushed between two moored vessels.

Vessel operator and field team 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 ft [100 yards (yds.)] 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 ft (50 yd.) of a marine mammal or sea turtle. If a marine mammal or sea turtle is closer than 150 ft (50 yd.) to moving equipment the equipment shall be shut down and all water borne activities shall cease to ensure protection of the species.

When marine mammals or sea turtles are sighted while a vessel 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 Field Team shall monitor for the presence of marine mammals and sea turtles.

All sightings and actions taken shall be reported as described in Part 4.1.6 of Appendix G, Final Supplemental SOP for Endangered Species Conservation and their Critical Habitat (Addendum 1) (CESAJ, February, 2015).

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 of Appendix G, Final Supplemental SOP for Endangered Species Conservation and their Critical Habitat (Addendum 1) (CESAJ, February, 2015).

Seabirds

The cayos surrounding Culebra are known nesting areas for shorebirds, seabirds, and sea turtles. Although seabirds may be present on the cayos year round, the majority of shorebird and seabird nesting occurs during the spring and summer months. Critical times that MEC should not be detonated because of seabird activity is between the months of April through September; this would also be applicable of most sea turtle nesting. All work schedules will be coordinated with the responsible natural resource agencies to avoid or mitigate possible disturbance of sensitive species during nesting seasons.

The Roseate Tern (*Sterna dougallii*) is listed as threatened and the Brown Pelican (*Pelecanus occidentalis*) was delisted due to recovery but is being monitored. A complete list of seabirds that occur in the project area is included in Appendix G the SOP for USACE Final Standard Operating Procedure for Endangered Species and Conservation and Their Critical Habitat with Addendum 1, DERP-FUDS Property No. I02PR0068, Culebra Island, Puerto Rico (CESAJ, February 2015). Within this SOP Appendix D Lists the following seabirds found in Table 19 and Table 20 that visit Culebra and the Cayos of MRS 02.

Table 19: Culebra Archipelago Seabirds

Species Name	Nesting?	Species Name	Nesting?
Audubon's Shearwater	Yes	Least Tern	Yes
Masked Booby	Yes	Great Shearwater	No
Brown Booby	Yes	Manx Shearwater	No
Red-footed Booby	Yes	Wilson's Storm-Petrel	No
White-tailed Tropicbird	Yes	Leach's Storm-Petrel	No
Red-billed Tropicbird	Yes	Double-crested Cormorant	No
Laughing Gull	Yes	Common Tern	No
Royal Tern	Yes	Arctic Tern	No
Sandwich Tern	Yes	Pomarine Skua	No
Cayenne Tern	Yes	Black Noddy	No
Roseate Tern	Yes	Herald's Petrel	No
Bridled Tern	Yes	Brown Pelican	Yes
Sooty Tern	Yes	Magnificent Frigatebirds	No*
Brown Noddy	Yes		

*Need to be confirmed; potential areas for nesting occur.

Table 20: Seabird Areas on Culebra Archipelago

Seabird areas on Culebra Archipelago	Bird Name	Observed or Nesting	Nesting Period	Resident or Migratory
Flamenco Peninsula	Sooty Tern	nesting	March to September	Migratory
Luis Peña Cay	Audubon's Shearwater	nesting	February to July	Migratory
	White-tailed Tropicbird	nesting	February to September	Migratory
	Red-billed Tropicbird	nesting	May to September	Migratory
Del Agua Cay	Audubon's Shearwater	nesting	February to July	Migratory
	White-tailed Tropicbird	nesting	February to September	Migratory
	Bridled Tern	nesting	April to August	Migratory
	Brown Noddy	nesting	April to August	Migratory
Ratón Cay	Audubon's Shearwater	nesting	February to July	Migratory
	Red-billed Tropicbird	nesting	May to September	Migratory
	Roseate Tern	nesting	April to July	Migratory
	Bridled Tern	nesting	April to August	Migratory
	Brown Noddy	nesting	April to August	Migratory
Yerba Cay	Audubon's Shearwater	nesting	February to July	Migratory
	Red-billed Tropicbird	nesting	May to September	Migratory
	Roseate Tern	nesting	April to July	Migratory
	Bridled Tern	nesting	April to August	Migratory
	Sooty Tern	nesting	March to September	Migratory
	Brown Noddy	nesting	April to August	Migratory

Seabird areas on Culebra Archipelago	Bird Name	Observed or Nesting	Nesting Period	Resident or Migratory
Lobo Cay	Audubon's Shearwater	nesting	February to July	Migratory
	White-tailed Tropicbird	observed	February to September	Migratory
	Red-billed Tropicbird	observed	May to September	Migratory
Lobito Cay	Audubon's Shearwater	nesting	February to July	Migratory
	Red-billed Tropicbird	nesting	May to September	Migratory
	Laughing Gull	nesting	April to September	Migratory
	Royal Tern	nesting	May to July (Sept to April)	Migratory
	Sandwich Tern	nesting	May to July (Sept to April)	Migratory
	Cayenne Tern	nesting	May to July	Migratory
	Bridled Tern	nesting	April to August	Migratory
Noroeste Cay	White-tailed Tropicbird	nesting	February to September	Migratory
	Bridled Tern	nesting	April to August	Migratory
	Sooty Tern	nesting	March to September	Migratory
	Brown Noddy	nesting	April to August	Migratory
Molinos Cay	White-tailed Tropicbird	nesting	February to September	Migratory
	Red-billed Tropicbird	nesting	May to September	Migratory
	Roseate Tern	nesting	April to July	Migratory
	Bridled Tern	nesting	April to August	Migratory
	Sooty Tern	nesting	March to September	Migratory
	Brown Noddy	nesting	April to August	Migratory
Alcarraza Cay	Audubon's Shearwater	nesting	February to July	Migratory
	Red-billed Tropicbird	nesting	May to September	Migratory
	Masked Booby	nesting	Throughout the year	Resident
	Brown Booby	nesting	Throughout the year	Resident
	Bridled Tern	nesting	April to August	Migratory
	Sooty Tern	nesting	March to September	Migratory
	Brown Noddy	nesting	April to August	Migratory
Matojo Cay	Audubon's Shearwater	nesting	February to July	Migratory
	Red-billed Tropicbird	nesting	May to September	Migratory
	Royal Tern	nesting	May to July (Sept to April)	Migratory
	Laughing Gull	nesting	April to September	Migratory
	Sandwich Tern	nesting	May to July (Sept to April)	Migratory
Geniquí Cays	Red-billed Tropicbird	nesting	May to September	Migratory
	Brown Booby	nesting	Throughout the year	Resident
	Laughing Gull	nesting	April to September	Migratory
	Bridled Tern	nesting	April to August	Migratory
	Brown Noddy	nesting	April to August	Migratory
	Red-footed Booby	nesting	Throughout the year	Resident

Seabird areas on Culebra Archipelago	Bird Name	Observed or Nesting	Nesting Period	Resident or Migratory
Culebrita Island	Audubon's Shearwater	nesting	February to July	Migratory
	White-tailed Tropicbird	observed	February to September	Migratory

Seabirds are pelagic birds. This means that they just come to land to nest and after that, they pass the rest of the time flying over the ocean looking for food. The nesting season of seabirds consists of the period of time that birds are present or near lands doing courtships, nesting area selections, nesting periods, etc. This period is finished when fledglings or juveniles abandon the colony area. The most critical months in Culebra Island for seabirds are from February to August. During this period, the seabirds, and depending on the species, are in the process of courtship, selection of nesting areas, laying eggs, feeding their chicks, and protecting their fledglings from predators. Areas more used by birds in the Culebra Archipelago are Yerba, Molinos, Alcarraza, Geniqui, Lobito, Agua, Raton and Matojo cayos, and Flamenco Peninsula.

The most common and dangerous perturbations in the seabirds colonies are predators and human disturbances. In the Culebra offshore cays, introduced predators such as cats and rats, can eat eggs and chicks. Also, other predators (i.e., goats and deer) in the cays can manipulate and change the nesting habitat by grazing. Human disturbances as loud noise made by jet skis, boats, and other sources, or just the presence of one or more persons near the colony(ies) may cause abandonment of nests by adults which may cause eggs overheat and predated by ants, rats, or cats. It is very important not to disturb the colonies during nesting season. Any work or activity necessary to do near or in colony areas should be completed outside of nesting period.

Field work will be implemented on the Cayos outside of nesting season. During field operations the team biologist will assess each cay for the presence of nesting seabirds to determine if the scheduled field operation can be conducted. In addition, prior to a munition detonation, a qualified observer will check the beach and adjacent waters surrounding the cayo for the presence of protected and listed seabird species by scanning the area with 10 X 50 binoculars. The qualified observer (team biologist) will also survey the beaches for signs of bird nesting. If bird nests are found within the detonation site and/or blast impact area, no detonation will be conducted in that area. If any protected bird species are within 200 meters of the detonation site, the MEC detonation will be delayed until after the animal(s) leave the area. In addition, if blast impacts will extend into nearshore waters, a qualified observer for sea turtles and marine mammals shall be required. If these species are observed the detonation shall be postponed until the animal has left the impact zone or more than 30 minutes have elapsed since it was last sighted.

All on-site project personnel will be instructed during site orientation training of the potential threatened and endangered species in the area and of the need to avoid harming these plants and animals. On-site personnel will be instructed that civil and criminal penalties exist for harming, harassing, or killing birds, manatees, sea turtles, dolphins, or whales, which are protected under the Marine Mammal Protection Act of 1972, the ESA of 1973, and PRDNER Regulation Number 6766 for the preservation of vulnerable species and species in danger of extinction (February 11, 2004).

Terrestrial Plants and Animals.

The main island of Puerto Rico and its associated islands support 82 federally listed threatened and endangered species consisting of 33 animals and 49 plants. Among this diverse group of fauna and flora are multiple species that are known to exist, potentially exist, or temporarily use areas within the Culebra Island. The Final Supplemental SOP for Endangered Species Conservation and their Critical Habitat (Addendum 1) (CESAJ, February, 2015) Appendix B provides background information and protection strategies for the plant and animal species that will be protected during the TCRA. The Federally listed species of most concern for the project are:

- *Anolis roosevelti* (Culebra Island Giant Anole)
- *Epicrates monensis granti* (Virgin Islands Tree Boa)
- Leptocereus grantianus (Cactus)

- *Peperomia wheeleri* (Wheeler's Peperomia).

The primary strategy for the protection of plant and animal species during the TCRA is "recognition, avoidance, and reporting of the discovery of protected species". Plant species will be tapped off with engineers tape, GPS referenced and photographed. Reporting will be conducted at the end of the day using the "Daily Observer Log Sheet". The TCRA work force will be familiarized with the recognition and avoidance measures for protected species during the Site Specific Training which is provided prior to the field teams conducting field work.

Site Preparation

- Site Survey Control: Existing Site Survey Control points on Culebra will be used and confirmed. Once confirmed, these points may be used to bring survey control onto the Cayo. For Cayo del Agua Site Survey Control points Pusito 1 and Pusito 2 located on Cayo Luis Pena are recommended with Padang 1 and Padang 2 located on Melones Point as alternates.
- Instrument Verification Strip (IVS): Prior to implementation of detection equipment, an IVS will be established for DGM detection equipment and documented in an IVS Technical Memorandum (see Appendix G: (Appendix G: SOP DGM-01). The EM61-MK2 will be used. The IVS will document that geophysical systems are performing as designed, finalize geophysical performance metrics, and document initial anomaly selection criteria, and a blind seed program. The geophysical data are positioned by RTK DGPS or Line and Fiducial. The IVS will be established IAW Appendix G: SOP-05 DGM SOPs and Checklists.
- An ATS for analog detection equipment will be established near the DGM IVS (Appendix G: SOP DGM-01). The Minelab ETRAC or other equivalent all-metals detector will be used. An analog function check will be performed on the cayo.
- Vegetation Removal: The type and density of vegetation on the cayo will require vegetation removal in most areas for reliable functionality of the detection equipment. Vegetation Removal will be conducted prior to geophysical surveys/investigations being conducted. USA anticipates more vegetation removal will be required to allow for DGM (vegetation removed to a height of 6 inches from the surface), and less for analog instruments. In areas with protected plant species present, analog detection equipment will be employed, as it can operate in heavier vegetation and site preparation is anticipated to be less destructive. Protected plant species are identified in Supplemental Standard Operating Procedures for Endangered Species Conservation and their Critical Habitat (USACE 2015). Cutting or pruning of any species of cacti shall be avoided in order to prevent impacts to *Leptocereus grantinanus* species unless specific permission is provided by USFWS/PRDNER (e.g., *Leptocereus grantinanus* is determined to not be found on the Cay.

  Vegetation removal is completed by 8 vegetation team members following guidance provided in the Supplemental Standard Operating Procedures for Endangered Species Conservation and their Critical Habitat (USACE 2015). Cut vegetation will be distributed on the cay. The eight vegetation team members are escorted by UXO Technicians II (UXOTIIs). The Team Biologist escorts the vegetation removal team to ensure critical habitat and protected species are identified, avoided, and reported. The Team Biologist completes the "Daily Observer Log Sheet" each day, detailing endangered or threatened species sightings. The Team Biologist also maintains a written log of the daily activities, and notes identified endangered species. Vegetation removal teams will be equipped with handheld gasoline-powered weed eaters and chainsaws.
- Site grid corners will be established with the RTK DGPS, and marked with a combination of wooden stakes, metal nails/rebar, paint, and potentially sand bags. Anomaly avoidance procedures will be followed in setting grid corners, and any required anomaly avoidance offset recorded. If metal grid corners are used, the field QC team will pull the grid corner metal during their anomaly resolution task and check that there is no masked anomaly using an EM61-MK2.
- GSV Blind Seeding: The field QC team seeds each DGM grid with a small ISO. BSIs are buried horizontal at depths equal to the IVS depths (see SOP 06_DGM-01. BSI locations are measured with the RTK DGPS or with tape measures for Line and Fiducial positioned grids. The field QC

team maintains the BSI log. This BSI log is only shared with the QC and QA Geophysicists (see Appendix G: SOP 1.11.0).

- Analog Grid Blind Seeding: The field QC team seeds each analog grid/lot per operator with: variable 1 to 2 large/deep and 1 to 3 small/shallow ISOs. If soil is too rocky to bury ISOs, variable rate coverage seeds may be used. Analog BSIs are buried to match the analog test strip depths/inclinations (see SOP 06-DGM_01). BSI locations are measured with the RTK DGPS or with tape measures for Line and Fiducial positioned grids. The field QC team maintains the BSI log. This BSI log is only shared with the QC and QA Geophysicists.

Surface Clearance of MEC, MD, and RRD

The first phase of the MEC removal work is a surface clearance of the entire project area which is approximately 5 acres (Appendix B: Figure 2). As much surface metal will be removed from the work site as possible during this phase. Surface clearance will follow the guidance provided in Appendix G: SOP OPS 17. All MD and RRD will be collected, inspected, and then staged for later re-inspection and certification as MDAS. All RRD and MD which has passed the two independent inspections by UXO Technicians will be removed from the cayo and transported to a staging area on Culebra by a 29-ft CMS small barge capable of handling 2,000 pounds of material per trip.

USFWS has identified tires in which sea bird nesting occurs. These tires, if moved during the clearance work, will be put back in their original location once the TCRA field work is complete. At a minimum, the UXOQCS and project biologist will accompany the Culebra NWR Biologist to Cayo del Agua prior to surface clearance operations begin to identify which tires are used for nesting. These tires will be flagged with engineer's tape, photographed, and GPS referenced.

DGM Survey

DGM survey of Cayo del Agua by EM61-MK2 is conducted in all DGM accessible areas on the western portion of the cay. Analog instruments (Minelab ETRAC or other equivalent all-metals detector) are used in areas inaccessible to DGM in 50 ft x 50 ft grids.

A blind seed program is implemented in all geophysical production areas where intrusive operations are to be performed (e.g., grids) by the UXOQCS. Blind seed items are placed at a sufficient rate so that each geophysical team encounters at least one BSI per day. Blind seed item locations are measured with the RTK DGPS. BSI type, location, depth, and inclination are maintained in a database by the UXOQCS, and are provided only to the QC Geophysicist and the USAESCH Geophysicist. Small Industry Standard Objects for BSIs will be used.

During DGM operation the EM61-MK2 will be processed through the IVS, also a daily IVS Static check is required and the DGM team may perform an additional Static check on the Cayo, if necessary

DGM Data will be processed using the IVS Technical Memorandum, and Appendix G: SOPs OPS 5A, OPS 5B.

Reacquisition of DGM Targets and Intrusive Investigation

Prior to the reacquisition phase or analog and dig phases the work site will be divided into 50-ft by 50–ft grids.

Reacquisition of DGM selected anomalies is performed using Trimble RTK DGPS. Intrusive work is performed using hand tools. Verification that the dig holes are cleared is performed by analog detection equipment. Holes will be restored following resolution of the anomaly or MEC treatment through detonation, whichever is applicable.

Daily Analog instrument checks will be conducted at the analog test strip and a function check may be performed on the cayo if the UXOQCS or Team leaders determine it is necessary.

Analog and dig within established grids will follow or may be performed concurrently with the intrusive investigation of the DGM selected anomalies. Intrusive work is performed using hand tools. Holes will be

restored following resolution of the anomaly or MEC treatment through detonation, whichever is applicable. The intrusive depth for investigation is to the depth of detection for the instrument used or until bedrock is reached whichever occurs first.

UXOQCS or designee will place blind seeds in DGM grids designated for reacquisition or Analog and dig grids. QC Geophysicist or UXOQCS will ensure that all blind seeds are recovered and all related MPCs are met.

MEC Treatment

Upon discovery, MEC items will be marked (by physical indicators and by Trimble GEOXT, Tablet GPS if tablets are used, or DGPS). Prior to MEC treatment, coordinates may be updated with RTK DGPS. The items will receive treatment via detonation once all other intrusive field work for the Cayo is complete.

MEC treatment will involve disposal by detonation conducted IAW the TCRA Explosives Safety Submission (ESS), Appendix G: SOP OPS 3 and the SOP for Endangered Species[Supplemental SOP for Endangered Species Conservation and their Critical Habitat (USACE 2015) Addendum 1, sections 4.4.6, and 4.4.7].. The detonation of a MEC item will be conducted on the cayo in which the MEC item was discovered. If the item is deemed suitable to move, the detonation will be conducted in an area where the item may be consolidated with other items if appropriate. Should consolidation of MEC items occur they will be consolidated to locations where vegetation is not present whenever possible. USFWS will assist in identifying proper consolidation sites for MEC Treatment prior to the detonation of the consolidated items. This may be performed by a USFWS representative accompanied onto the Cayo by a UXO Technician to identify the MEC Treatment consolidation site or through conference.

USA will employ UXO Blasters with the Puerto Rico Blasters Permit to conduct the operation.

Level D personal protective equipment (PPE) will be worn during MEC Treatment operations. When explosives are used the type and the employment of the explosives will be determined by the SUXOS and Permitted Puerto Rico Blaster with concurrence from the UXOSO and OESS. Due to public access to the waters surrounding the cay the initiation of the explosive firing train shall be by a method that ensures positive control of the initiation/detonation and the ability to halt the operation should non-essential personnel travel into the exclusion zone (e.g. Remote Firing Device, etc.). For The Cayo del Agua minimum separation distance (MSD) and team separation distance (TSD) distances see Table 21.

Table 21: Munition with the Greatest Fragmentation Distance (MGFD) Table

MRA	MGFD[1]	TSD[2] (ft)	MSD[3] (ft) unintentional detonation	MSD[4] (ft) intentional detonation
MRS 02				
Cayo del Agua	Mk 84 2000-lb Bomb (H-6 Fill)	437	963	4021
	Mk 84 2000 lb Bomb (Tritonal Fill)	401	935	4078

Notes:

1. *Combined MGFD for the Mk 84 2000-lb bomb is provided as historical documents do not specify the explosive payload.*
2. *For essential personnel for manual operations based on K40 of MGFD.*
3. *For nonessential personnel for manual operations based on the HFD of the MGFD*
4. *For all personnel for intentional single in-grid detonations based on the MFD of the MGFD*.

On-call explosives delivery will be used for the detonation of any MEC items recovered during operations. Explosives will be provided by a local vendor (Alba Explosives) on an “as-needed” basis. CMS and USA Environmental will pick up the explosives from the main island of Puerto Rico by boat and transport to the

cay in which the demolition operations are scheduled. Should it be necessary to store explosives due to adverse weather conditions or other factors USA Environmental' s magazine with attached cap box is located at the North end of the Flamenco Beach and Camp area will be used. A Standard Operating Procedure is in place for accountability and security (Appendix G: SOP OPS 07). The magazine is an un-barricaded Bureau of Alcohol, Tobacco, Firearms and Explosives (BATFE) Type II magazine. The total maximum net explosive weight (NEW) stored in the magazine will not exceed a total of 31 pounds. The current BATFE Federal Explosives License/Permit held by USA is found in Appendix I.

Notification and coordination to all required agencies (USAESCH, CESAJ, USFWS, PRDNER, PREQB, and NMFS) will occur prior to commencement of demolition operations. Contact information for the above agencies can be found in Worksheet #6. Additional coordination is also required at least 36 hours in advance of performing any demolition operations. These agencies will also be used to assist in securing the area, as appropriate, where the item presenting an explosive hazard is located until demolition operations have occurred.

- USCG, Mr. Efrain Lopez, Marine Information Specialist (787) 289-2097), efrain.lopez1@uscg.mil, USCG Sector San Juan and, CWO Anthony Cassisa (787) 289-2073, anthony.j.cassisa@uscg.mil. Warning broadcast to mariners over VHF for a scheduled demolition shot (Notice to Mariners).
- Federal Aviation Administration (FAA) Coordination Facility (787) 253-8695, Mr. Eddie Perez, eddie.perez@faa.gov, for a Notice to Airmen on flight restriction above the demolition area. Additional points of contact include Mr. Hector Plaza, (787) 525-6070 or 305-625-8867. San Juan FAA Watch Desk 787-253-8664/8665 should be contacted 15 minutes prior to detonation and upon completion.
- Municipal Police (787) 742-0106 for any demolition activity.
- Puerto Rican State Police (787) 742-3501, for any activities on Culebra and explosive delivery escort when vessel is used (from Ceba to Culebra).

No security will be placed on MEC items identified in the removal action. The cays are remote and leaving security on these isolated cays is considered a safety issue.

MEC treatment options will be recommended by USA to the Project Delivery Team (PDT), taking into account: (1) the MEC item to be treated by detonation; (2) site conditions; (3) and ecological concerns. MEC treatment will be in compliance with the ESS. Examples of optional approaches to MEC treatment are: (1) sandbagging of MEC item prior to detonation; (2) counter charge the munitions main charge with boosters or bulk explosives; (3) initiate the munitions booster cup by detonating an oil perforator shape charge, allowing the perforator explosive jet to propel through the munitions booster cup detonating the munitions; (4) and low order the munitions by employing the Vulcan explosive tool which explosively propels a metal disc through the center of the munitions body, causing rapid expansion inside of the munitions and resulting in a mechanical explosion. When the Vulcan is used, clean-up detonations will be required.

Prior to detonation, the team Biologist will evaluate the area for the presence of sea turtles, seabirds, the known endangered plants on site, and other species of concern. Procedures identified in Appendix G: SOP Final Supplemental Standard Operating Procedures (SOP) for Endangered Species Conservation and their Critical Habitat (Addendum 1-February 2015) will be used to protect sea turtles and seabirds. Should a protected plant species be identified USA will provide recommendations on how to protect the plant species (e.g., establishing a fragmentation barricade with sand bags, etc.) to the USACE PDT and the project Regulators

A USFWS Biologist will be allowed to accompany the Demolition Team to the cayo prior to the demolition operation and after detonation has occurred.

MPPEH Management

All recovered MPPEH items will undergo a 100% inspection and an independent 100% re-inspection to determine and document whether it is safe (MDAS) or whether it is known to have or is suspected of having an explosive hazard MDEH). Two qualified UXO Technicians will inspect and re-inspect the MD to deem

the debris meets MDAS certification and is safe to move, to a staging area on Culebra Island where final packaging can take place. The use of top sealing bulk bags to contain MDAS and transport from the Cayo to Culebra is recommended, however the team leaders may deviate from using the bulk bags if required, with concurrence from the UXOSO or SUXOS. A material inspection form (see Appendix G: SOP-OPS-13) will accompany the material once inspection is complete. Final packaging will take place on Culebra. MDAS material destined for smelting will be packaged in 55-gallon drums, sealed, and then labeled with a 1348-A1 per Appendix G: SOP-OPS-13 and Appendix D: Forms. Material Documented as Safe destined for disposal via smelting will be shipped for disposal to the San Juan, PR. Tires (RRD) will be packaged in the container or truck provided by San Juan vendor for eventual recycling. The MDAS material will be shipped in two separate shipments to control the buildup of the MDAS material in the holding and processing area on Culebra Island. All MDAS will be transported to appropriate disposal facilities off of Culebra. Following certification of MDAS, CoC shall be maintained. If during UXOQCS daily audits 55-gallon drum containers or the tire container seal or lock is broken. The material will be re-certified as MDAS. Properties managed by the Culebra Municipality have been approved for the collection and processing of MDAS material (see Appendix B Figure 7).

MC-RELATED ACTIVITIES

This worksheet summarizes the project design for the MC-related tasks that will be required to successfully complete field operations during this project and achieve the DQOs described in WS #11.

The project objective for MC at Cayo del Agua is to evaluate if the TCRA munitions treatment by demolition resulted in a release of MC to soil that poses an imminent hazard. During the TCRA field operations, information regarding type, location, and depths at which MEC are encountered and removed will be recorded to guide characterization of potential MC releases from MEC items as part of a future project.

APPROACH FOR POST-DETONATION SAMPLING

Post-detonation sampling is planned at locations where MEC is treated by demolition.

- Following the last demolition event on the Cayo post detonation soil samples will be collected at all MEC treatment (treatment by detonation) locations. Prior to the demolition, the USA Team Biologist will evaluate the impacts to sensitive species, and make recommendations for potential mitigation. The USFWS Biologist will be allowed to accompany the Demolition Team to shore prior to the set-up of demolition and after detonation has occurred.

The post-detonation samples will be collected as CRREL 7-point wheel samples, adjusted to the size of the crater created by the demolition. Samples will be collected following the final demolition event at the location.

USA will provide the laboratory DVR and an excel file of results in the TCRA Site Specific Final Report (SSFR) appendices. In the TCRA SSFR report main text, summary statistics to include: # samples, # detections, including max, min, and average will be provided in table format. Note: A baseline risk assessment is not part of the TCRA Scope and will not be included in the TCRA SSFR.

Samples will be analyzed for Explosives (8330B) and Ammonium Picrate. Ammonium Picrate is analyzed due to the presence of munitions with Explosives D. Ammonium Picrate results will be calculated based on Picric Acid (SW8321A) results multiplied by a molecular weight conversion factor.

Sampling will only be conducted if soil is present at the location of the demolition event. Some areas of Cayo del Agua are devoid of topsoil. When MEC items are discovered and treated through detonation in areas in which there is no soil then soil samples will not be collected.

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WORKSHEET #18: SAMPLING LOCATIONS AND METHODS

(EPA UFP-QAPP Guidance Manual, Section 3.1.1)

MEC-RELATED TASKS

There are no MEC-Related Tasks addressed on this worksheet.

MC-RELATED TASKS

During any sampling collection or associated activities (sample handling, decontamination, waste management), personnel will follow the directives of the Accident Prevention Plan, to include compliance with established protocols and wearing appropriate PPE.

Table 22: MC Sampling Locations and Methods

ID Number (1)	Matrix	Depth	Analytical Group	Concentration Level	Sampling SOP Reference	Rationale for Sampling Location 2
TBD	Soil	0-2 inches bgs	Explosives, Ammonium Picrate (3)	Low	SOP-OPS 34 SOP-OPS 36a	**CRREL 7-pt. Wheel Sampling:** Post-detonation sample to be collected within the crater created when a munitions item is treated by demolition.

(1) Sample ID methodology is presented in WS #26 & 27.

(2) The post-detonation samples will be collected as CRREL 7-point wheel samples, adjusted to the size of the crater created by the shot. Samples will be collected following the final demolition event at the location.

(3) Ammonium Picrate is analyzed due to the presence of munitions with Explosives D. Ammonium Picrate results will be calculated based on Picric Acid results multiplied by a molecular weight conversion factor.

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WORKSHEETS #19 & 30: SAMPLE CONTAINERS, PRESERVATION, AND HOLD TIMES

(EPA UFP-QAPP Guidance Manual, Section 3.1.1)

This worksheet applies to MC-Related Tasks and summarizes the analytical methods for each sampling matrix, including the required sample volume, containers, preservation, and holding time requirements. Details concerning sampling handling are included on WS #26 & 27.

Table 23: Analytical Requirements, Sample Containers, Preservation, and Hold Times

Matrix	Analytical Group	Concen-tration Level	Analytical and Preparation Method/SOP Reference (1)	Sample Volume	Containers (number, size, and type) (2)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Soil (Post-detonation samples)	Explosives	Low	Preparation Method/SOP: SW8330B/MSE018IS Analysis Method/SOP: 8330B/HPL8330	10 g	1G bag or two 16-oz jars jar with Teflon-lined screw cap	Cool to < 6 °C	14 days for extraction / 40 days for analysis
Soil (Post-detonation samples)	Picric Acid	Low	Preparation Method/SOP: SW8330B/MSE018IS Analysis Method/SOP: 8321A/HPL8321	10 g	Note: Volume for Picric Acid analysis will be taken from container(s) collected for explosives analysis. No extra container needed.	Cool to < 6 °C	14 days for extraction / 40 days for analysis

(1) Laboratory SOPs are subject to revision and updates during duration of the project, lab will use the most current revision of the SOP at the time of analysis.

(2) Sample size is a minimum, the containers listed will be filled to compensate for any required re-analysis or re-extractions. For samples requiring MS/MSD containers listed should be tripled.

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WORKSHEET #20: FIELD QUALITY CONTROL

(EPA UFP-QAPP Guidance Manual, Section 3.1.1)

MEC-RELATED TASKS

The QC process incorporates the three-phase inspection method to assess and document project quality. Specific inspection timelines, references, forms, inspection procedures, and CA criteria for each DFW are listed in WS #12.

Table 24: Three-Phase QC Surveillance Summary Table

Three-Phase QC Surveillance Program	Description of QC Surveillance Program	Responsible Individuals to Verify Compliance
Phase 1: Preparatory Inspection	A Preparatory Inspection is a compliance inspection performed prior to beginning each DFW. The purpose of this inspection is to review applicable job specifications and verify the necessary equipment, personnel, and controls are in place before work activities start. It is attended by all personnel involved in implementation of the specific DFW. The SUXOS will identify equipment available, verify plans are in place, and describe in detail the work specifics outlined in the MEC-QAPP and SOPs. The UXOSO will brief all activity hazard analyses (AHAs) pertinent to the job. The UXOQCS will discuss pass/fail criteria and provide a copy of the specific QC check sheet used to observe/grade the task to the SUXOS, Team Leader, and PM. The Team Leader and all team members will attend. This inspection is the point at which any questions concerning the task, safety equipment, quality standards, SOP, etc., are discussed and agreed upon. The inspection is documented on a QC Preparatory Inspection Check sheet for that DFW.	UXOQCS
Phase 2: Initial Inspection	An Initial Inspection is performed the first time a parcel of work is started under a DFW. The purpose of the inspection is to check the preliminary work for compliance with procedures and contract specifications, establish an acceptable level of workmanship, check safety compliance, review the preparatory phase inspection/briefing findings, check for any omissions, and resolve differences of interpretation before the task progresses too far. Additionally, the following are checked:	UXOQCS

Three-Phase QC Surveillance Program	Description of QC Surveillance Program	Responsible Individuals to Verify Compliance
Phase 2: Initial Inspection (cont.)	Verify deficiencies identified during the preparatory phase were corrected and implemented. Verify all equipment is used properly. Verify quality workmanship is performed and acceptable. The Initial Inspection is documented on the respective QC Initial Inspection Check sheet for that DFW.	
Phase 3: Follow Up Inspection	**Follow Up Inspections** start immediately after the initial phase QC inspection. They address the routine day-to-day activities of the project. During this phase, the items of concern observed are: • Daily inspection of active DFWs to ensure the work remains in compliance with contract requirements, the MEC QAPP, SOPs, and all other supporting documents. • Evaluate that the quality of workmanship is maintained at or above the levels established during the preparatory/initial phases. • Verify required equipment testing/checks/procedures are performed correctly and IAW procedures established at the preparatory phase and confirmed during the initial phase inspections. • Verify deficient items identified on QC punch lists were corrected/implemented IAW a CA plan. All active DFWs are observed daily, with the observation documented on a QC Follow up Inspection Check sheet for that DFW (refer to the Forms in Appendix D).	UXOQCS

MC-RELATED TASKS

This worksheet summarizes the QC samples to be collected and analyzed for the MC-related tasks of this project. It shows the relationship between the number of field samples and associated QC samples for each combination of analyte/analytical group and matrix. The number of samples to be collected will be determined by the number of MEC items found, whether they are deemed safe to move, and how many can be consolidated in shots together.

Daily field operations related to MC sampling will be documented in a DQCR for each day sampling is conducted. An SOP for the DQCR is found in Appendix G. A template for the DQCR is found in Appendix D: Forms.

Table 25: QC Samples for MC Related Tasks

Matrix	Analytical Group	Estimated No. of Field Samples	Field Triplicates	Field duplicate	Matrix Spike / Matrix Spike Duplicates	Estimated Number of Total Analyses
Soil (Post-detonation samples)	Explosives, Ammonium Picrate	TBD	NA	10% (1 per 10 samples)	5% (1 per 20 samples)	TBD

Note: Only dedicated equipment is planned for use and, therefore, no equipment blank samples are planned.

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WORKSHEET #21: FIELD STANDARD OPERATING PROCEDURES (SOPS)

(EPA UFP-QAPP Guidance Manual, Section 3.1.2)

MEC-RELATED TASKS

The applicable field SOPs to be used for the TCRA MEC removal are listed and provided Appendix G.

Table 26: MEC Field SOPs

Reference Number	Title	SOP Originating Organization	Related Equipment	Modified for project (Y/N)	QAPP Location
HSP-01	Accident Reporting	USA	None	N	Appendix G
HSP-23	Weather Emergencies	USA	None	N	Appendix G
OPS-03	Demolition/Disposal Operations	USA	Explosives, Initiators, Remote Firing Device,	Y (SOP was modified to remove non related MEC activities and to include specific MEC activities specific to the TCRA)	Appendix G
OPS-04	DGM Anomaly Investigations	USA	RTK DGPS, Minelab ETRAC,	Y (SOP was modified to remove non related MEC activities and to include specific MEC activities specific to the TCRA)	Appendix G

Reference Number	Title	SOP Originating Organization	Related Equipment	Modified for project (Y/N)	QAPP Location
OPS-05A	DGM Geophysical Data Processing and Interpretation	USA	Geonics EM61-MK2/2A, RTK DGPS	Y (SOP was modified to include specific MQOs found in WS#12)	Appendix G
OPS-5B	Geophysical Data Processing and Interpretation	USA	RTK DGPS, Geonics EM61-MK2/2A, Data Processing Software	Y (SOP was modified to include specific MQOs found in WS#12)	Appendix G
DGM-01	Instrument Verification Strip (IVS) and Analog Test Strip (ATS)	USA	EMS1-Mk2, Analog Sensor, ISOs	Y (SOP was modified to include specific MQOs found in WS#12)	Appendix G
OPS-07	Explosives Storage and Accountability	USA	BATFE Type 2 magazine with fencing, padlocks	Y (SOP was modified to remove non related MEC activities and to include specific MEC activities specific to the TCRA)	Appendix G
OPS-08	Explosives Transportation	USA	Vehicle with tarpaulin, fire extinguishers, First Aid Kit, IME 22 container, BATFE day box, placards	Y (SOP was modified to remove non related MEC activities and to include specific MEC activities specific to the TCRA)	Appendix G

Reference Number	Title	SOP Originating Organization	Related Equipment	Modified for project (Y/N)	QAPP Location
OPS-11	Hand and Power Tool Operation	USA	General	N	Appendix G
OPS-12	Heavy Equipment Operation	USA	Backhoe	N	Appendix G
OPS-13	MPPEH Management	USA	Drums and Seals	N	Appendix G
OPS-14	MEC Analog Detection and Removal Actions	USA	Analog Detectors	Y(SOP was modified to include specific MQOs found in WS#12)	Appendix G
OPS-15	UXO/MEC Avoidance	USA	Analog Detectors	N	Appendix G
OPS-17	MEC Surface Sweeps	USA	Pin Flags, RTK-DGPS	N	Appendix G
OPS-21	Vegetation Removal	USA	Chainsaws, Weed eaters, PPE	N	Appendix G
OPS-29	Explosives Transportation via Water Vessel	USA	Boat, IME 22 container, pad locks, Placard, Fire extinguisher, Day Boxes, Personnel Floatation Devices (PFD), Bravo Flag	Y (SOP was modified to include Culebra explosive delivery location if not used during the day's demolition event)	Appendix G
OPS-40	Location Surveys	USA	RTK-DGPS,	N	Appendix G
OPS-41	Small Boat Operations	USA	Small Boats, CMS Small Barge, PFD, USCG Required Safety Equipment	Y (New SOP developed for the TCRA)	Appendix G
1.11.0	Blind Seeding Procedures	USA	ISOs	Y (SOP was modified to include specific MQOs found in WS#12)	Appendix G
N/A	SOP For Endangered Species Conservation And their Habitat on DERP-FUDS Project No. I02PR0068. Culebra, Puerto Rico	CESAJ	None	N	Appendix G

MC-RELATED TASKS

The applicable field SOPs to be used for collection of and daily documentation of samples during the MC related tasks for the TCRA are listed and provided in Appendix G. The DQCR form to be used for documentation on days when samples are collected is provided in Appendix D. Laboratory SOPs are found in Appendix H.

Table 27: MC Field SOPs

Reference Number	Title	SOP Originating Organization	Related Equipment	Modified for project (Y/N)	QAPP Location
OPS-34	Sample Packing and Shipping Field Guidance	USA	Soil sampling related materials (coolers, zip-loc bags etc.)	Y (Modified to provide more detail to sampler when preparing cooler to ship from tropical environment.)	Appendix G
OPS-36A	Soil Sampling Field Guidance – Discrete and CRREL 7 PT Wheel Methods	USA	Soil sampling related materials (coolers, zip-loc bags etc.)	Y (Modified to alert the sampler to alter the size of the circle to include the entire detonation crater and record the diameter of the circle in the Field Logbook)	Appendix G

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WORKSHEET #22: FIELD EQUIPMENT CALIBRATION, MAINTENANCE, TESTING, AND INSPECTION

(UFP-QAPP Manual Section 3.1.2.4)
(EPA 2106-G-05 Section 2.3.6)

This worksheet lists field equipment for the MEC-Related tasks that require calibration, maintenance, testing, and inspection. This worksheet also documents the frequency of activity, acceptance criteria, and CA requirements for the field equipment.

Table 28: Field Equipment Calibration, Maintenance, Testing and Inspection

Field Equipment	Calibration, Verification, Testing, or Maintenance Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference (1)
EM61-MK2A	Battery Strength Check Initial IVS, daily IVS Dynamic Checks, and Daily Static Checks	Start of DGM task and daily	See WS #12	See WS #12	Site Geo	SOP-OPS 05A: Digital Geo-physical Mapping. SOP-OPS 05B: Geophysical Data Pro-cessing and Interpretation
Minelab ETRAC or other equivalent all-metals detector	Battery Strength Test	Start of survey day	Audio response over ferrous item	Replace batteries; resurvey affected areas, if necessary	Operator	SOP-OPS 14: MEC Analog Detect and Removal
	For Surface Clearance: Function Test	See WS #12	See WS #12	See WS #12	Operator	SOP-OPS-15: MEC Avoidance SOP-OPS-17: MEC Surface Sweeps

Field Equipment	Calibration, Verification, Testing, or Maintenance Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference (1)
	For Subsurface Investigation: Standardization Check (analog repeatability)	See WS #12	See WS #12	See WS #12	Operator	SOP-OPS-04: DGM Anomaly Investigation SOP-OPS-14::MEC Analog and Detect and Removal
RTK-DGPS Unit	RTK DGPS *Geodetic Functionality*)	See WS #12	See WS #12	See WS #12	Operator	SOP-OPS 40: Location Surveys
Handheld GPS Unit or Tablet GPS Unit	Positional Accuracy	Once/survey day	±5 meters at known monument	Conduct unit maintenance; if noted after operations, identify affected points to re-survey	Operator	N/A

(1) See Project SOP Reference Table (WS #21) for SOP titles.

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WORKSHEET #23: ANALYTICAL STANDARD OPERATING PROCEDURES

(EPA UFP-QAPP Guidance Manual, Section 3.2.1)

The applicable laboratory SOPs to be used for analysis of samples during the MC-related tasks of the project are listed in the below table. Copies of these laboratory SOPs were provided by APPL, Inc. and are presented in Appendix H.

Table 29: APPL, Inc. Analytical Standard Operating Procedures

Reference Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group (1)	Instrument	Organization Performing Analysis	Modified for Project Work?
Preparatory Method						
MSE018IS	Mechanical Shaker Extraction for Solid Explosive Samples using Incremental sampling (IS) techniques EPA METHOD 8330B; -Rev. 5, 10/2015	Definitive	Soil: Explosives	N/A	APPL Inc., Clovis, CA	N
Analytical Method						
HPL8330	Explosive compounds: Diode array detector by high pressure liquid chromatography, Rev. 9, 06/29/16	Definitive	Soil: Explosives	HPLC	APPL Inc., Clovis, CA	N
Preparatory Method						
MSE018	EPA Method 8330 Mechanical orbital shaker extraction for solid explosive samples, Rev. 0, 01/2014	Definitive	Soil: Picric Acid	N/A	APPL Inc., Clovis, CA	N
Analytical Method						
HPL8321	Method 8321 LC-Mass Spectrometer Analysis of Carbamate / Urea and Nitroaromatic /Nitrosamine Compounds. Rev 5, 01/04/16	Definitive	Soil Picric Acid	LCMS	APPL Inc., Clovis, CA	N

Ammonium Picrate is analyzed due to the presence of munitions with Explosives D. Ammonium Picrate results will be calculated based on Picric Acid results multiplied by a molecular weight conversion factor.

WORKSHEET #24: ANALYTICAL INSTRUMENT CALIBRATION

(EPA UFP-QAPP Guidance Manual, Section 3.2.2)

The Analytical Instrument Calibration Table is presented in this worksheet; the specific analytical method SOP references are provided in Appendix H.

Table 30: Analytical Instrument Calibration, APPL, Inc.

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
HPLC (Method 8330B)	Initial Calibration (ICAL) for all analytes (including surrogates) 5-point ICAL for linear calibration (6-points for quadratic)	At instrument setup and after Initial Calibration Certification (ICV) or Continuing Calibration Verification (CCV) failure, prior to sample analysis.	ICAL must meet one of the three options below: Option 1: Relative Standard Deviation (RSD) for each analyte ≤ 15%; Option 2: linear least squares regression for each analyte: $r^2 \geq 0.99$; Option 3: non-linear least squares regression (quadratic) for each analyte: $r^2 \geq 0.99$.	Correct problem then repeat initial calibration	Analyst or certified instrument technician	HPL8330
HPLC (Method 8330B)	Second source calibration verification (ICV)	Once after each initial calibration	Analytes within ±20% of expected value (initial source)	Correct problem. Rerun ICV. If that fails, repeat ICAL.	Analyst or certified instrument technician	HPL8330
HPLC (Method 8330B)	Retention Time (RT) window width	At method set-up and after major maintenance	RT width is ±3 times standard deviation for each analyte RT from 72-hour study.	N/A	Analyst or certified instrument technician	HPL8330

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
HPLC (Method 8330B)	Establishment and verification of the RT window for each analyte and surrogate	Once per ICAL and at the beginning of the analytical shift for establishment of RT; and with each Continuing Calibration Verification (CCV) for verification of RT	Using the midpoint standard or the CCV at the beginning of the analytical shift for RT establishment; analyte must fall within established window during RT verification.	N/A	Analyst or certified instrument technician	HPL8330
HPLC (Method 8330B)	CCV	Before sample analysis, after every 10 field samples, and at the end of the analysis sequence.	All reported analytes and surrogates within ±20% of the true value.	Recalibrate, and reanalyze all affected samples since the last acceptable CCV; Or Immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, take CA(s) and re-calibrate; then reanalyze all affected samples since the last acceptable CCV.	Analyst or certified instrument technician	HPL8330
LCMS (Method 8321A)	ICAL for all analytes (including surrogates)	At instrument set-up and after ICV or CCV failure, prior to sample analysis.	Minimum 5 levels for linear and 6 levels for quadratic. ICAL must meet one of the three options below: Option 1: RSD for each analyte ≤ 20%; Option 2: linear least squares regression for each analyte: $r^2 \geq 0.99$; Option 3: non-linear least squares regression (quadratic) for each analyte: $r^2 \geq 0.99$.	Correct problem then repeat ICAL.	Analyst or certified instrument technician	HPL8321

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
LCMS (Method 8321A)	Retention Time window position establishment	Once per ICAL and at the beginning of the analytical sequence.	Position shall be set using the midpoint standard of the ICAL curve when ICAL is performed. On days when ICAL is not performed, the initial CCV is used.	NA.	Analyst or certified instrument technician	HPL8321
LCMS (Method 8321A)	Retention Time (RT) window width	At method set-up and after major maintenance (e.g., column change).	RT width is ± 3 times standard deviation for each analyte RT from the 72-hour study.	NA.	Analyst or certified instrument technician	HPL8321
LCMS (Method 8321A)	ICV	Once after each ICAL, analysis of a second source standard prior to sample analysis.	All reported analytes within established RT windows. All reported analytes within ± 15% of true value.	Correct problem, rerun ICV. If that fails, repeat ICAL.	Analyst or certified instrument technician	HPL8321
LCMS (Method 8321A)	CCV	Before sample analysis, after every 10 field samples, and at the end of the analysis sequence.	All reported analytes and surrogates within established RT windows. All reported analytes and surrogates within ± 15% of true value.	Recalibrate, and reanalyze all affected samples since the last acceptable CCV; or Immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, take CA(s) and re-calibrate; then reanalyze all affected samples since the last acceptable CCV.	Analyst or certified instrument technician	HPL8321

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WORKSHEET #25: ANALYTICAL INSTRUMENT AND EQUIPMENT MAINTENANCE, TESTING, AND INSPECTION

(EPA UFP-QAPP Guidance Manual, Section 3.2.3)

WS #25 provides information on analytical instruments and equipment, maintenance, testing, and inspection. To ensure that the analytical instruments and equipment are available and in working order when needed, all laboratory analytical equipment will undergo maintenance and testing procedure IAW the laboratory SOPs (provided in Appendix H).

Table 31: Analytical Instrument and Equipment Maintenance, Testing, and Inspection for APPL, Inc.

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference (1)
HPLC (Explosives)	Change guard cartridge, inlet filter and polytetra-fluoro-ethylene (PTFE) frit	N/A	Review pressure profile	As needed, based on pressure profile	N/A	Replace them and check often	Analyst or certified instrument technician	HPL8330
	Change analytical column	N/A	Check peak tailing, decreased sensi-tivity, retention time changes, etc.	When chroma-tography indicates	N/A	N/A	Analyst or certified instrument technician	HPL8330
	Replace mobile phase daily	N/A	N/A	Daily	N/A	N/A	Analyst or certified instrument technician	HPL8330
HPLC	Change guard cartridge, inlet filter and PTFE frit	N/A	Review pressure profile	As needed, based on pressure profile	Passing ICAL and CCV	Replace them and check often	Analyst or certified instrument technician	HPL8321

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference (1)
HPLC	Change analytical column	N/A	Check peak tailing, decreased sensi-tivity, retention time changes, etc.	When chroma-tography indicates	Passing ICAL and CCV	Replace with another analytical column	Analyst or certified instrument technician	HPL8321
HPLC	Replace mobile phase daily	N/A	Check the stability of the base line	Daily	Minimum noise in the base line	Prepare fresh mobile phase solution	Analyst or certified instrument technician	HPL8321
LC-MS (Picric Acid)	N/A	N/A	Monitor for subtle changes in chroma-tography and detector quality. Warning flags indicating a decrease in data quality include: a decreased detector response, elevated baseline or calibration incon-sistencies	Daily	N/A	tune MS	Analyst or certified instrument technician	HPL8321
LC-MS	tune MS	N/A	N/A	N/A	N/A	A service call should be placed with the manufacturer	Analyst or certified instrument technician	HPL8321

(1) Laboratory Standard Operating Procedures are subject to revision and updates during duration of the project, lab will use the most current revision of the SOP at the time of analysis.

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WORKSHEETS #26 & 27: SAMPLE HANDLING, CUSTODY, AND DISPOSAL

(EPA UFP-QAPP Guidance Manual, Section 3.3)

MEC-RELATED TASKS

There are no MEC-Related Tasks addressed on Worksheets #26 or 27.

MC-RELATED TASKS

Sample Numbering

A sample numbering system will be implemented to identify each sample collected during the investigation. This numbering system will ensure that each sample is uniquely labeled and will provide a tracking procedure to allow retrieval of information about each sample collected. QC samples will be numbered using the same sequential system and notes will be made in the field notebook to record which samples are QC samples. H**owever, field duplicates (FDs) will <u>not</u> have the same sample identification as the parent sample; therefore, the laboratory will not know the association between the parent and FD.**

Every sample number will be preceded by the site name designation ("PRCA") to identify that the sample was collected from a Puerto Rico FUDS at Cayo del Agua project site. If the demolition occurs at a location off of Cayo del Agua, the name designation will begin with PR followed by two letters to indicate the location where demolition occurs.

The type of sampling used for collection of the soil will also be reflected in the sample number using "dpst" for post-detonation samples collected as CRREL 7-point wheel composite samples. This will be followed by depth of the soil (in inches) and a unique identifier for the sample (i.e., 01, 02, etc.).

The matrix that is sampled will be reflected in the sample number and will be indicated by "SS" for surface soil. For example:

- The sample number "PRCA-dpst-SS-02-03" would indicate a post-detonation surface soil sample collected from Cayo del Agua from a depth interval 0 to 2 inches bgs, with a unique identifier of 03.

Sample Handling

To ensure sample authenticity and data defensibility, proper sample handing system procedures will be followed from the time of sample collection to final sample disposal. The USA Sampling Lead or designee is responsible for completing the sample container label and CoC form, sample collection, sample packing, and coordination of sample shipment. Immediately following collection, samples will be placed in a refrigerated cooler or in a cooler with ice to maintain the samples at < 6°C. The samples will be sent in coolers on ice to the laboratory, APPL, Inc. in Clovis, CA, via overnight courier.

The laboratory receiving staff and/or custodian will acknowledge the sample receipts upon arrival. The laboratory analytical technicians will prepare and analyze the field samples IAW the analytical SOPs. The field samples and all extracts will be stored at the laboratory for 30 days at required temperature after a final report has been submitted to USA. The laboratory hazardous waste manager will be responsible for the final sample disposal upon notice from the USA Project Chemist.

Table 32: Responsibilities for Sample Handling, Custody, and Disposal

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT	
Sample Collection (Personnel/Organization)	USA Sampling Lead or designee
Sample Packaging (Personnel/Organization)	USA Sampling Lead or designee
Coordination of Shipment (Personnel/Organization)	USA Project Chemist
Type of Shipment/Carrier	Overnight (Fed Ex is the anticipated carrier, but other carrier may be used as/if necessary)
SAMPLE RECEIPT AND ANALYSIS	
Sample Receipt (Personnel/Organization)	Sample receiving supervisor, APPL, Inc.
Sample Custody and Storage (Personnel/Organization)	Sample receiving supervisor, APPL, Inc.
Sample Preparation (Personnel/Organization)	Analyst, APPL, Inc.
Sample Determinative Analysis (Personnel/Organization)	Analyst, APPL, Inc.
SAMPLE ARCHIVING	
Field Sample Storage (No. of days from sample collection)	60 days
Sample Extract/Digestate Storage (No. of days from extraction/digestion)	60 days
SAMPLE DISPOSAL	
Personnel/Organization	Sample receiving supervisor, APPL, Inc.
Number of Days after report is received by USA	30 days

Sample Labeling

Sample labels will include, at a minimum, project name, project number, sample ID, date/time collected, analysis group or method, preservative, and sampler's name. Labels will be taped to the jar or sample bag prior to sample collection to ensure that they do not separate.

Field Sample Custody Procedures (Sample Collection, Packaging, Shipment, and Delivery to Laboratory)

Samples will be collected by field team members under the supervision of the USA Sampling Lead. Samples will be cushioned if necessary with packaging material and placed into coolers along with the CoC. The Post-detonation samples require cooling to <6 °C after being collected at the site. One temperature blank will be included with each cooler sent to the laboratory which requires ice for preservation. Coolers will be shipped to the laboratory via overnight shipping, with the air bill number indicated on the CoC (to relinquish custody). Upon delivery, the laboratory will log in each cooler and report the status of the samples.

The following addresses will be used for sample shipment:

APPL, Inc.
Attn.: Diane Anderson
908 N. Temperance Ave
Clovis, CA 93611
Tel.: 559-275-2175

Laboratory Sample Custody Procedures (Receipt of Samples, Archiving, Disposal)

All laboratory sample receipt, internal custody, sample archiving, and disposal procedures shall be completed IAW APPL, Inc. SOPs identified in WS #23 and located in Appendix H.

Sample Identification Procedures

Upon opening the cooler at the analytical laboratory, the receiving clerk will sign the CoC and take the cooler temperature. Then the sample containers in the cooler will be unpacked and checked against the client's CoC. Any discrepancies noted with the samples will be noted on the CoC upon receipt. The clerk will deliver the CoC (and any other paperwork) to the Laboratory PM for entry into the Laboratory Information Management System (LIMS) and for client notification.

The laboratory will send sample login forms to the USA Project Chemist or designee to check sample IDs and parameters are correct. The field logbook will identify the sample ID with the location, depth, date/time collected, and the parameters requested. The laboratory will assign each field sample a laboratory sample ID based on information in the CoC.

Chain-of-Custody Procedures

CoC forms will include, at a minimum, laboratory contact information, client contact information, sample information, and relinquished by/received by information. Sample information will include sample ID, date/time collected, number and type of containers, preservative information, analysis method, and comments. The CoC will also have the sampler's name and signature. The CoC will link the location of the sample from the field logbook to the laboratory receipt of the sample. The laboratory will use the sample information to populate the LIMS database for each sample. Blank copies of the COCs, as well as partially completed COCs, are included in Appendix D.

Non-Conformance

The Laboratory Project Manager will contact the USA Project Chemist to resolve any issues encountered during sample receipt and login. The USA Project Chemist will coordinate with the USA Sampling Lead and other personnel as necessary to resolve the issues.

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WORKSHEET #28: ANALYTICAL QUALITY CONTROL AND CORRECTIVE ACTION

(EPA UFP-QAPP Guidance Manual, Section 3.4 and Tables 4, 5, and 6)

The tables in this worksheet are for MC-Related tasks, only and provide information on the QC samples, frequency, method or SOP QC acceptance limits, CAs, person responsible for the CAs, and measurement performance criteria.

This worksheet contains the following tables:

Table 33: Explosives Analysis QC/Corrective Actions – APPL, Inc.

Table 34: Control Limits – APPL, Inc.

Table 35: Picric Acid (Ammonium Picrate) Analysis QC/Corrective Actions – APPL, Inc.

Table 36: Control Limits – APPL, Inc.

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Matrix: Soil
Analytical Group: Explosives
Method/SOP: EPA Method SW-8330B/SOP HPL8330

Table 33: Explosives Analysis QC/Corrective Actions – APPL, Inc.

QC Sample	Number/ Frequency	Method/SOP Acceptance Criteria	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator	Measurement Performance Criteria
Soil drying procedure	Each sample, LCS, and Method Blank.	Laboratory must have a procedure to determine when the sample is dry to constant mass. Record date, time, and ambient temperature on a daily basis while drying samples.	NA	Analyst/ Technician	NA	NA
Soil sieving procedure	Each sample, LCS, and Method Blank.	Weigh entire sample. Sieve entire sample with a #10 mesh sieve. Breakup pieces of soil (especially clay) with gloved hands. Do not intentionally include vegetation in the portion of the sample that passes through the sieve unless this is a project specific requirement. Collect and weigh any portion unable to pass through the sieve	NA	Analyst/ Technician	NA	NA

QC Sample	Number/ Frequency	Method/SOP Acceptance Criteria	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator	Measurement Performance Criteria
Soil grinding Procedure	Initial demonstration	The laboratory must initially demonstrate that the grinding procedure is capable of reducing the particle size to < 75 µm by passing representative portions of ground sample through a 200 mesh sieve [American Society for Testing and Materials (ASTM) E11].	NA	Analyst/ Technician	NA	NA
Soil grinding blank	Prior to grinding samples; after every 10 samples; and at the end of the batch.	A grinding blank using clean solid matrix (such as Ottawa sand) must be prepared (e.g., ground and subsampled) and analyzed in the same manner as a field sample. No reported analytes must be detected > 1/2 LOQ. Grinding blanks will be composited for analysis and one grinding blank per batch will be analyzed.	Blank results must be reported and the affected samples must be flagged accordingly if blank criteria are not met.	Analyst Lab QA Officer Project Chemist	Accuracy / Sensitivity	No reported analytes must be detected > 1/2 LOQ

QC Sample	Number/ Frequency	Method/SOP Acceptance Criteria	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator	Measurement Performance Criteria
Soil sub-sampling Process	Each sample, duplicate, LCS, and Method Blank.	Entire ground sample is mixed, spread out on a large flat surface (e.g., baking tray), and 30 or more randomly located increments are removed from the entire depth to sum a ~10 g subsample	NA	Analyst/ Technician	NA	NA
Soil sample triplicate	At the subsampling step, one sample per batch. Cannot be performed on any type of blank sample. Client must designate sample.	Three 10-g sub-samples are taken from the designated sample. The RSD for results above the LOQ must not exceed 20%.	CA must be taken if this criterion is not met (e.g., the grinding process should be investigated to ensure that the samples are being reduced to a sufficiently small particle size).	Analyst Lab QA Officer Project Chemist	Accuracy / Precision	The RSD for results above the Reporting Limit must not exceed 20%.
Method Blank	One per preparatory batch. Grinding Blank may be used as the batch method blank.	No analytes detected >1/2 LOQ or > 1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater.	Correct problem. If required, re-prep and reanalyze method blank and all samples processed with the contaminated blank. If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch.	Analyst Lab QA Officer Project Chemist	Accuracy / Sensitivity	No analytes detected >1/2 LOQ or > 1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater. Per DoD Quality Systems Manual (QSM) 5.0

QC Sample	Number/ Frequency	Method/SOP Acceptance Criteria	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator	Measurement Performance Criteria
LCS	One per preparatory batch. The LCS is prepared from clean sand matrix that has been spiked.	A laboratory must use the QSM 5.0 Appendix C Limits for batch control if project limits are not specified. If the analyte(s) are not listed, use in-house LCS limits. See Table 26 for acceptance limits.	Correct problem. If required, re-prep and reanalyze the LCS and all samples in the associated preparatory batch for the failed analytes, if sufficient sample material is available.	Analyst Lab QA Officer Project Chemist	Accuracy / Precision - Analytical	QC acceptance criteria specified by DoD QSM v 5.0
Solid Reference Material (SRM)	One per preparatory batch of Incremental Samples.	An SRM containing all reported analytes must be prepared (e.g., ground and subsampled) and analyzed in exactly the same manner as a field sample. Control limits are provided by the SRM manufacturer	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available	Analyst Lab QA Officer Project Chemist	Accuracy / Precision - Analytical	QC acceptance criteria specified by DoD QSM v 5.0
Matrix spike (MS) / Matrix Spike Duplicate (MSD)	One per preparatory batch.	A laboratory must use the QSM v 5.0 Appendix C Limits for batch control if project limits are not specified. If the analyte(s) are not listed, use in-house LCS limits. See Table 26 for acceptance limits.	Examine the project-specific DQOs. Contact the client as to additional measures to be taken.	Analyst Lab QA Officer Project Chemist	Precision - Analytical	QC acceptance criteria specified by DoD QSM v 5.0

QC Sample	Number/ Frequency	Method/SOP Acceptance Criteria	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator	Measurement Performance Criteria
Surrogate Spike	All field and QC samples.	QC acceptance criteria specified by the project, if available; otherwise use QSM 5.0 Appendix C limits. or in-house limits if analyte(s) are not listed. See Table 26 for acceptance limits.	Correct problem, then re-prep and reanalyze all failed samples for all surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	Analyst Lab QA Officer Project Chemist	Accuracy / Precision - Analytical	QC acceptance criteria specified by DoD QSM v 5.0
Confirma-tion of positive results (second column)	All positive results must be confirmed.	Calibration and QC criteria are the same for the confirmation analysis as for initial or primary column analysis. Results between primary and second column RPD ≤ 40%.	Report from both columns. Apply J-flag if RPD > 40%. Discuss in the case narrative.	Analyst Lab QA Officer Project Chemist	Precision - Analytical	QC acceptance criteria specified by DoD QSM v 5.0

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Table 34: Control Limits – APPL, Inc.

Analytes	Soil	
	Matrix Spike/ Matrix Spike Duplicate and LCS/ Laboratory Control Sample Duplicate (LCSD)	
	% Recovery	RPD
Explosives (Method 8330B)		
1,3,5-Trinitrobenzene	81-123	≤20
1,3-Dinitrobenzene	84-124	≤20
2,4,6-Trinitrotoluene	75-125	≤20
2,4-Dinitrotoluene	82-123	≤20
2,6-Dinitrotoluene	86-119	≤20
2-Amino-4,6-Dinitrotoluene	87-121	≤20
2-Nitrotoluene	84-120	≤20
3-Nitrotoluene	79-127	≤20
4-Amino-2,6-Dinitrotoluene	84-124	≤20
4-Nitrotoluene	83-122	≤20
HMX	77-122	≤20
Nitrobenzene	80-128	≤20
Nitroglycerin	73-122	≤20
PETN	78-123	≤20
RDX	82-124	≤20
Tetryl	66-138	≤20
Surrogate: 1,2-Dinitrobenzene	89-123	--

Table 35: Picric Acid (Ammonium Picrate) Analysis QC/Corrective Actions – APPL, Inc.

Matrix	**Soil**
Analytical Group	Picric Acid/Ammonium Picrate
Analytical Method/SOP Reference	EPA Method SW8321A/ HPL8321
Analytical Organization	APPL Inc.

QC Sample	Frequency & Number	Analytical/Prep Method and SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank (MB)	One per preparatory batch.	No analytes detected > 1/2 LOQ or > 1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater.	Correct problem. If required, reprep and reanalyze MB and all samples processed with the contaminated blank. If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch.	Analyst Lab QA Officer Project Chemist	Accuracy / Sensitivity	All target analytes ≤ 1/2 laboratory LOQ, For common laboratory contaminants, no analytes detected > LOQ
Laboratory Control Sample (LCS)	One per preparatory batch.	A laboratory must use the QSM v5.0 Appendix C Limits for batch control if project limits are not specified. If the analyte(s) are not listed, use in-house LCS limits if project limits are not specified. See Table 28 for acceptance limits.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.	Analyst Lab QA Officer Project Chemist	Accuracy / Precision - Analytical	QC acceptance criteria specified by DoD QSM v5.0
Matrix Spike (MS)	One per preparatory batch.	A laboratory must use the QSM v5.0 Appendix C Limits for batch control if project limits are not specified. If the analyte(s) are not listed, use in-house LCS limits if project limits are not specified. See Table 34 for acceptance limits.	Examine the project- specific requirements. Contact the client as to additional measures to be taken.	Analyst Lab QA Officer Project Chemist	Precision - Analytical	For matrix evaluation, use QC acceptance criteria specified by DoD QSM v5.0

QC Sample	Frequency & Number	Analytical/Prep Method and SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Matrix Spike Duplicate (MSD) or Matrix Duplicate (MD)	One per preparatory batch.	A laboratory must use the QSM v5.0 Appendix C Limits for batch control if project limits are not specified. If the analyte(s) are not listed, use in-house LCS limits if project limits are not specified. See Table 34 for acceptance limits. RPD ≤ 30% (between MS and MSD or sample and MD).	Examine the project- specific requirements. Contact the client as to additional measures to be taken.	Analyst Lab QA Officer Project Chemist	Precision - Analytical	For matrix evaluation, use QC acceptance criteria specified by DoD QSM v5.0
Surrogate Spike	All field and QC samples.	QC acceptance criteria specified by the project, if available; otherwise use QSM v5.0 Appendix C limits or in-house LCS limits if analyte(s) are not listed. See Table 34 for acceptance limits.	Correct problem, then reprep and reanalyze all failed samples for all surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	Analyst Lab QA Officer Project Chemist	Accuracy	QC acceptance criteria specified by DoD QSM v5.0
Confirma-tion of positive results (second column)	All positive results must be confirmed	Calibration and QC criteria for second column are the same as for initial or primary column analysis. Results between primary and secondary column RPD ≤ 40%.	Apply J-flag if RPD > 40%. Discuss in the case narrative.	Analyst Lab QA Officer Project Chemist	Accuracy	Results between primary and secondary column RPD ≤ 40%.

Table 36: Control Limits – APPL, Inc.

Analytes	Soil	
	Matrix Spike/ Matrix Spike Duplicate and LCS/LCSD	
	% Recovery	RPD
Picric Acid/Ammonium Picrate	30-130	30
Surrogate: 1,2-Dinitrobenzene	50-150	--

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WORKSHEET #29: PROJECT DOCUMENTS AND RECORDS

(EPA UFP-QAPP Guidance Manual, Section 3.5.1)

This Worksheet contains tables of the project documents and records for MEC and MC-Related Tasks.

MEC RELATED TASKS

Table 37: Project Documents and Records for MEC-Related Tasks

Record	Generator(1)	Verification	Storage Location/Archive
Analog Data Package	UXOQCS	QC Geophysicist	Analog Access Database
DGM Data Package for each week's data collection (raw and final mapping and QC data. Maps, Field Data Sheets, and updates to database tables)	Project Geophysicist	QC Geophysicist	Project Files/USA Corporate Office
Site Manager's Logbook	Site Manager	UXOQCS	Project Files/USA Corporate Office
IVS Technical Memorandum	Project Geophysicist	QC Geophysicist	Project Files/USA Corporate Office
SUXOS Logbook	SUXOS	UXOQCS	Project Files/USA Corporate Office
Team Leader Logbook(s)	Team Leader(s)	UXOQCS	Project Files/USA Corporate Office
Team Biologist Log and Daily Observation Reports	Team Biologist	UXOQCS	Project Files/USA Corporate Office
Photograph Log	SUXOS	UXOQCS	Project Files/USA Corporate Office
Team Biologist Log and Daily Observation Reports	Team Biologist	UXOQCS	Project Files/USA Corporate Office
Geodetic Instrument Daily Log	Team Leaders	UXOQCS	Project Files/USA Corporate Office
Seed Tracking Log	UXOQCS	QC Geophysicist	Project Files/USA Corporate Office
Site Visitor Log	Team Leader or UXOSO	UXOQCS	Project Files/USA Corporate Office
Heat Stress Monitoring Log	UXOSO	UXOQCS	Project Files/USA Corporate Office
MEC Accountability Log	SUXOS	UXOQCS	Project Files/USA Corporate Office

Record	Generator[1]	Verification	Storage Location/Archive
Accident Investigation Report	UXOSO	Director of Safety and Quality	Project Files/USA Corporate Office
Accident/Illness/Near Miss Report	UXOSO	Director of Safety and Quality	Project Files/USA Corporate Office
AHA Blank Template	UXOSO or USA Certified Safety Professional	Director of Safety and Quality	Project Files/USA Corporate Office
QC Surveillance DGM Anomaly Reacquisition	Team Leader	UXOQCS	Project Files/USA Corporate Office
QC Surveillance DGM Grid Survey	UXOQCS and Site Geophysicist	QC Geophysicist	Project Files/USA Corporate Office
QC Surveillance MEC Avoidance	UXOQCS	SUXOS	Project Files/USA Corporate Office
QC Surveillance MEC Management and Disposal	UXOQCS	SUXOS	Project Files/USA Corporate Office
QC Surveillance MPPEH Management	UXOQCS	SUXOS	Project Files/USA Corporate Office
QC Surveillance Site Preparation Transect and Grid Layout	UXOQCS and Site Geophysicist	QC Geophysicist	Project Files/USA Corporate Office
QC Surveillance Subsurface Removal	UXOQCS	SUXOS	Project Files/USA Corporate Office
QC Surveillance Surface Removal	UXOQCS	SUXOS	Project Files/USA Corporate Office
Form DoD 626	Team Leader	UXOQCS	Project Files/USA Corporate Office
Daily Status Reports	Site Manager	UXOQCS	Project Files/USA Corporate Office
Weekly QC Report	UXOQCS	Director of Safety and Quality	Project Files/USA Corporate Office
Field Change Request Form	Site Manager	UXOQCS	Project Files/USA Corporate Office
Root Cause Analysis	UXOQCS or Assigned Investigative Person	Director of Safety and Quality	Project Files/USA Corporate Office
Grid/Area Completion Form	Team Leader(s)	SUXOS	Project Files/USA Corporate Office
QC Grid/Area Inspection Form	UXOQCS	SUXOS	Project Files/USA Corporate Office
Operator & Geophysical Instrument Checkout Form for	Team Leader(s)	UXOQCS	Project Files/USA Corporate Office

Record	Generator[1]	Verification	Storage Location/Archive
MEC Operations			
DD Form 1348-1A	SUXOS	UXOQCS	Project Files/USA Corporate Office
Explosives Usage Records	DTL/SUXOS	UXOQCS	Project Files/USA Corporate Office
Explosives Vehicle On-Site Inspection	DTL/Vehicle Operator	UXOQCS	Project Files/USA Corporate Office
Explosives Demolition Operations Record	SUXOS or Explosive Blaster	Director of Safety and Quality	Project Files/USA Corporate Office
Heat Stress Alert Monitoring and Checklist	UXOSO	SUXOS	Project Files/USA Corporate Office
MDAS Accumulation Form	UXOTII/UXOTIII (Two independent inspections)	SUXOS	Project Files/USA Corporate Office
Tailgate Safety Briefing	Team Leader	UXOSO	Project Files/USA Corporate Office
Safety Inspection Form	UXOSO	Director of Safety and Quality	Project Files/USA Corporate Office

(1) The generator may designate another qualified individual to prepare the document or record; however, the listed generator is responsible for ensuring the quality and accuracy of that document/record and for providing the preparer's signature, when appropriate.

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MC RELATED TASKS:

Table 38: Project Documents and Records for MC-Related Tasks

Record	Generation	Verification	Storage location/archival
Field Records			
Field logbook or data collection sheets	USA Sampling Lead	USA Sample Team Member	Project Files/USA Corporate Office
Chain-of-Custody Forms	USA Sample Team Member	USA Sampling Lead	Project Files/USA Corporate Office
Air Bills	USA Sample Team Member	USA Sampling Lead	Project Files/USA Corporate Office
USA Daily QC Reports	USA Sampling Lead	USA Sample Team Member, Project Chemist	Project Files/USA Corporate Office
Deviations	USA Sampling Lead	USA Sample Team Member	Project Files/USA Corporate Office
Corrective Action Reports	USA Sampling Lead	USA Sample Team Member	Project Files/USA Corporate Office
Laboratory Records (APPL, Inc.)			
Record	**Generation**	**Verification**	**Storage location/archival**
Sample Log-in	Sample Receiving	QA Laboratory Project Manager	LIMS
Instrument Print-Out and Raw Data	Analyst	Analyst and peer reviewer	LIMS and corporate server
Review Checklists (Analyst)	Analyst	Analyst and peer reviewer	Lab
PM Review Checklist	Laboratory QA Manager	Peer reviewer/QA (10% of data packages)	Lab
Data Validation Report	Data Validators or Project Chemist	USA Project Chemist or Project Manager	Project Files/USA Corporate Office
Laboratory data in Staged Electronic Data Deliverable (SEDD) format	Laboratory PM	USA Project Chemist or Project Manager	Project Files/USA Corporate Office/FUDSCHEM
Most recent eQAPP	Laboratory PM	USA Project Chemist or Project Manager	Project Files/USA Corporate Office & FUDSCHEM
SEDD files reviewed by Data Validator, and Automated Data Review (ADR) output files.	Data Validator	USA Project Chemist or Project Manager	Project Files/USA Corporate Office & FUDSCHEM

WORKSHEET #31, 32, & 33: ASSESSMENTS AND CORRECTIVE ACTION

(EPA UFP-QAPP Guidance Manual, Section 4.1.1)

This worksheet provides information on the required periodic assessments that will be performed during the course of the project to ensure that the planned project activities are implemented IAW this QAPP. Table 39, below, summarizes the type, frequency, and responsible parties of planned assessment activities to be performed for the project.

MEC - RELATED TASKS

Table 39: MEC Assessments and Corrective Action

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment	Person(s) Responsible for Responding to Assessment Findings	Person(s) Responsible for Identifying and Implementing Corrective Actions	Person(s) Responsible for Monitoring Effectiveness of Corrective Actions
Field Procedure Assessment and QAPP Compliance	Once during field activities	Internal	USA Team	Project QC Manager	UXOQCS	UXOQCS	Site Manager SUXOS
Geophysical Data Assessment	Weekly with data submittals	Internal	USA Team	QC Geophysicist	Project and Site Geophysicist	Project and Site Geophysicist	QC Geophysicist
MEC Operations Audit	Once during field activities	Internal	USA Team	Director of Safety and Quality Operations	UXOQCS	UXOQCS	Site Manager SUXOS

Based on the findings of the project assessments, CA may be required. For assessment findings that require CA, deficiencies will be documented and communicated to the appropriate project personnel. CA will then be implemented and a follow-up assessment will be performed to verify the results of the CA. Procedures for handling UFP-QAPP deviations during each type of assessment are summarized in Table 40 below.

Table 40: MEC Procedures for Handling Deviations

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings	Time Frame of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response	Time Frame for Response
Field Procedure Assessment and QAPP Compliance	Internal memo	UXOQCS	1 business day	Internal e-mail	Site Manager	1 business day
Field Documentation Reviews	Internal memo	Field Team Leaders	3 to 5 business days	Internal e-mail	Site Manager	3 to 5 business days
MEC Operations Audit	Written audit report	USA PM, Site Manager, SUXOS, and UXOQCS	3 to 5 business days	Letter or memo	PM Site Manager	3 to 5 business days

In order to demonstrate that PQOs have been achieved, periodic QA management reports will be prepared to ensure that the project stakeholders are updated on project status and the results of QA assessments. The frequency and type of planned QA management reports, the delivery date, the personnel responsible for report preparation, and the report recipients are identified in Table 41, below.

Table 41: MEC QA Management Reports

Type of Report	Frequency	Projected Delivery Date(s)	Primary Person(s) Responsible for Report Preparation	Report Recipient(s)
IVS Technical Memorandum	Once after initial IVS	Beginning of DGM Task	Project and Site Geophysicists	QA Geophysicist
Final TCRA SSFR	Once after data are generated and validated	TBD	USA PM	Recipients listed in the Distribution Memo (see Worksheet #3)

MC - RELATED TASKS

PLANNED PROJECT ASSESSMENTS

This table provides information on the required periodic assessments that will be performed during the course of the project to ensure the planned project activities are implemented IAW this QAPP. The type, frequency, and responsible parties of planned assessment activities to be performed for the project are summarized in the table below.

Table 42: MC Planned Assessments Table

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment (Title and Organizational Affiliation)	Person(s) Responsible for Responding to Assessment Findings (Title and Organizational Affiliation)	Person(s) Responsible for Identifying and Implementing Corrective Actions (CA) (Title and Organizational Affiliation)	Person(s) Responsible for Monitoring Effectiveness of CA (Title and Organizational Affiliation)
Laboratory Technical Systems Audit (if necessary)	Once, prior to sam-pling startup	Ext.	USAESCH	Michael D'Auben, Project Chemist, USAESCH	Diane Anderson, Project Manager, APPL	Diane Anderson, PM, APPL	Diane Anderson, PM, APPL
Field Sampling Technical Systems Audit	Once, at sampling startup	Int.	USA	TBD, UXOQCS, USA	TBD, Field Sampling Team Leader, USA	TBD, Field Sampling Team Leader	TBD, UXOQCS, USA

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ASSESSMENT FINDINGS AND CORRECTIVE ACTION RESPONSES

Based on the findings of project assessments, CA may be required. A "corrective action" is defined as an action taken by a project to eliminate the cause(s) of nonconformity in order to prevent recurrence. For assessment findings that require CA, deficiencies will be documented and communicated to the appropriate project personnel. CA will then be implemented and a follow-up assessment will be performed to verify the results of the CA. Procedures for handling UFP-QAPP deviations during each type of assessment are summarized in Table 43.

Table 43: MC Assessment Findings and Corrective Action Responses

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings (Name, Title, Organization)	Timeframe of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response (Name, Title, Org.)	Timeframe for Response
Laboratory Technical Systems Audit (if necessary)	Written Audit Report	Sharon Dehmlow QA Director, APPL	2 working days after audit	Letter or Report	Diane Anderson, Project Manager, APPL	3 working days after notification
Field Sampling Technical Systems Audit	Written Audit Report	Robert Crownover, Director of Safety and Quality, USA	1 working day after audit	Letter or Report	Tom Bourque, Project Manager, USA Environmental	1 working day after notification

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QUALITY ASSURANCE MANAGEMENT REPORTS

In order to demonstrate that DQOs have been achieved, periodic QA management reports will be prepared to ensure that the project stakeholders are updated on project status and the results of all QA assessments. The frequency and type of planned QA management reports, the delivery date, the personnel responsible for report preparation, and the report recipients are identified in Table 44 below.

Table 44: MC QA Management Reports Table

Type of Report	Frequency (daily, weekly monthly, quarterly, annually, etc.)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation (Title and Organizational Affiliation)	Report Recipient(s) (Title and Organizational Affiliation)
Laboratory Technical Systems Audit Report (if necessary)	Once, prior to sampling startup	TBD	Michael D'Auben, Project Chemist, USAESCH	Project Manager, USA; Project Manager, USAESCH
Field Sampling Technical Systems Audit Report (when applicable)	Once	TBD	Robert Crownover, Director of Safety and Quality, USA	Project Manager, USAESCH
Final TCRA SSFR Report	USA internal review of Draft, Draft Final, Final SSFR Reports and responses to comments from USACE and Regulators prior to submission.	TBD	Tom Bourque, Project Manager, USA Robert Crownover, Director of Safety and Quality, USA	Project Manager, USAESCH

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WORKSHEET #34: DATA VERIFICATION & VALIDATION INPUTS

(EPA UFP-QAPP Guidance Manual, Section 5.2.1)

This worksheet lists the inputs that will be used during data verification and validation. Inputs include planning documents, field records, and laboratory records. Data verification is a check that all specified activities involved in collecting and analyzing samples have been completed and documented and that the necessary records (objective evidence) are available to proceed to data validation. Data validation is the evaluation of conformance to stated requirements, including those in the contract, methods, SOPs and the QAPP. Data validation includes evaluation of the data against the project-specific MPCs (Worksheet #12). Data verification and validation procedures and responsibilities are described on Worksheet #35 and Worksheet #36, respectively. Once verification and validation have been completed, a MEC usability assessment is conducted to evaluate whether process execution and resulting data meet DQOs. A DVR will be provided by the laboratory for MC-related tasks. Usability assessment procedures are described on Worksheet #37. The data verification, validation, and usability assessment process is summarized in Table 45 for MEC and Table 46 for MC.

MEC-RELATED TASKS: DATA VERIFICATION AND VALIDATION INPUTS

Table 45: Data Verification and Validation Inputs for MEC-Related Tasks

Verification Input	Verification (completeness)	Validation (conformance to specifications)
Site Manager's Logbook	X	X
Daily Status Reports	X	X
Daily QC Report	X	X
Team Leader Logbook(s)	X	-
Root Cause Analyses	X	X
Grid Status Sheet	X	X
IVS Technical Memorandum	X	X
Photograph Log	X	-
Analog All Metals Detector Check Sheet (or equivalent data)	X	-
Dig Sheet – Analog	X	X
Analog Data Deliverable	X	X
Daily Instrument Test Report (or equivalent data)	X	X
Seed Tracking Log	X	X
Dig Sheet – DGM	X	X
DGM Data Deliverable (includes DGM map)	X	X
Grid QA Documentation	X	X
DD Form 1348-1A	X	X
Explosives Usage Record	X	-
Demolition Shot Record	X	-
MDAS Disposal Documentation	X	-

MC-RELATED TASKS - VERIFICATION AND VALIDATION INPUTS

Table 46: Data Verification and Validation Inputs for MC-Related Tasks

Description	Verification (completeness)	Validation (conformance to specifications)
Field Records		
Field logbooks	X	-
Chain-of-Custody Forms	X	-
Daily QC Report	X	-
Change orders/deviations, when applicable	X	-
Field CA reports, when applicable	X	-
Analytical Data Package		
Cover sheet (laboratory identifying information)	X	X
Case narrative	X	X
CoC and shipping forms	X	X
Sample condition upon receipt	X	X
Sample chronology (i.e. dates/times of receipt, preparation, & analysis)	-	X
DL/LOD/LOQ establishment and verification	X	X
Standards Traceability	-	X
Instrument calibration records	-	X
Definition of laboratory qualifiers	X	X
Analytical Results	X	X
QC sample results	X	X
Raw data including manual integrations when applicable (1)	-	X
Electronic data deliverable	-	X
CA reports, when applicable	X	X

(1) When manual integrations are performed, raw data records shall include a complete audit trail for those manipulations (i.e., the chromatograms obtained before and after the manual integration must be retained). This requirement applies to all analytical runs including calibration standards and QC samples. The person performing the manual integration must sign and date each manually integrated chromatogram and record the rationale for performing the manual integration.

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WORKSHEET #35: DATA VERIFICATION PROCEDURES

(EPA UFP-QAPP Guidance Manual, Section 5.2.2)

"Verification" is a completeness check that is performed before the data review process is conducted to determine whether the required information is available for validation. It involves a review of all data inputs to ensure that they are present. This step of the data review process answers whether or not the required data inputs are present. The following sections summarize the methods for data verification.

MEC-RELATED TASKS VERIFICATION PROCESS

Table 47: Verification Process for MEC-Related Processes

Verification Input	Description of Verification Process	Internal/ External	Responsible for Verification
Site Manager's Logbook	Confirm logbooks on file cover entire duration of field effort	Internal	Site Manager
Daily Status Reports	Confirm Daily Status Reports on file cover entire duration of field effort	Internal	PM
Daily QC Report	Verify Daily QC Reports on file cover entire duration of field effort	Internal	Site Manager
Team Leader Logbook(s)	Confirm logbooks on file cover entire duration of field effort	Internal	UXOQCS
Root Cause Analyses	Confirm Root Cause Analyses on file for all recorded MPC failures	Internal	UXOQCS and Project Geophysicist
Grid Status Sheet	Confirm grid status sheets on file for all removal grids	Internal	Site Manager
IVS Technical Memorandum	Confirm IVS Technical Memorandum on file	Internal	Project Geophysicist and PM
Photograph Log	Verify photographs are listed on log and that the log spans the duration of the project; verify that all photographs are on file	Internal	UXOQCS
Analog All Metals Detector Check Sheet (or equivalent data)	Verify that all analog all metals detector test data are on file spanning the duration of the project	Internal	UXOQCS
Dig Sheet – Analog (MEC)	Confirm that all dig sheets are on file listing MEC recovered from grids cleared using analog methods	Internal	UXOQCS

Verification Input	Description of Verification Process	Internal/ External	Responsible for Verification
Dig Sheet – Analog (Other)	Confirm that dig sheets are on file listing field estimated weights of MD, RRD, and other debris recovered from grids cleared using analog methods	Internal	UXOQCS
Daily Instrument Test Report (or equivalent data)	Verify that all instrument test data are on file spanning the duration of the project	Internal	Project Geophysicist
Seed Tracking Log	Confirm that tracking logs are on file addressing the locations and recovery status of all seeds placed	Internal	UXOQCS
Analog Data Deliverable	Verify that complete database is on file and that it contains the required data tables	Internal	UXOQCS QC Geophysicist
Dig Sheet – DGM	Confirm that dig sheets are on file listing items recovered from all grids surveyed using DGM methods	Internal	UXOQCS
DGM Data Deliverable (includes DGM map)	Verify that complete database is on file and that it contains the required data tables	Internal	Project Geophysicist
Grid QA Documentation	Confirm that Government QA documents are on file documenting the QA status (i.e., accepted or rejected) of all grids in the removal area	External	Government QA Representative UXOQCS
DD Form 1348-1A	Confirm that DD Form 1348-1A's are on file, spanning the duration of the project	Internal	SUXOS and UXOQCS
Explosives Usage Record	Verify that Explosives Usage Records are on file for all demolition operations conducted over the duration of the project	Internal	SUXOS
Demolition Shot Record	Verify that the shot records are on file for all demolition operations conducted over the duration of the project	Internal	SUXOS
MDAS Disposal Documentation	Confirm there are disposal documents on file for all off-site shipments of MDAS during the project	Internal	USA PM

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MC-RELATED TASKS - VERIFICATION PROCESS

Table 48: Verification Process for MC-Related Tasks

Verification Input	Description of Verification Process	Internal/ External	Responsible for Verification
Field Notebooks	Verify that records are presented and complete for each day of field activities and all planned samples including field QC samples were collected and sample IDs were documented. Also verify that meteorological data were provided for each day of field activities, changes/exceptions are documented and reported as required, and any required field measurement are performed and results documented. Reviewed internally by Site Manager each week initially, moving to a monthly review.	Internal	Site Manager or Sampling Lead
Daily QC Report	The Sampling Daily Quality Control Report (DQCR) will be prepared daily by the sampling team leader and work performed verified against requirements of the QAPP. Any deviations from the QAPP will be noted.	External and Internal	Sampling Lead and Project Chemist.
CoC and Shipping Forms	CoC forms and shipping documentation will be reviewed internally upon their completion and verified against the packed sample coolers they represent and the field logbook. The shipper's signature on the CoC will be initialed by the reviewer, a copy of the CoC retained in the site file, and the original and remaining copies taped inside the cooler for shipment.	Internal	Site Manager Project Chemist or designee
Sample Condition upon Receipt	Any discrepancies, missing, or broken containers will be communicated to the project chemist or designee in the form of laboratory logins.	External	Laboratory sample receiving staff
Cover Sheet	Confirm the cover sheet includes laboratory identifying information, contact information, assigned sample delivery group number, date issued, project name, and laboratory approval signature.	External and Internal	Laboratory PM or QA Manager USA Project Chemist or designee
Case Narrative	Confirm the case narrative documents all non-conformance issues related to the samples and analytical data contained in the report.	External and Internal	Laboratory PM USA Project Chemist or designee
DL/LOD/LOQ establishment and verification	LOD and/or LOQ quarterly verifications must be provided for all required methods, matrices, and analytes. This information may be provided in the laboratory data report or as a separate deliverable.	External and Internal	Laboratory PM, USA Project Chemist or designee

Verification Input	Description of Verification Process	Internal/ External	Responsible for Verification
Analytical Sample Results	Review analytical sample results for completeness against the requested parameters listed on the CoC.	External and Internal	Laboratory PM, USA Project Chemist or designee
QC Sample Results	Ensure all QC associated with sample analysis is included. (Laboratory should NOT include MS/MSD data associated with non-project samples.)	External and Internal	Laboratory PM, USA Project Chemist or designee
CA Reports	CA reports will be reviewed by the project chemist or PM and placed into the project file for archival at project closeout.	Internal	USA Team Technical Manager, USA Project Chemist or designee

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WORKSHEET #36: DATA VALIDATION PROCEDURES

(EPA UFP-QAPP Guidance Manual, Section 5.2.2)

Validation is performed to identify and qualify data that do not meet the MPCs specified on WS #12. The information on the tables that follow show what data inputs are required for data validation, as well as the processes used to conduct the validation.

MEC-RELATED TASKS: VALIDATION PROCEDURES

Table 49: MEC Validation Procedures

Step IIa/IIb (1)	Validation Input	Description of Validation Process	Responsible for Validation
IIa	Root Cause Analyses	Ensure that recorded MPC failures were adequately explained and that implemented CAs were documented	UXOQCS and Project Geophysicist
IIa	Grid Status Sheet	Ensure that the removal status of grids is accurately described and documented; ensure that appropriate removal operations (i.e., surface or subsurface) have been conducted in grids	Site Manager and UXOQCS
IIa	Photograph Log	Ensure that there are photographs of all MEC items; ensure that there is a representative selection of photographs for MDAS and general site activities	UXOQCS
IIb	Analog All Metals Detector Check Sheet	Ensure that the stipulated instrument checks were performed on all days that analog surveys were conducted	UXOQCS
IIa	Dig Sheet – Analog	Ensure that data recorded in these dig sheets is complete and describes the correct item type, MEC type, nomenclature, description, quantity, field estimated weights of MD, RRD, and other debris removed and disposition for all listed items	UXOQCS
IIb	Daily Instrument Test Report	Ensure that the stipulated instrument checks were performed on all days that DGM surveys were conducted	Project Geophysicist
IIb	Seed Tracking Log	Ensure that all placed seeds in all grids are listed on tracking log and that the complete listing of all seeds detected and recovered confirms the relevant MPC has been achieved	UXOQCS and QC Geophysicist

Step IIa/IIb [1]	Validation Input	Description of Validation Process	Responsible for Validation
IIb	Analog Data Deliverables	Ensure that the results of all relevant MPCs are correctly documented in the analog geophysical QC database.	UXOQCS and QC Geophysicist
IIa	Dig Sheet – DGM	Ensure that data recorded in these dig sheets is complete and adequately describes the reacquisition results and dig results, including the correct item type, MEC type, nomenclature, description, quantity, post-dig response, and disposition for all listed items; ensure that any items "left in place" are clearly noted and described; ensure that any anomalies not investigated because they were deeper than the removal depth are clearly noted	UXOQCS
IIb	DGM Data Deliverable	Ensure that the results of all relevant MPCs are correctly documented in the geophysical QC database, and that all raw and processed data files are included	Project Geophysicist
IIa	Grid QA Documentation	Ensure that all grids are indicated on the QA documentation as approved by the Government QA Representative with regard to the completion of MEC removal	Government QA Representative UXOQCS
IIb	DD Form 1348-1A	Ensure that all MDAS handled and transported off site is accounted for and that the CoC for those transfers is correctly documented	SUXOS and UXOQCS
IIb	Explosives Usage Record	Ensure that the record of each demolition event agrees with the delivery entries; ensure that there is no remaining inventory of donor explosives	UXOQCS
IIb	Demolition Shot Record	Ensure that the record of each demolition event agrees with the related dig sheet.	SUXOS and UXOQCS
IIa	MDAS Disposal Documentation	Ensure that disposal documents account for all shipments of MDAS transported off site and that they certify the disposal of the material IAW project requirements	USA PM

[1] Step IIa involves compliance with methods, procedures, and contracts, while Step IIb involves comparison with the MPCs specified on Worksheet #12.

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MC-RELATED TASKS: DATA VALIDATION PROCEDURES

"Validation" is performed to identify and qualify data that do not meet the MPCs specified on Worksheet #12. Data requiring validation are summarized on Worksheet #34. The information in these tables shows what data inputs are required for data validation as well as the processes used to conduct the validation.

The MC portion of worksheet #36 contains the following tables:Table 52: Data Validation Qualifiers and Definitions

Table 50: Validation Process for MC-Related Tasks[1]

Table 51: Overview of Analytical Data Validation for All Analytes

Table 52: Data Validation Qualifiers and Definitions

Table 50: Validation Process for MC-Related Tasks[1]

Validation Input	Description of Validation Process	Primary Person(s) Responsible
Instrument Calibration Records	Ensure instrumentation was properly calibrated prior to sample analysis	USA Subcontractor LDC
Standard Traceability	Verify all chemicals, spikes, and solvents used in the analysis are traceable back to the associated ASTM standard	USA Subcontractor LDC
Raw Data (including manual integrations when applicable)	Verify the accuracy of instrument print-outs and spot check the calculations performed by the instrument software. Review all manual integrations to ensure they were performed properly and that all required documentation was provided.	USA Subcontractor LDC
Sample Chronology	Calculate preparation and analytical holding times and compare to method requirements.	USA Subcontractor LDC
Detection / Quantitation Limits	Ensure that the reported sample DLs, LODs, and LOQs met the project sensitivity requirements specified in the project QAPP.	USA Subcontractor LDC
Electronic Data Deliverable (EDD)	Verify the EDD is error free and agrees with the hard copy report.	USA Subcontractor LDC

[1] Items listed in this table are in addition to those detailed in Worksheet #35 (Verification Process for MC-Related Tasks).

Table 51: Overview of Analytical Data Validation for All Analytes

Data Validators:	USA Project Chemist and designee(s)
Analytical Group/Method:	All Chemical Analyses
Data deliverable requirements:	Level IV data packages and EDDs
Analytical specifications:	Per UFP-QAPP and DoD QSM version 5.0
Measurement performance criteria:	Per UFP-QAPP (Worksheet #12)
Percent of data packages to be validated:	100%
Percent of raw data reviewed:	100%
Percent of results to be recalculated:	10%
Validation procedure:	Per UFP-QAPP and DoD QSM version 5.0
Data validation codes:	See table below
Electronic validation program/version:	SEDD 2a/ADR.net

Table 52: Data Validation Qualifiers and Definitions

Data Validation Qualifiers	Definitions
U	Analyte was analyzed for, but not detected and is reported as less than the Limit of Detection (LOD). The LOD has been adjusted for any dilution or concentration of the sample.
B	The analyte was found in an associated blank above one-half the LOQ, as well as in the sample.
J	The analyte was positively identified, but the associated concentration is estimated above the DL and below the LOQ or the quantitation is an estimation because of discrepancies in meeting certain analyte-specific QC criteria.
UJ	The analyte was not detected above the reported sample LOQ. However, the reported LOQ is approximate and may or may not represent the actual LOQ necessary to accurately and precisely measure the analyte in the sample.
R	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. The presence or absence of the analyte cannot be verified.

Note: Analytical laboratories will report all concentrations down to the DL and flag any results between the DL and LOQ with “J”. All non-detected concentrations will be reported as <LOD, per DoD QSM version 5.0.

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WORKSHEET #37: USABILITY ASSESSMENT

(EPA UFP-QAPP Guidance Manual, Section 5.2.3)

This worksheets describes the procedures/methods/activities that will be used to determine whether data are of the right type, quality, and quantity to support environmental decision-making for the project. It will describe how data quality issues will be addressed and how limitations of the use of the data will be handled.

MEC DATA USABILITY

Summary of Usability Assessment Processes

The USA SUXOS, UXOQCS, Project Geophysicist, and other technical personnel, as necessary, will ensure that the collected data meet the MPCs specified in this QAPP. During data validation (Worksheet #35), non-conformances will be documented, and data will be qualified accordingly. Data usability assessment is the responsibility of key members of the PDT. All data are usable as qualified by the relevant USA Team personnel, with the exception of rejected data. Estimated and/or biased results are usable. Potential outliers, if present, can be addressed on a case-by-case basis. The data are considered usable if the relevant MPCs are achieved and both the verification and validation steps are considered to have yielded acceptable data. During verification and validation steps, data may be qualified by the person validating the data. Qualifiers represent minor QC deficiencies that will not affect the usability of the data. All qualifiers will be documented in the TCRA SSFR.

When major QC deficiencies are encountered, data will be rejected and, in most cases, will not be considered usable for making project decisions. Where applicable, project data will be checked to ensure that values and any relevant qualifiers are appropriately transferred to the project's electronic database. These checks include comparison of hard copy data and qualifiers to the electronic database. Once data have been uploaded into the electronic database, another check will be performed to ensure that data were loaded accurately. Deviations from the QAPP will be reviewed to assess whether CA is warranted and to assess impacts on achievement of PQOs.

Personnel Responsible for Performing Usability Assessment

The following personnel are responsible for performing usability assessments:

- USA PM
- Site Manager
- SUXOS
- UXOQCS
- Project Geophysicist
    - Other project personnel, as necessary.

Usability Assessment Documentation

All results will be presented in the TCRA SSFR using the following (see Table 53).

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Table 53: TCRA Usability Process (MEC)

Step 1	**Review the project's objectives and sampling design** *Review the data quality objectives. Are underlying assumptions valid? Were the project boundaries appropriate? Review the sampling design as implemented for consistency with stated objectives. Were sources of uncertainty accounted for and appropriately managed? Summarize any deviations from the planned sample design.*
Step 2	**Review the data verification/validation outputs and evaluate conformance to MPCs documented on Worksheet #12** *Review the site-specific project library for completeness. Review available QA/QC reports, including weekly QC reports, assessment reports, corrective action reports, and the data verification/validation reports. Evaluate the implications of unacceptable QC results. Evaluate conformance to MPCs documented on Worksheet #12. Summarize the impacts of non-conformances on data usability.*
Step 3	**Document data usability, update the CSM, and draw conclusions** *Determine if the data can be used as intended, considering implications of deviations and corrective actions. Assess the performance of the sampling design and Identify any limitations on data use. Update the conceptual site model and document conclusions.*
Step 4	**Document lessons learned and make recommendations** *Summarize lessons learned and make recommendations for changes to DQOs or the sampling design for future similar studies. Prepare the data usability summary report.*

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MC DATA USABILITY

This section documents procedures that the laboratory will use to assess the sample results. ..

See WS #28 for data quality indicators associated with the analytical measurements to be used on the project.

The following DQIs will be assessed in the DVR provided by the lab:

Precision

Precision is the measure of variability among individual sample measurements under prescribed conditions. The RPD between primary and field duplicate samples, laboratory sample duplicate (SD) pairs, and matrix spike/matrix spike duplicate (MS/MSD) sample results demonstrate the precision of the sample matrix, field sampling technique, and lab procedures. When the LCS results meet the accuracy criteria, results are also believed to be precise, and represent the precision of the laboratory, independent from sample matrix. This is based on the LCS being within control limits in comparison to LCS results from previous analytical batches of similar methods and matrices. Precision will be expressed in terms of RPD between the values resulting from primary and duplicate sample analyses. RPD is calculated as follows:

$$RPD = [\ |(x_1 - x_2)|\ /\ \bar{x}\ ][100]$$

Where:

x_1 = analyte concentration in the primary sample,

x_2 = analyte concentration in the duplicate sample, and

$\bar{x}$ = average analyte concentration of the primary and the duplicate sample.

For field duplicate samples, the target RPD is ≤ 40 percent for water and ≤ 50 percent for soil and sediment. An RPD within the control limit indicates satisfactory precision in a measurement system.

Accuracy

Accuracy is a measure of the closeness of a reported concentration to the true value. Accuracy is expressed as a bias (high or low) and is determined by calculating percent recovery (%R) from MS/MSDs, LCSs, and surrogate spikes (where applicable). MS/MSD and surrogate spike recoveries indicate accuracy relevant to a unique sample matrix. LCS recoveries indicate accuracy relevant to an analytical batch lot, and are strictly a measure of accuracy conditions in preparation and analysis independent of samples and matrices. The %R of an analyte, and the resulting degree of accuracy expected for the analysis of spiked samples for QC, are dependent upon the sample matrix, method of analysis, dilution (if required) and the compound or element being measured. Accuracy expressed as %R is calculated as follows:

$$\%R = [(A-B)/C] \times 100$$

Where:

A = spiked sample concentration,

B = measured sample concentration (without spike), and

C = concentration of spike added.

Accuracy criteria for the laboratory are defined by control limits listed in WS #28.

Completeness

Completeness is defined as the percentage of laboratory measurements judged to be valid on a method-by-method basis. In addition to valid results (data not rejected), broken and/or spilled samples, and any other problems that may compromise sample representativeness are included in the assessment of completeness. Valid data are defined as all data and/or qualified data considered to meet the DQOs for this project. Data completeness is expressed as percent complete (PC) and should be ≥ 90 percent. At the end of each sampling event, the completeness of the data will be assessed. If any data omissions are apparent, the parameter in question will be resampled and/or reanalyzed, if feasible. The laboratory will notify the USA Project Chemist with any non-conformance issue and CA will be initiated immediately. Laboratory results will be monitored as they become available to assess laboratory performance and its effect on data completeness requirements. PC is calculated as follows:

$$PC = [N_A/N_I] \times 100$$

Where:

N_A = Actual number of valid analytical results obtained, and

N_I = Theoretical number of results obtainable under ideal conditions.

Comparability

Comparability expresses the confidence with which data from one sample, sampling round, site, laboratory, or project can be compared to those from another. Comparability during sampling is dependent upon sampling program design and time periods. Comparability during analysis is dependent upon analytical methods, DLs, laboratories, units of measure, and sample preparation procedures. Comparability is determined on a qualitative rather than quantitative basis. For this project, comparability of all data collected will be ensured by adherence to standard sample collection procedures, standard field measurement procedures, and standard reporting methods, including consistent units. For example, concentrations will be reported in a manner consistent with general industry practice (e.g., soil data will be reported on a dry-weight basis). In addition, to support the comparability of fixed-base laboratory analytical results with those obtained from previous or future testing, all samples will be analyzed by USEPA-approved methods, where available. The USEPA-recommended maximum permissible sample holding times (Worksheet #19) for parameters will not be exceeded. All analytical standards will be traceable to standard reference materials. Instrument calibrations will be performed IAW USEPA method specifications, and will be checked at the frequency specified for the methods. The results of these analyses can then be compared to analyses by other laboratories and/or to analyses for other sites addressed by this investigation.

Representativeness:

Representativeness expresses the extent to which collected data define site contamination. Where appropriate, sample results will be statistically characterized to determine the degree to which the data accurately and precisely represent a characteristic of a population, parameter variation at a sampling point, a process, or an environmental condition. Sample collection, handling, preservation, and analytical procedures are designed to obtain the most representative sample possible.

Representative samples will be achieved by the following:

- Collection of samples from locations representing site conditions;
- Use of appropriate sample preservation techniques;
- Use of appropriate sampling procedures, including proper equipment;
- Use of appropriate analytical methods for the required parameters and LOQs; and,
- Analysis of samples within the required holding times.

Sample representativeness is also affected by the portion of each sample chosen for analysis. The laboratory will adequately homogenize all samples prior to taking aliquots for analysis to ensure that the reported results are representative of the sample received.

Sensitivity:

The concentration of any one target compound that can be detected and/or quantified is a measure of sensitivity for that compound. Sensitivity is instrument-, compound-, method-, and matrix-specific.

Following the QSM, the subcontract laboratory will report detected concentrations down to the DL and non-detects down to the limit of detection (LOD) and target compounds detected below the LOD but above the DL will be "J" flagged to indicate that concentrations are estimated.

A data validation report will be created by the lab for each sample delivery group (SDG), including a summary of all QA/QC results associated with the SDG to provide documentation whether data generated were in control throughout sample analysis. Topics of discussion include Accuracy/Biased Contamination, Precision of field duplicate and/or lab duplicate, Sensitivity, Representativeness, and Completeness. Criteria listed in Worksheet #12 will be examined to determine if the Measurement Performance Criteria were met. Any lab trending in the QC samples, such as high biased lab control sample for a particular compound or metal will be discussed about. Correlations between methods will not be performed when appropriate.

The project chemist will evaluate the sensitivity of the data collected to determine whether the required DLs, LODs, and LOQs were met. Data will be further evaluated to determine whether the reported DL, LOD, and LOQ are sufficient to meet the associated project action limits. Sensitivity of target compounds may be affected by matrix interference, high levels of target or non-target analytes, sample volume available for collection, etc. If the sensitivity requirements are not met for a particular analyte, the USA Team will evaluate whether the data can still be used for project decisions. For analytes that are site-related, the USA team will use a "weight of evidence" approach to evaluate whether the chemical could have been present. This approach uses available data that does meet sensitivity requirements to evaluate the presence or absence of other similar compounds and/or degradation products for the analyte in question. If sufficient evidence exists to determine a compound was not present due to the absence of similar compounds and breakdown products, the USA Team can deduce that the analyte was not present, and thus data is usable for decision making.

Data summary tables will be generated in order for data reviewer to review the results in an organized manner.

Table 54: TCRA Usability Assessment (MC)

Step 1	**Review the project's objectives and sampling design** *Review the data quality objectives. Are underlying assumptions valid? Were the project boundaries appropriate? Review the sampling design as implemented for consistency with stated objectives. Were sources of uncertainty accounted for and appropriately managed? Summarize any deviations from the planned sample design.*
Step 2	**Review the data verification/validation outputs and evaluate conformance to MPCs documented on WS #12** *Review the sampling conducted for completeness per the sampling design. Review the DQCRs, CA reports (if any needed), and the data verification/validation reports. Evaluate the implications of unacceptable QC results. Evaluate conformance to MPCs documented on WS #12. Summarize the impacts of non-conformances on data usability.*
Step 3	**Document data usability, update the CSM, and draw conclusions** *Determine if the data can be used as intended, considering implications of deviations and CAs. Assess the performance of the sampling design and Identify any limitations on data use. Update the conceptual site model and document conclusions.*
Step 4	**Document lessons learned and make recommendations** *Summarize lessons learned and make recommendations for changes to DQOs or the sampling design for future similar studies. Prepare the data usability summary report.*

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REFERENCES

Department of Defense (DoD), 2012. Manual (DoDM) 4715.20, *Defense Environmental Restoration Program (DERP) Management*, 9 March 2012.

Department of Defense (DoD), 2013. *Quality Systems Manual (QSM) for Environmental Laboratories*, Version 5.0. July.

Ellis Environmental Group (EEG), 2006. *Final WP, Non-Time Critical Removal Action at the Municipality of Culebra, Puerto Rico, United States Army Corps of Engineers, Huntsville Center, Contract No. W912DY-05-D-0007*.

EM 200-1-15. 30 October 2015. *Technical Guidance for Military Munitions Response Actions.*

EM 385-1-1. *USACE Safety and Health Requirements Manual*.

Engineer Regulation (ER) 200-3-1, 2004. *FUDS Program Policy*, 10 May. 2004

Environmental Science & Engineering, Inc. (ESE), 1997. *Final Engineering Evaluation/Cost Analysis: Former Culebra Island Naval Facility, Culebra Island, Puerto Rico. DERP- FUDS Project Number I02PR006802*. April.

Gaddy, Dr. L.L., 2011. "Inventory of Endangered, Threatened, and otherwise Protected Species and Their Habitats on Selected Portions of Culebra and Outlying Cays, Puerto Rico." Prepared for USA Environmental. March, rev. April.

Los Alamos National Laboratory (LANL). 2015. EcoRisk Database, release Release 3.3.

Southeast Regional Climate Center (SERCC), 2012. Charlotte Amalie HAR, Virgin Islands (678905). http://www.sercc.com/cgi-bin/sercc/cliMAIN.pl?vi8905, Accessed 8/27/13.

U.S. Army Corps of Engineers (USACE), 2016. *Explosives Safety Submission. Cayo Botella.*

U.S. Army Corps of Engineers (USACE-RI), 1995. *Archive Search Report Findings for Culebra Island National Wildlife Refuge, Culebra, Puerto Rico. Project No. I02PR006802*. Prepared by USACE Rock Island District. February

U.S. Army Corps of Engineers Jacksonville District (CESAJ), 2015. *Final Supplemental Standard Operating Procedure (SOP) for Endangered Species Conservation and their Critical Habitat* (Addendum 1 – February 2015)

U.S. Army Corps of Engineers, Jacksonville District (CESAJ), 2016. "Time Critical Removal Action - Action Memorandum, Cayo Botella Culebra, Puerto Rico, Munitions Response Site 07, Formerly Used Defense Site Project Number 102PR006807." June.

U.S. Army Corps of Engineers, Jacksonville District, 1991, revised 2005. *Defense Environmental Restoration Program Formerly Used Defense Sites CULEBRA, PUERTO RICO PROPERTY NO. I02PR0068 Inventory Project Report (INPR)* Original May 1991 Revised July 2005 (Final), Inventory Project Report (INPR). (Original May 1991, Revised July 2005.

U.S. Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS), 2008. *Soil Maps for Puerto Rico, Humacao Area, Puerto Rico Eastern Part -PR689*, Version 3, August 19, 2008.

U.S. EPA 2016. Regional Screening Levels (RSLs). May.

U.S. EPA, 2005. *Uniform Federal Policy for Quality Assurance Project Plans: Evaluating, Assessing, and Documenting Environmental Data Collection and Use Programs, Part 1: UFP-QAPP Manual*, March.

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APPENDIX A. PERFORMANCE WORK STATEMENT (PWS)

This appendix contains a copy of the PWS.

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Performance Work Statement
Time Critical Removal Action (TCRA)
Cayo Botella and Cayo del Agua
Culebra Island, Puerto Rico
I02PR0068
29 March 2016
Revision: 1
Revision Date: 25 August 2016

The purpose of this revision is to correct the Approval Memoranda Date, update Task 1 objectives to clearly state the project will require a separate document for each site, to change the objective of the ESS from updating to creation, to edit the Field Work Task Objectives to reflect the price spreadsheet, to allow 35 days for QAPP submission and revise the payment milestones schedule. New text is in italic and underlined, removed text is in strikethrough type.

1.0 Objective: The objective of this task order is to remove Munitions and Explosives of Concern (MEC), Material Potentially Presenting an Explosive Hazard (MPPEH) and Explosive Hazards from Cayo Botella and Cayo del Agua, Culebra, per the TCRA Approval Memoranda dated ~~04 April 2016~~ *07 June 2016*.

2.0 BACKGROUND

2.1 Work under this Performance Work Statement (PWS) falls within the within the DERP-FUDS Military Munitions Response Program (MMRP) for Culebra, a Formerly Used Defense Site (FUDS). The Contractor shall perform all work in compliance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Contingency Plan (NCP), 40 CFR Part 300. All activities involving work in areas potentially containing explosive hazards shall be conducted in full compliance with United States Army Corps of Engineers (USACE), Department of the Army (DA), and Department of Defense (DOD) regulations, guidance, standards and manuals.

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

3.0 General Requirements:

3.0.1 Contractor Methods: This is a performance based task order. The performance objectives and standards included herein are the basis of the task order requirements. The technical approach and level of effort expended to achieve task order objectives and standards are solely up to the contractor to select and adjust as necessary through the life of the task order. Government recognizes the contractor's right to change the technical approach and level of effort from that proposed with the understanding that the contractor shall still meet all project objectives and gain government Quality Assurance acceptance in order to receive payment.

3.0.2 Quality monitoring and measurement: The contractor will be evaluated periodically during performance of this task order to ensure compliance with the proposed and accepted performance goals, regulations, guidance and DIDs, and to document that acceptance criteria (AC), delivery schedule, and the overall completion date are being met. This evaluation will be performed according to a Quality Assurance Surveillance Plan (QASP). A programmatic QASP will be provided by the government as a starting point for the contractor prepared Draft QASP per Task 1. The government will finalize the contractor's Draft QASP. This final QASP will be supplied to the contractor and used by the government to evaluate the contractor's performance. Failure to adequately complete any service or submittal to at least a satisfactory level of quality or timeliness may result in a repeat of the work, or a poor performance evaluation, or both.

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

3.0.4 Task Pricing: A pricing schedule is provided separately.

3.1 Task 1, Project Management Plan (PMP), Munitions and Explosives of Concern Quality Assurance Project Plan (MEC-QAPP) and QASP: This is a Firm Fixed Price task.

Objective: Prepare, submit, and gain acceptance of a PMP, MEC-QAPP, and QASP that are detailed and comprehensive plans covering all aspects of project execution as required in Task 3. The PMP is a living document and shall be updated as necessary. ~~Each document (PMP, MEC-QAPP, QASP) shall cover all sites listed below~~ *A separate document (PMP, MEC-QAPP, QASP) shall be created for each site listed below:*

3.1.1 Task 1a, Cayo Botella, FUDS Project No. I02PR0068.

3.1.2 Task 1b, Cayo del Agua, FUDS Project No. I02PR0068.

Performance Standard: Prepare the PMP in accordance with Army Regulation (AR) 5-1; AR 11-2; USACE PMBP Manual, PROC2000, PMP-PgMP Development, REF8005G; PMP-PgMP Content and Data Item Description (DID) WERS-018. Prepare the MEC-QAPP in accordance with Section 1.0 of DID WERS-001.01 and other applicable DIDs for sub plans, EM 200-1-15, EM 385-1-1, EM 385-1-97 (including Errata Sheets and Changes), Intergovernmental Data Quality Task Force UFP-QAPP Manual, and other interim guidance, DIDs, or State regulatory guidance, as appropriate. The Draft QASP shall meet the requirements described in guidance. The QASP shall include systematic methods used to monitor performance and to identify the required documentation and the resources to be employed to include monitoring Quality Control requirements in guidance, DIDs and the Contractor's Quality Control Plan.

AC: Acceptance of MEC-QAPP and all sub-plans with a Draft for Government agency review, Draft Final for back check and review by the EM-CX prior to release to the Regulators, Draft Final to the regulators, Final for Back check by all, Approved Final. One additional revision is acceptable to incorporate EM-CX, as required. Draft QASP reflects requirements of the QAPP with one revision required. Acceptance of the PMP with one revision.

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

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

Specific Task Requirements: The intention of Section 2.3 of WERS-018 is to discuss remedy reviews (e.g. root cause analysis, corrective action plans) to address QC/QA failures. In addition to Basic Contract Section C and DID project status reporting requirements, the contractor shall include a project kick-off meeting and in-progress review (IPR) meetings. IPR meetings shall include but are not limited to, regular feedback to the Government on the progress of its work through teleconferences, electronic mails, and face to face meetings as required by the government. The MEC-QAPP shall include methods that will be utilized to ensure that data generated are of an acceptable quality for its intended use. The Contractor shall include a discussion as to how the project shall be managed and implemented. The Contractor shall determine if a streamlined QAPP is appropriate for this task order.

3.1.3 Task 1c, Optional Explosive Safety Submission ~~Amendment~~: This is a Firm Fixed Price task. If this optional task is not awarded, an up to date Explosive Safety Submission will be provided by the government for inclusion in the UFP-QAPP. The ESS shall cover all sites listed below:

3.1.3.1 Task 1c1, Optional ESS for Cayo Botella, FUDS Project No. I02PR0068.

3.1.3.2 Task 1c2, Optional ESS for Cayo del Agua, FUDS Project No. I02PR0068.

Objective: Prepare, submit and gain acceptance of an ~~amendment to the current~~ Explosives Safety Submission.

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

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

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

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

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

3.2 Task 2, GeoSpatial Data: This is a Firm Fixed Price task.
Objective: Utilize GIS in the maintenance and management of all project and geospatial data.

Performance Standard: Manage and maintain project data, and update the CSM in GIS IAW DID WERS-007.01, EM 200-1-2, EM 1110-1-1200, EM 200-1-15, ER 1110-1-8156, EM 1110-1-2909 and applicable Interim Guidance Documents.

AC: Acceptance of GeoSpatial Data submissions meets quality and formatting requirements.

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

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

Specific Task Requirements: The GeoSpatial Data shall include:
- Maintain and update property GIS data for all landowners within the project boundaries. Property owner privacy will be preserved. Property owner names shall not be disseminated in any documents.
- Track and assist the District in obtaining property Right -of -Entry as needed.
- A pre and post-project response action geospatial data analysis will be performed using a GIS.
- All available existing data that is applicable to the project will be consolidated into the GeoDatabase and analyzed to relay pertinent information to the PDT. If an existing GIS database is available, it will be provided by the government.
- The analyses may detail the fieldwork strategies, areas of concern, survey requirements, environmental concerns, milestones and/or other factors that affect product delivery and future action planning.
- Entities that may be affected by response actions include but are not limited to: landowners, homeowners, rental tenants, schools, utilities, roads, businesses, recreational areas, air traffic, water bodies and/or industries.
- The GeoDatabase shall be a living repository that is refined throughout the life of the project.
- Incorporate layers that overlay on maps of the site that identify physical features, and Material Potentially Presenting Explosive Hazard (MPPEH)/Munitions Debris (MD) found during the investigation. Examples include: streets, anomalies, Munitions and Explosives of Concern (MEC) positively identified, identifiable MD, sampling location, cultural resources, environmental, biological, and socio-economic variables.
- Archeological site location(s) will not be released to the public without written permission from USACE.
- Perform civil surveys IAW EM 200-1-15 and DID WERS-007.01.
- Final GIS deliverable shall include all documentation, reports, meeting minutes databases, etc. created developed or modified under this task order in original and PDF format. This deliverable shall meet QA acceptance prior to payment of final invoice.

3.3 Task 3, TCRA Field Activities: This is a Firm Fixed Price task.
Objective: Conduct a TCRA for the land portions of Cayo Botella and Cayo Agua in accordance with the accepted MEC-QAPP, ESS, and all applicable standards such that the objective of this PWS is met. The contractor shall also conduct all field work so as to sufficiently reduce the imminent hazard of contamination to potential receptors. Field Work shall begin within 6 months of approval of the TCRA Memo and IAW FUDS policy.

3.3.1 Task ~~3a~~ *3b*, Cayo Botella, FUDS Project No. I02PR0068.

3.3.2 Task ~~3b~~ *3c*, Cayo del Agua, FUDS Project No. I02PR0068.

3.3.3 Task ~~3c~~ *3a*, Biological Monitoring: This is a Firm Fixed Price task.
Objective: The Contractor shall provide a qualified Project Biologist for daily biological monitoring prior to intrusive ordnance activities as described in the Standard Operation Procedure (SOP) 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).

Performance Standard:
- The contractor shall perform all necessary field work to identify and remove all UXO items from the specified areas, and to subsequently dispose of all confirmed MEC in accordance with the MEC-QAPP and ESS.
-Field work, data quantity and quality, and analysis of data shall be performed in accordance with applicable laws, regulations, and guidance documents and the results will be provided in the appropriate deliverable format.
-Field activities shall be performed in accordance with the accepted MEC-QAPP and all SOPs.
- The Government finding no MEC or MPPEH excluding small arms ammunition (.50 cal and smaller), and no MD or RRD equivalent to, or greater than 37mm in diameter or width on the surface of the munitions response site.
- The Government finding no subsurface MEC or MPPEH shallower than 8x the item's diameter.
-The Government finding no signal equivalent to, or greater than anomaly selection criteria as documented in the Instrument Verification Strip (IVS) Letter Report or approved UFP-QAPP without an acceptable explanation.
- Anomalies in the subsurface shall be resolved, regardless of if water is encountered.
- Quality Control (QC) deliverables and Quality Assurance (QA) inspections/review demonstrate that the work was performed IAW the UFP-QAPP, ESS, applicable laws, regulations, and guidance documents.
- All operations at the project site shall be managed, supervised, and performed by fully Unexploded Ordnance (UXO)-qualified personnel meeting the requirements of the DDESB Technical Paper 18.
-Site restorations and backfilling shall be in accordance with the work plan and all applicable laws, regulations, and guidance documents.
-MEC encountered during the removal action will be detonated onsite or otherwise properly disposed of under a TCRA ESS.
- Proper processing and disposition of UXO, DMM, and MD encountered in accordance with approved plan(s).
- All MPPEH encountered will be inspected, characterized according to its explosive safety status as Material Documented as Safe (MDAS) or Material Documented as Explosive Hazard (MDEH). It shall be managed, certified, and recycled according to procedures in DoDM 6055.9 Vol 7, DoDI 4140.62, and EM 385-1-97.
- QC deliverables and QA inspections/review demonstrate that the work was performed in accordance with the MEC-QAPP, ESS, applicable laws, regulations, and guidance documents;
- All materials for circulation to the public shall be approved by USAESCH and CESAJ before distribution.
- All geophysics shall be IAW EM 200-1-15 and DID WERS-004.01.
- A geo-referenced permanent record of the investigation shall be delivered as part of the report (GIS of traverse and items located, digital geophysical data, etc).
-Project Biologist qualifications shall reflect 2-4 years' experience in related work, working independently under general supervision (equivalent to industry Biologist II).

AC: Conduct the RA in accordance with the accepted/approved MEC-QAPP, and ESS.
- Geophysical QC data submitted meets requirement described in DID WERS-004.01 and EM 200-1-15.
- No more than 3-4 CARs/948s for non-critical violations and/or 1 CAR/948 for critical violation. No unresolved corrective action requests.
- All final data and QC tests/documentation submitted. Government QA acceptance of QC tests/documentation gained.
- No Class "A" Safety accidents, contractor at fault; No Class "B", contractor at Fault, no more than 1 non-explosive Class "C" accident; and <2 non-explosive related Class "D" accidents, IAW AR 385-40.
- Major safety violations, no more than 1 non-explosive related safety violation.
- Minor safety violations, no more than 2 safety violations.
- Zero letters of formal grievances or letters of concern.

Measurement / Monitoring: Periodic inspection/review of field work. Verify compliance with accepted MEC-QAPP and applicable laws, regulations, and guidance documents. Quality control tests/documentation submitted per the QASP for government review. QC deliverables and QA inspections/review demonstrate that the field activities are performed such that sufficient quality data is produced and the data can be used for its intended purpose.

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

Specific Task Requirements:
- This is a time critical removal action and must comply with all time limits, laws, regulations, and guidance related to TCRA field work. The contractor will obtain any necessary permits or Rights of Entry.

- Restore all areas to their original condition; all access/excavation/detonation holes shall be backfilled.
- Maintain a detailed accounting of all UXO, DMM, MD and range-related debris encountered per DID WERS-004.01. This accounting shall include as a minimum: amounts of UXO, DMM and MD; nomenclature; location and depth of UXO/DMM; location of MD; and final disposition. The accounting system shall also account for all demolition materials utilized on site. Digital photographs of UXO and DMM and examples of MD found during the investigation are to be taken.
- All UXO, DMM and MC encountered during this munitions response shall be processed in accordance with the approved work and safety plans.

3.4 Task 4, TCRA Site Specific Final (SSF) Report: This task is a Firm Fixed Price task.
Objective: Prepare, submit and gain acceptance of a TCRA SSF report covering all sites listed below:

3.4.1 Task 4a, Cayo Botella, FUDS Project No. I02PR0068.

3.4.2 Task 4b, Cayo del Agua, FUDS Project No. I02PR0068.

Performance Standard: The SSF report shall document the results of the TCRA and be in accordance with EP 1110-1-18 and DID WERS-013.01.

AC: Acceptance of SSF report with two revisions. One additional revision is acceptable to incorporate EM-CX.

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

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

Specific Task Requirements: None

3.5 Task 5, Administrative Record: This task is a Firm Fixed Price task.
Objective: Update and maintain the Administrative Record for the TCRA areas throughout the period of performance of this Task Order for all sites listed below:

3.5.1 Task 5a, Cayo Botella, FUDS Project No. I02PR0068.

3.5.2 Task 5b, Cayo del Agua, FUDS Project No. I02PR0068.

Performance Standard**:** Prepare in accordance with the guidance in EP 200-3-1, Chapter 4 (Establishing and Maintaining Administrative Records) and Standard Operating Procedure for Formerly Used Defense Sites (FUDS) Records Management, Revision 5, dated January 2008 (or most recent version).

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

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

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

Specific Task Requirements: Within 60 days of the start of on-site removal activity, the Contractor shall establish or update as required the Administrative Record and publish a public notice in a major local newspaper of general circulation to announce the availability of the Administrative Record file. All materials for circulation to the public shall be approved by USAESCH and CESAJ before distribution. Provide copies of all final documents posted to the Administrative Record on CD/DVD to USAESCH and CESAJ, 2 copies each. These files shall be suitable for placement on the FRMD web site. This task requires close coordination with the Jacksonville District (CESAJ) and USAESCH to secure all required documents to support the Administrative Record.

4.0 Submittals.

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

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

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

US Army Engineering & Support Center, Huntsville
Attn: CEHNC-OE-DC (~~Roland Belew~~ *Teresa Carpenter*) (~~COR~~ *POC*)
PO Box 1600
Huntsville, AL 35807-4301
4820 University Square
Huntsville, AL 35816-1822

US Army Corps of Engineers, Jacksonville District
Attn: CESAJ-PM-M
Wilberto Cubero, Project Manager
701 San Marco Blvd
Jacksonville, FL 32207

US Army Engineering & Support Center, Huntsville
Attn: CEHNC-CX-MM
PO Box 1600
Huntsville, AL 35807-4301
4820 University Square
Huntsville, AL 35816-1822

Contractor to obtain and/or verify addresses.

4.2 Submittals and Due Dates.
The Contractor shall submit 1 copy of the entire submittal on a CD with each hard copy of a submittal (Reports, Plans, etc) in accordance with DID WERS-007.01, latest version. Hardcopies shall be printed on both sides of the paper whenever possible. **All deliverables, except for Final versions, shall be electronic submittals.**

Table 4-1 List of Submittals

Submittal	**Due Date (Calendar Days)**
Meeting minutes for Kickoff phone conference	7 days after Kickoff phone conference
Proposed Schedule	7 days after Kickoff conference call
Explosives Safety Submission Addendum	Separate DDESB approval before intentional physical contact with MEC on site
Draft PMP, electronic copy only	14 days after Kickoff conference call
Final PMP, electronic copy only	7 days after acceptance of comment responses
Draft MEC-QAPP	~~21~~ 35 days after Kickoff conference call
Draft Final MEC-QAPP w/ GIS on DVD	14 days after acceptance of comment responses
Final MEC-QAPP	14 days after acceptance of comment responses

Draft QASP, electronic copy only	With Draft Final UFP-QAPP
Quality Control Documents	**As required by Regulation, guidance, DIDs, QCP, QASP, or agreed to in project schedule.**
Draft TCRA SSF Report	21 day after completion of field work
Draft Final TCRA SSF Report	14 days after receipt of comments
Final TCRA SSF Report	14 days after on board Review
Final GIS Files on CD	End of Project
Final Administrative Record	End of Project

4.3 Submittal Quantities
Provide the number of submittals shown in Table 4-2 to the addressees given in Section 4.2. No draft documents shall be released to the regulatory community until reviewed by the government.

Table 4-2 Submittal Guidance

	Draft Documents	Draft Final/Final Documents
KO/COR	1 each	1 each
USAESCH	2	2
CESAJ	2	4

4.4 Review Period: The contractor shall include at least a minimum 14 calendar day review period for USAESCH, 21 calendar day review period for the EM-CX and 30 calendar day review period for the regulators.

4.5 Period of Performance: Field activities must be initiated within six (6) months from approval of the Action Memorandum. The Completion Date for this Task Order is 31 March 2018.

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

5.1 The following is a list of potential milestones for payment:
- Final Submittals: upon government acceptance, for example: Final MEC-QAPP
- Field Work: completion of TCRA removal actions
- Meetings: after completion of meetings with government acceptance of meeting minutes, for example: Kick-off meeting minutes.

6.0 REFERENCES:

6.1 Refer to "Base Contract."

6.2 Data Items Descriptions provided upon request.

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

7.1 This is a performance based task order.

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

7.3 If the Government at its sole discretion chooses to modify the performance standard the parties to this task order will assess the impact on the estimated amount of field work required to achieve the new performance standards and will negotiate a price adjustment.

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

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

7.6 Proposals shall account for any reasonably foreseeable delays due to weather or oceanic events.

8.0 ARMY CONTRACTOR MANPOWER REPORTING

8.1 Implementation.

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

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

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

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

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

Attachment A

Performance Requirements Summary:

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

Table A-1 Performance Requirements Summary

Task	Objective	Performance Standard	Minimum Acceptable Criteria	Measurement / Monitoring	Incentive/ Disincentive
1	Prepare, submit, and gain acceptance of a PMP, MEC-QAPP, and QASP that are detailed and comprehensive plans covering all aspects of project execution as required in Task 3. The PMP is a living document and shall be updated as necessary. Each document (PMP, MEC-QAPP, QASP) shall cover all sites listed.	See Task.	Acceptance of MEC-QAPP and all sub-plans with a Draft for Government agency review, Draft Final for back check and review by the EM-CX prior to release to the Regulators, Draft Final to the regulators, Final for Back check by all, Approved Final. One additional revision is acceptable to incorporate EM-CX, as required. Draft QASP reflects requirements of the QAPP with one revision required. Acceptance of the PMP with one revision.	Review of PMP, MEC-QAPP, and QASP to verify that the minimum acceptable content has been provided and meets applicable guidance.	Satisfactory or greater CPARS rating/poor CPARS rating and/or re-performance of work at contractor's expense.
1a	Prepare, submit and gain acceptance of an ~~amendment~~ to the current Explosives Safety Submission that covers all listed sites.	Prepare required submission in accordance with DoD 6055.09-M, EM 385-1-97, Errata Sheet #3, and DID WERS-003.01 as a stand-alone document for inclusion after acceptance into the QAPP.	Acceptance of submission with two revisions. One additional revision is acceptable to incorporate EM-CX, USATCES and DDESB comments.	Review by Government using guidance cited to determine acceptability.	Satisfactory or greater CPARS rating/poor CPARS rating and/or re-performance of work at contractor's expense.
2	Utilize GIS in the maintenance and management all project and geospatial data.	Manage and maintain project data, and update the CSM in GIS IAW DID WERS-007.01, EM 200-1-2, EM 1110-1-1200, EM 200-1-15, ER 1110-1-8156, EM	Acceptance of GeoSpatial Data submissions meets quality and formatting requirements.	Review by Government using guidance cited to determine acceptability.	Satisfactory or greater CPARS rating/poor CPARS rating and/or re-performance of work at contractor's expense.

		1110-1-2909 and applicable Interim Guidance Documents.			
3	Conduct a TCRA for the land portions of Cayos Botella and del Agua in accordance with the accepted MEC-QAPP, ESS, and all applicable standards such that the objective of this PWS is met. The contractor shall also conduct all field work so as to sufficiently reduce the imminent hazard of contamination to potential receptors. Field Work shall begin within 6 months of approval of the TCRA Memo and IAW FUDS policy.	See Task	Conduct the RA in accordance with the accepted/approved MEC-QAPP, and ESS. - Geophysical QC data submitted meets requirement described in DID WERS-004.01 and EM 200-1-15. - No more than 3-4 CARs/948s for non-critical violations and/or 1 CAR/948 for critical violation. No unresolved corrective action requests. - All final data and QC tests/documentation submitted. Government QA acceptance of QC tests/documentation gained. - No Class “A” Safety accidents, contractor at fault; No Class “B”, contractor at Fault, no more than 1 non-explosive Class “C” accident; and <2 non-explosive related Class “D” accidents, IAW AR 385-40. - Major safety violations, no more than 1 non-explosive related safety violation. - Minor safety violations, no more than 2 safety violations. - Zero letters of formal grievances or letters of concern.	Periodic inspection/review of field work. Verify compliance with accepted MEC-QAPP and applicable laws, regulations, and guidance documents. Quality control tests/documentation submitted per the QASP for government review. QC deliverables and QA inspections/review demonstrate that the field activities are performed such that sufficient quality data is produced and the data can be used for its intended purpose.	Satisfactory or greater CPARS rating/poor CPARS rating and/or re-performance of work at contractor’s expense.
4	Prepare, submit and gain acceptance of a TCRA SSF report that covers all sites	The SSF report shall document the results of the TCRA and be in accordance with EP	Acceptance of SSF report with two revisions. One additional revision	Review of SSF report against guidance to verify that the minimum	Satisfactory or greater CPARS rating/poor CPARS rating and/or re-performance of

	listed.	1110-1-18 and DID WERS-013.01.	is acceptable to incorporate EM-CX.	acceptable content has been provided.	work at contractor's expense.
5	Update and maintain the Administrative Record for the TCRA areas throughout the period of performance of this Task Order for all sites listed.	Prepare in accordance with the guidance in EP 200-3-1, Chapter 4 (Establishing and Maintaining Administrative Records) and Standard Operating Procedure for Formerly Used Defense Sites (FUDS) Records Management, Revision 5, dated January 2008 (or most recent version).	Administrative record will be evaluated against guidance for compliance with requirements, accuracy and completeness of the record, with up to one uncorrected deficiencies remaining during the period of performance.	The government will visit, at least once, the administrative record's location and check for completeness and compliance with referenced EP; electronic submissions will be evaluated randomly upon receipt as data is entered into the record.	Satisfactory or greater CPARS rating/poor CPARS rating and/or re-performance of work at contractor's expense.

Attachment B
PERFORMANCE METRICS

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

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

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

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

	Exceptional	Very Good	Satisfactory	Marginal	Unsatisfactory
	violations	violations			handling, storage, transportation, or use of explosives IAW the WP, and all Federal, State and local laws/ordinances
*Minor safety violations	No safety violations	1 safety violation		3 safety violations	>3 safety violations

Classes of Accidents:

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

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

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

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

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

APPENDIX B. SITE MAPS

This appendix contains the following site maps:

- Figure 1: Regional Location Map
- Figure 2: Cayo del Agua Surface Clearance Map
- Figure 3: Cayo del Agua Intrusive Investigation Area Map
- Figure 4: Cayo del Agua Grid Map (Surface clearance, Analog and Dig, and Selected DGM Anomaly Investigations)
- Figure 5: Cayo del Agua Vegetation Removal Map
- Figure 6: Cayo del Agua Small Boat and CMS Barge 4 Point Moor Location Map
- Figure 7: Primary MDAS Processing Area
- Figure 8: Cayo del Agua Turtle Nest Monitoring Map
- Figure 9: Cayo del Agua Access Map
- Figure 10: Cayo del Agua Potential Inaccessible Areas Map.

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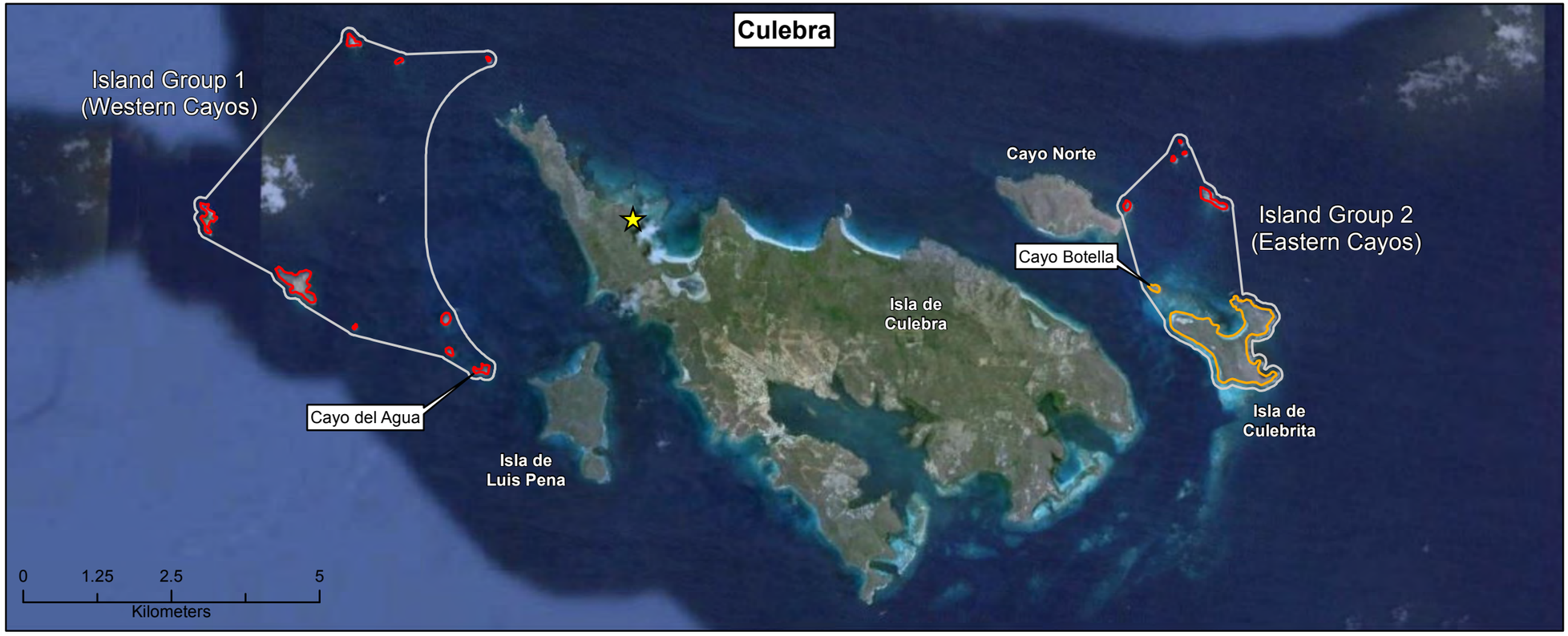


N

Scale Varies

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

Culebra Cayo TCRA

Figure 1
Regional Location Map

Island of Culebra, Puerto Rico

Legend

- Magazine Location
- Island Groups

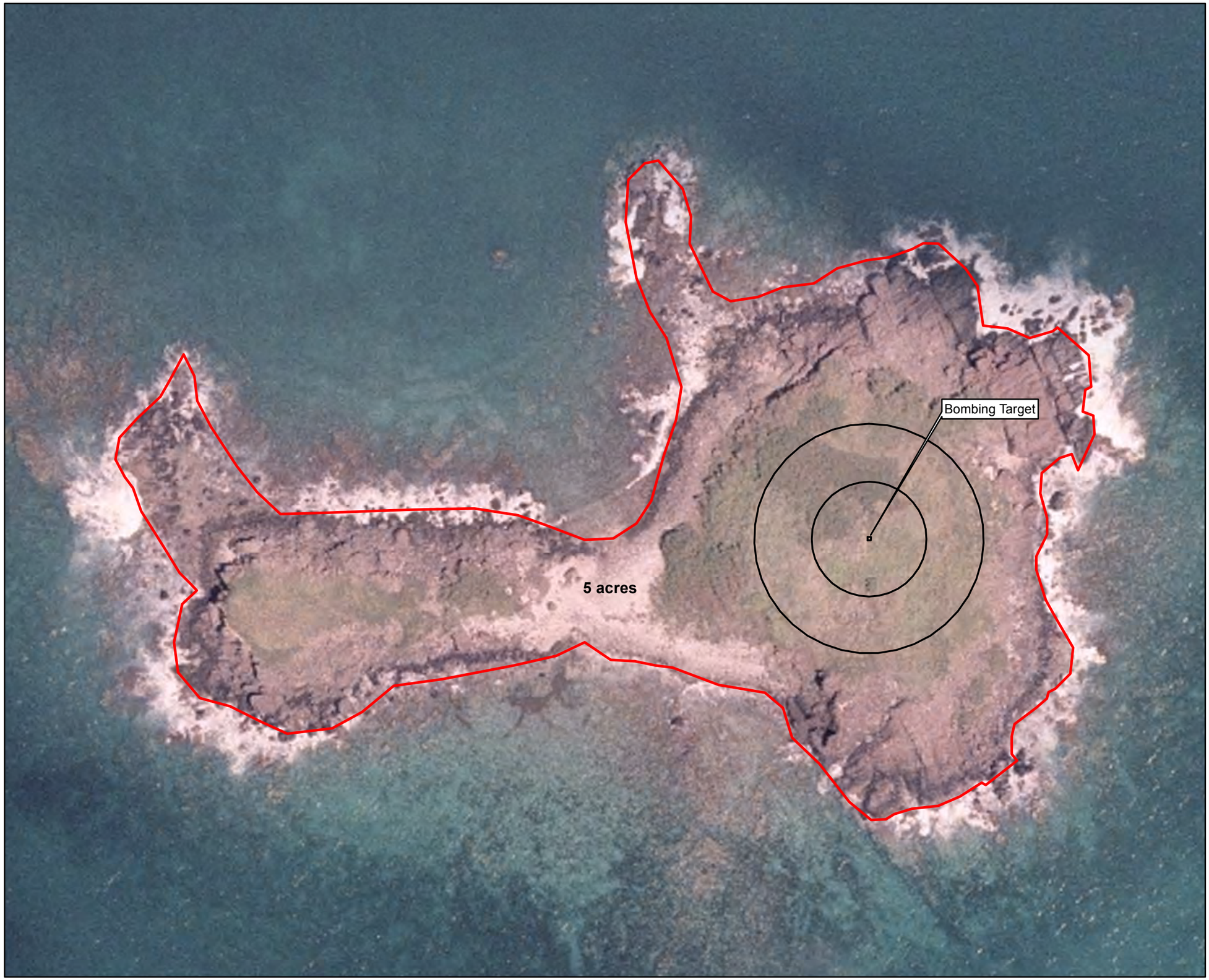
MRS Locations

- MRS 02
- MRS 07

US Army Engineering And Support Center - Huntsville, Alabama

Drawn By:	CLH	Scale:	Scale Varies
Checked By:		Date Drawn:	8/1/2016
Submitted By:		Revision Date:	Rev No.

Path: S:\Culebra1\Cayo TCRA\Maps\MXDs\QAPP\Fig 1 Regional Location map.mxd



N

0 12.5 25 50 m

0 40 80 160 ft

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

Culebra Cayo TCRA

Figure 2
Cayo Del Agua
Surface Clearance Map

Island of Culebra, Puerto Rico

Legend

- Bombing Target Rings
- Density Area

Note:
Surface or subsurface clearance will not take place in areas that are submerged by waves or tide.

US Army Engineering And Support Center - Huntsville, Alabama

Drawn By: CLH	Scale: 1 inch = 25 meters		
Checked By:	Date Drawn: 8/1/2016		
Submitted By:	Revision Date:	Rev No.	

Path: S:\Culebra1\Cayo TCRA\Maps\MXDs\QAPP\Del Agua\Fig 2 Surface Clearance Map.mxd

N

0 12.5 25 50 m

0 40 80 160 ft

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

Culebra Cayo TCRA

Figure 3
Cayo Del Agua
Intrusive Investigation
Area Map

Island of Culebra, Puerto Rico

Legend

- Possible Water Intrusion Area for Subsurface Investigation
- Anticipated Intrusive Investigation Acres

US Army Engineering And Support Center - Huntsville, Alabama

Drawn By: CLH	Scale: 1 inch = 25 meters		
Checked By:	Date Drawn: 8/1/2016		
Submitted By:	Revision Date:	Rev No.	

Path: S:\Culebra1\Cayo TCRA\Maps\MXDs\QAPP\Del Agua\Fig 3 Intrusive Investigation Area Map.mxd

N

0 12.5 25 50 m

0 40 80 160 ft

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

Culebra Cayo TCRA

Figure 4
Cayo Del Agua
Grid Map

Island of Culebra, Puerto Rico

Legend

- Density Area (5 acres)
- 50' x 50' Grids

US Army Engineering And Support Center - Huntsville, Alabama

Drawn By: CLH	Scale: 1 inch = 25 meters		
Checked By:	Date Drawn: 8/1/2016		
Submitted By:	Revision Date:	Rev No.	

Path: S:\Culebra1\Cayo TCRA\Maps\MXDs\QAPP\Del Agua\Fig 4 Grid Map.mxd

N

0 12.5 25 50 m

0 40 80 160 ft

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

Culebra Cayo TCRA

Figure 5
Cayo Del Agua Vegetation Removal Map

Island of Culebra, Puerto Rico

Legend

Vegetation Removal Acres (1.61 acres)

US Army Engineering And Support Center - Huntsville, Alabama

Drawn By: CLH	Scale: 1 inch = 25 meters		
Checked By:	Date Drawn: 8/1/2016		
Submitted By:	Revision Date:	Rev No.	

Path: S:\Culebra1\Cayo TCRA\Maps\MXDs\QAPP\Del Agua\Fig 5 Vegetation Removal Map.mxd

N

0 12.5 25 50 m

0 40 80 160 ft

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

Culebra Cayo TCRA

Figure 6
Cayo Del Agua Small Boat and CMS Barge 4 Point Moor Location Map

Island of Culebra, Puerto Rico

Legend

- 4 Point Moor Lines
- CMS Barge Mooring Location

US Army Engineering And Support Center - Huntsville, Alabama

Drawn By: CLH	Scale: 1 inch = 25 meters		
Checked By:	Date Drawn: 8/1/2016		
Submitted By:	Revision Date:	Rev No.	

Path: S:\Culebra1\Cayo TCRA\Maps\MXDs\QAPP\Del Agua\Fig 6 CMS Barge 4 Point Moor Location Map.mxd

N

0 20 40 80 m

0 65 130 260 ft

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

Culebra Cayo TCRA

Figure 7
Primary MDAS Processing And Collection Area

Island of Culebra, Puerto Rico

Legend

Primary MDAS Processing Location

US Army Engineering And Support Center - Huntsville, Alabama

Drawn By: CLH	Scale: 1 inch = 40 meters		
Checked By:	Date Drawn: 11/14/2016		
Submitted By:	Revision Date:	Rev No.	

Path: S:\Culebra1\Cayo TCRA\Maps\MXDs\QAPP\Del Agua\Fig 7 Primary MDAS Processing and Collection Map.mxd

N

0 12.5 25 50 m

0 40 80 160 ft

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

Culebra Cayo TCRA

Figure 8
Cayo Del Agua
Turtle Monitoring Map

Island of Culebra, Puerto Rico

Legend

TCRA Boundary

Note:
Surface or subsurface clearance will not take place in areas that are submerged by waves or tide.

US Army Engineering And Support Center - Huntsville, Alabama

Drawn By: CLH	Scale: 1 inch = 25 meters		
Checked By:	Date Drawn: 8/2/2016		
Submitted By:	Revision Date:	Rev No.	

Path: S:\Culebra1\Cayo TCRA\Maps\MXDs\QAPP\Del Agua\Fig 9 Turtle Monitoring Map.mxd

N

0 12.5 25 50 m

0 40 80 160 ft

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

Culebra Cayo TCRA

Figure 9
Cayo Del Agua
Island Access Map

Island of Culebra, Puerto Rico

Legend

- Island Access Route
- 4 Point Moor Anchor Lines
- CMS Barge Mooring Location

US Army Engineering And Support Center - Huntsville, Alabama

Drawn By: CLH	Scale: 1 inch = 25 meters		
Checked By:	Date Drawn: 9/7/2016		
Submitted By:	Revision Date:	Rev No.	

Path: S:\Culebra1\Cayo TCRA\Maps\MXDs\QAPP\Del Agua\Fig 9 Island Access Map.mxd

N

0 12.5 25 50 m

0 40 80 160 ft

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

Culebra Cayo TCRA

Figure 10
Cayo Del Agua
Potential Inaccessible Areas Map

Island of Culebra, Puerto Rico

Legend

- Potential Inaccessible Areas (1.2 acres)
- TCRA Boundary (5 acres)

Note:
Field teams will make all attempts to clear this acreage, however, it is possible some areas may be inaccessible.

US Army Engineering And Support Center - Huntsville, Alabama

Drawn By: CLH	Scale: 1 inch = 25 meters		
Checked By:	Date Drawn: 9/12/2016		
Submitted By:	Revision Date:	Rev No.	

Path: S:\Culebra1\Cayo TCRA\Maps\MXDs\QAPP\Del Agua\Fig 10 Potential Inaccessible Areas Map.mxd

APPENDIX C. ACCIDENT PREVENTION PLAN

This appendix contains the Accident Prevention Plan.

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APPENDIX C. ACCIDENT PREVENTION PLAN

Accident Prevention Plan/Site Safety and Health Plan Acknowledgment			
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 2 Activity Hazard Analysis
Attachment 3 Site Safety and Health Plan
Attachment 4 Plan for Prevention of Alcohol & Drug Abuse
Attachment 5 Material Safety Data Sheets

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ACRONYMS AND ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
AED	Automatic External Defibrillator
APP	Accident Prevention Plan
APPL	Agricultural Priority Pollutants Laboratory, Inc.
AHA	Activity Hazard Analysis
BDU	Bomb Dummy Unit
CFR	Code of Federal Regulation
CHSM	Corporate Health and Safety Manager
CMS	Caribbean Marine Services
CPR	Cardiopulmonary Resuscitation
CSPP	Construction Safety & Phasing Plan
CSP	Certified Safety Professional
CWM	Chemical Warfare Materiel
EM	Engineer Manual
EMS	Emergency Medical Services
ERCP	Emergency Response Plan and Contingency Procedures
EZ	Exclusion Zone
GDA	Government Designated Authority
HAZWOPER	Hazardous Waste Operations and Emergency Response
HIV	Human Immunodeficiency Virus
HPS	Hantavirus Pulmonary Syndrome
IDLH	Immediately Dangerous to Life or Health
IVS	Instrument Verification Strip
MC	Munitions Constituents
MEC	Munitions and Explosives of Concern
MPPEH	Material Potentially Presenting an Explosive Hazard
MRS	Munitions Response Site
MSDS	Material Safety Data Sheet
NASBLA	National Association of Safe Boating Law Administrators
NIOSH	National Institute for Occupational Safety and Health
OJT	On-the-job Training
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
PFD	personal floatation device
PPE	Personal Protective Equipment
PWS	Performance Work Statement
REL	Recommended Exposure Level
SDS	Safety Data Sheet
SPCD	Safety Plan Compliance Document
SSHP	Site Safety and Health Plan
SUXOS	Senior Unexploded Ordnance Supervisor

TBD	To Be Determined
TLV	Threshold Limit Value
TP	Technical Paper
USACE	U.S. Army Corps of Engineers
USA	USA Environmental, Inc.
USCG	U.S. Coast Guard
UXO	Unexploded Ordnance
UXOQCS	Unexploded Ordnance Quality Control Specialist
UXOSO	Unexploded Ordnance Safety Officer

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C.1 SIGNATURE SHEET

ACCIDENT PREVENTION PLAN
TIME CRITICAL REMOVAL ACTION
CAYO DEL AGUA, CULEBRA ISLAND, PUERTO RICO

C.1.1 Plan Prepared By

Cheryl M. Riordan _____ Date: 11/21/2016

Cheryl M. Riordan, CSP
Corporate Health and Safety Manager
USA Environmental, Inc.
(813) 426-2112

C.1.2 Plan Approval

Jonathan Chionchio _____ Date: 11/21/2016

Jonathan Chionchio
President
USA Environmental, Inc.
(813) 343-6350

C.1.3 Plan Concurrence

Robert D. Crownover _____ Date: 11/21/2016

Robert Crownover
Director of Safety and Quality
USA Environmental, Inc.
(813) 343-6364

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C.2 BACKGROUND INFORMATION

This Accident Prevention Plan (APP) has been prepared by USA Environmental, Inc. (USA) for the Time Critical Removal Action (TCRA) work that will occur at Cayo del Agua, Culebra Island, Puerto Rico. 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 site. The APP assigns responsibilities, establishes standard operating procedures, and provides for contingencies that may arise while operations are being conducted during the TCRA process. The APP will interface with the USA Corporate Safety and Health Program.

C.2.1 Contractor

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

C.2.2 Contract Number

W912DY-10-D-0026; Task Order No. 0027

C.2.3 Project Name

Time Critical Removal Action
Cayo del Agua, Culebra Island, PR

C.2.4 Project Description

Cayo del Agua is a small Cayo of Culebra Island, Puerto Rico that is accessible by boat or barge. This TCRA will occur on a 5.34-acre terrestrial site, with a 100-yard water buffer area. This Cayo is accessible only via boat. A small barge will be used to remove tires and Bomb Dummy Units (BDUs) deemed safe to move, as well as Material Documented as Safe (MDAS), in order to prevent disruption of habitats and coral in the vicinity of the Cayo. The TCRA will involve vegetation clearance, MEC surface clearance [including Munitions Debris (MD), MEC Treatment/Detonation and Range Related Debris (RRD)], digital geophysical mapping (DGM) survey, analog and dig clearance of grids, and MEC intrusive investigation. A site description table is presented at Table C-1. Regional Location Map (see Figure C-1) and Cayo del Agua Area Map (see Figure C-2) have been provided below:

Table C-1: Site Description

Site Location	Approximate Size (Acres)
Cayo del Agua	5.34 acres
Topography	**Present Usage**
☐ Forested ☐ Tillage ☐ River/Creeks ☒ Grassland ☒ Flat land ☒ Open Terrain ☐ Wetland ☐ Arid ☒ Other: Rocky with cliffs	☐ Rural ☐ Commercial ☐ Urban ☐ Government ☐ Industrial ☐ Farming ☐ Ranching ☐ Residential ☐ Recreational ☐ Military ☒ Other: Bird sanctuary

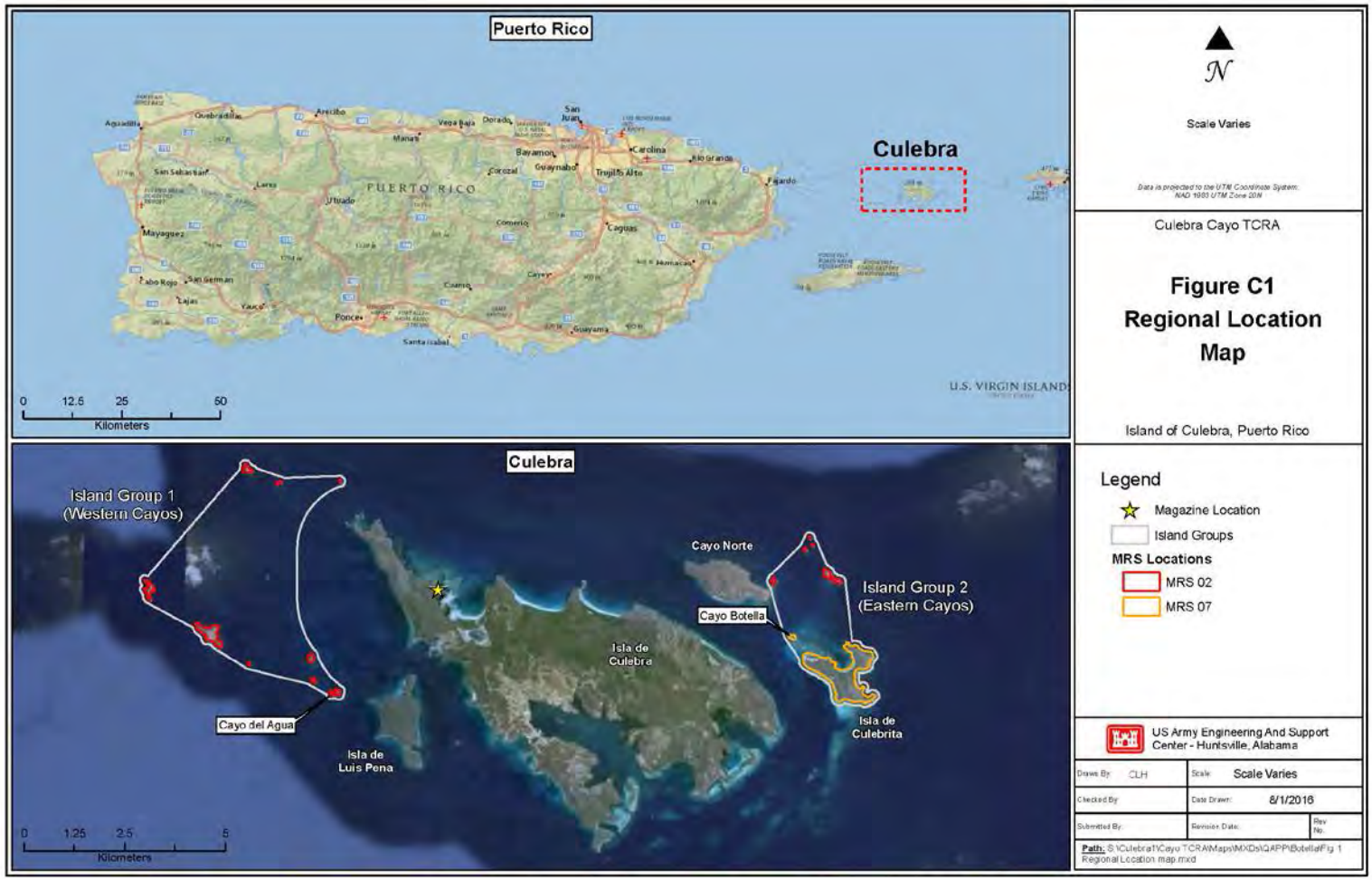

Figure C-1: Regional Location Map

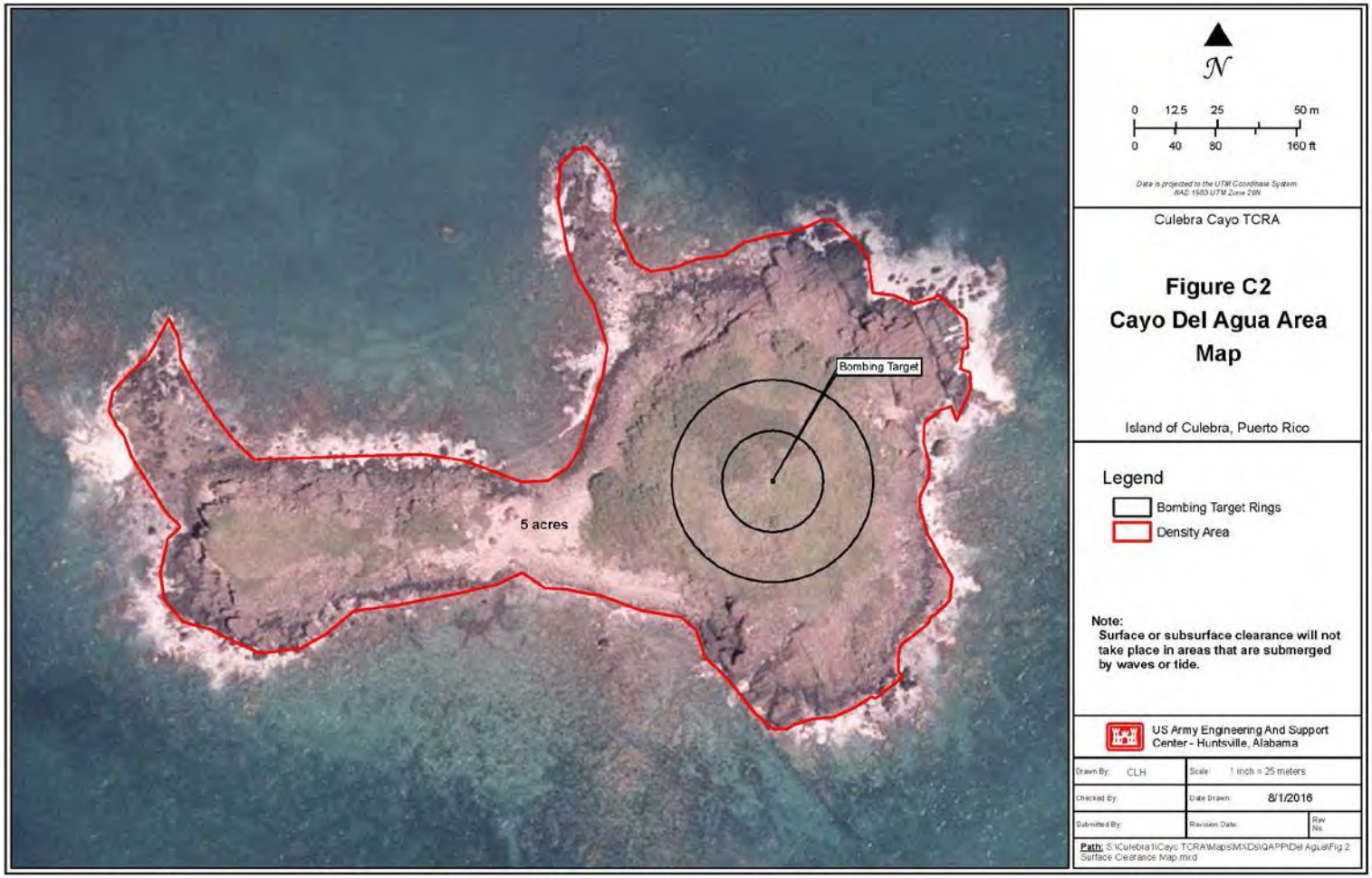

Figure C-2: Cayo del Agua Area Map

C.2.5 Major Phases of Work Anticipated

The major phases of work for this project to include vegetation clearance, MEC/MD/RRD surface clearance, DGM, analog and dig of grids, MEC Treatment/detonation and MEC subsurface clearance.

C.2.6 Activities Requiring Activity Hazard Analysis

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

- Boat Operations
- Digital Geophysical Mapping
- Instrument Verification Strip
- MEC Disposal
- MEC Investigation
- MEC Surface Clearance
- MPPEH Inspection and Certification
- Quality Control
- Soil Sampling
- Vegetation Removal
- Transportation of Explosives via Vessel
- Vehicle Operations.

The AHA forms are located in Attachment 2 of this APP.

Table C-2 lists the hazards and associated action levels.

Table C-2: Hazards Table

HAZARDS*	ACTION LEVELS**
Safety: include falling (rocks, inclines, slippery surfaces, excavations); climbing (uneven terrain); walking (uneven terrain, surface indentations); hand and power tool operations, eye and face hazards (vegetation removal operations); boat operations/ drowning.	None/Awareness/Avoidance
Chemical: Lubricants and fuels for equipment.	Per Material Safety Data Sheets (MSDSs)
Physical: include temperature extreme injuries, and noise.	Per Monitoring Requirements
Radiological: N/A	N/A
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 WILL NOT BE USED IF OVEREXPOSURES OR Immediately Dangerous to Life or Health (IDLH) CONDITIONS ARE EXPECTED. (List the chemical TLV/PEL/Recommended Exposure Level (REL); Occupational Safety and Health Administration (OSHA)/ National Institute for Occupational Safety and Health (NIOSH) 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, 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 of injury due to biological agents (e.g., poisonous plants, animals, insects, microorganisms, etc.)

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

**ACTION LEVELS: Action Levels will typically be defined as requiring site evacuation only, if significant hazards are encountered. Note: The activities for which this 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 permissible exposure limits 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 will always be in an upwind direction to a safe distance. PPE per hazard assessment will be worn.

C.3 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 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 the 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 be effective, each employee must take a serious interest in the prevention of injuries. In administering the program, management fully intends to provide 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, USA's Corporate Safety and Health Program and this APP. All USA employees will comply with the requirements of this plan.

C.4 RESPONSIBILITIES AND LINES OF AUTHORITY

USA is ultimately responsible for the implementation of the Safety and Health Program on this project site, including all USA employees, subcontractor employees, and all others on the worksite. All personnel are responsible for continuous adherence to this APP and safety and health procedures during the performance of their work, and these safety and health requirements will be strictly enforced.

C.4.1 Identification and Accountability of Personnel Responsible for Safety

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 warning, 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.

C.4.1.1 USA Program Manager – Doug Ralston

Responsibilities include:

- Ensures conformance with USA corporate and other regulatory policies and procedures
- Coordinates project with the client Manager
- Ensures the project has the necessary resources to operate safely
- Ensures that the project personnel satisfy USA and regulatory safety and health requirements.

C.4.1.2 USA Project Manager – Tom Bourque

Responsibilities include:

- Coordinates with USA Program Manager and client Project Manager
- Provides management of all aspects of project work
- Sets the tone for safety on the job site
- Ensures personnel have the equipment, training, and resources to perform the job safely

- Ensures that the project personnel implement the project APP
- Ensures that the project personnel have the appropriate regard for safe job performance.

C.4.1.3 USA Director of Safety and Quality – Robert Crownover

Responsibilities include:

- Oversees the development, maintenance, and implementation of the APP/ Site Safety and Health Plan (SSHP), as required
- Performs Safety Program audits as required
- Provides consultation to Project Managers and Project Engineers
- Makes changes to the APP/SSHP if warranted by changed conditions
- Evaluates occupational exposure monitoring/air sampling data and adjust APP/SSHP requirements as necessary
- Administers and enforces the General Health and Safety Program
- Determines the level of personnel 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
- Confirms each USA team member's suitability for work based on physician's recommendation
- Upgrades or downgrades levels of protection based on site observations or monitoring results
- Provides technical, analytical, and report writing support to ensure the technical quality of deliverables to the customer.

C.4.1.4 USA Corporate Health and Safety Manager – Cheryl Riordan, CSP

Responsibilities include:

- Develops, maintains, and implements the APP/SSHP, as required
- Performs Safety Program audits as required
- Provides consultation to Project Manager
- Recommends changes to the APP/SSHP if warranted by changed conditions
- Evaluates occupational exposure monitoring/air sampling data and adjusts APP/SSHP requirements as necessary
- Administers the General Safety and Health Program
- Determines the level of personnel protection required
- Conducts field safety and health audits to ensure Safety and Health Plan conformance and USA policy compliance
- Investigates significant accidents and illnesses and implements corrective action plans
- Certifies that all workers have proper training as per OSHA 29 Code of Federal Regulation (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.

C.4.1.5 Site Manager – Phil Ratliff

The Site Manager is the PM's primary POC on site and will be responsible to the PM for the supervision of the field management team. The Site Manager, along with the PM and Field Management Team, ensures the TO PWS requirements are met. The Site Manager will organize the weekly work schedules, and work force structure, to ensure efficiency in both time management and cost management for all field efforts. The Site Manager will work closely with the PM to develop strategies to overcome project challenges that are occurring or may be perceived to present a future risk to the project. The Site Manager will identify equipment or manpower needs and communicate those needs to the PM. The Site Manager will communicate any field change requirements as soon as they are identified to the PM. The Site Manager will submit a daily status report to the PM for review and submission to the USACE.

C.4.1.6 Senior Unexploded Ordnance Supervisor (SUXOS) – Jeff Barefield

All site MEC 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. The SUXOS is also responsible for:

- Supervising all USA site MEC activities
- Implementing the field APP
- Coordinating with the UXOSO/UXOQCS on safety related matters
- Determining evacuation routes
- Supervise surface clearance of MEC/MPPEH on the beach and preparation of site for use as a Med-Evac helicopter landing zone.
- Presenting daily safety meetings
- Maintaining logs and records in the field
- Implementing changes to the APP as directed by the Director of Safety and Quality, Corporate Health and Safety Manager (CHSM), or UXOSO/UXOQCS.

C.4.1.7 UXO Safety Officer/ UXO Quality Control Specialist (UXOSO/UXOQCS) – Rodney Isbell & Robert Wallace

Site activities will be conducted under the supervision of the USA UXOSO/UXOQCS for safety. The UXOSO/UXOQCS will act as safety oversight for normal and emergency work and will perform any emergency notification as the On-Scene Incident Commander. When more than 15 personnel are on the job site the UXOSO/UXOQCS must be separated into two separate positions. The UXOSO/UXOQCS is also responsible for:

- Implementing and enforcing all provisions of the field APP/SSHP
- Providing daily inspections of site activities to identify safety and occupational health deficiencies and assure corrective action
- Coordinating and Implementing changes to APP/SSHP as directed by the Director of Safety and Quality or CHSM
- Conducting project-specific training for site personnel and visitors
- Determining evacuation routes

- Regular inspection of the Med-Evac helicopter landing zone to ensure it remains in acceptable condition to land a helicopter if necessary
- Presenting daily safety meetings
- Maintaining safety logs and records in the field
- Enforcing the level of personnel protection required
- Investigating work related accidents and illnesses and implementing corrective action plans
- Performing air-monitoring based on expected contaminants
- Implementing employee exposure monitoring notification programs
- Stopping any operation that threatens the health or safety of the team or surrounding population
- Upgrading levels of protection based on site observations or monitoring results

C.4.2 Requirements of Risk Management Process

The USA CHSM prepares an AHA for each activity to be performed on the project site. These AHAs are approved by USACE prior to the start of site activities, and they are implemented on the project site. If new tasks are added, or unanticipated hazards are encountered, the existing AHAs may be updated or a new AHA may be prepared. These will be sent to USACE for review and approval prior to implementation of the new procedures on the site.

C.4.3 Requirement of UXOSO/UXOQCS Presence

Work will not be performed on the project site unless the UXOSO/UXOQCS, or a qualified alternate, is present on the job site. When more than 15 personnel are on the job site the UXOSO/UXOQCS must be separated into two separate positions.

C.4.4 Policies and Procedures Regarding Noncompliance with Safety Requirements

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 permanent record. 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.

C.4.5 Lines of Authority

Table C-3 lists contact information for project personnel and Figure C-1 contains the project personnel, their involvement on the project and the organization these individuals represent.

Table C-3: Project Contacts

Name	Organization	Telephone	Cell number	E-mail
Rebecca Terry	USAESCH Contracting Officer's Representative	256-698-2532	256-895-1788	Rebecca.L.Terry@usace.army.mil
Wilberto Cubero	USACE District Project Manager	904-232-1426	787-246-6133	Wilberto.Cubero-Deltoro@usace.army.mil
Kelly Longberg	USAESCH Technical Manager	256-895-1408	256-541-0907	Kelly.D.Longberg@usace.army.mil
Doug Ralston	USA Environmental, Program Manager	813-343-6368	813-500-1099	dralston@usatampa.com
Tom Bourque	USA Project Manager	941-746-5375	808-255-2320	tbourque@usatampa.com
Robert Crownover	USA Director of Safety and Quality	813-343-6364	813-310-1319	rcrownover@usatampa.com
Cheryl Riordan	USA Corporate Health and Safety Manager	757-689-4737	813-426-2112	criordan@usatampa.com
Phil Ratliff	Site Manager	N/A	336-314-1692	pwratliff@hotmail.com
Jeff Barefield	Senior UXO Supervisor	N/A	919-221-4840	bombkiller2003@yahoo.com
Rodney Isbell Robert Wallace	UXO Safety Officer	N/A	931-629-1981 508-274-239	rodney.j.isbell@gmail.com robertwaynewallace@gmail.com

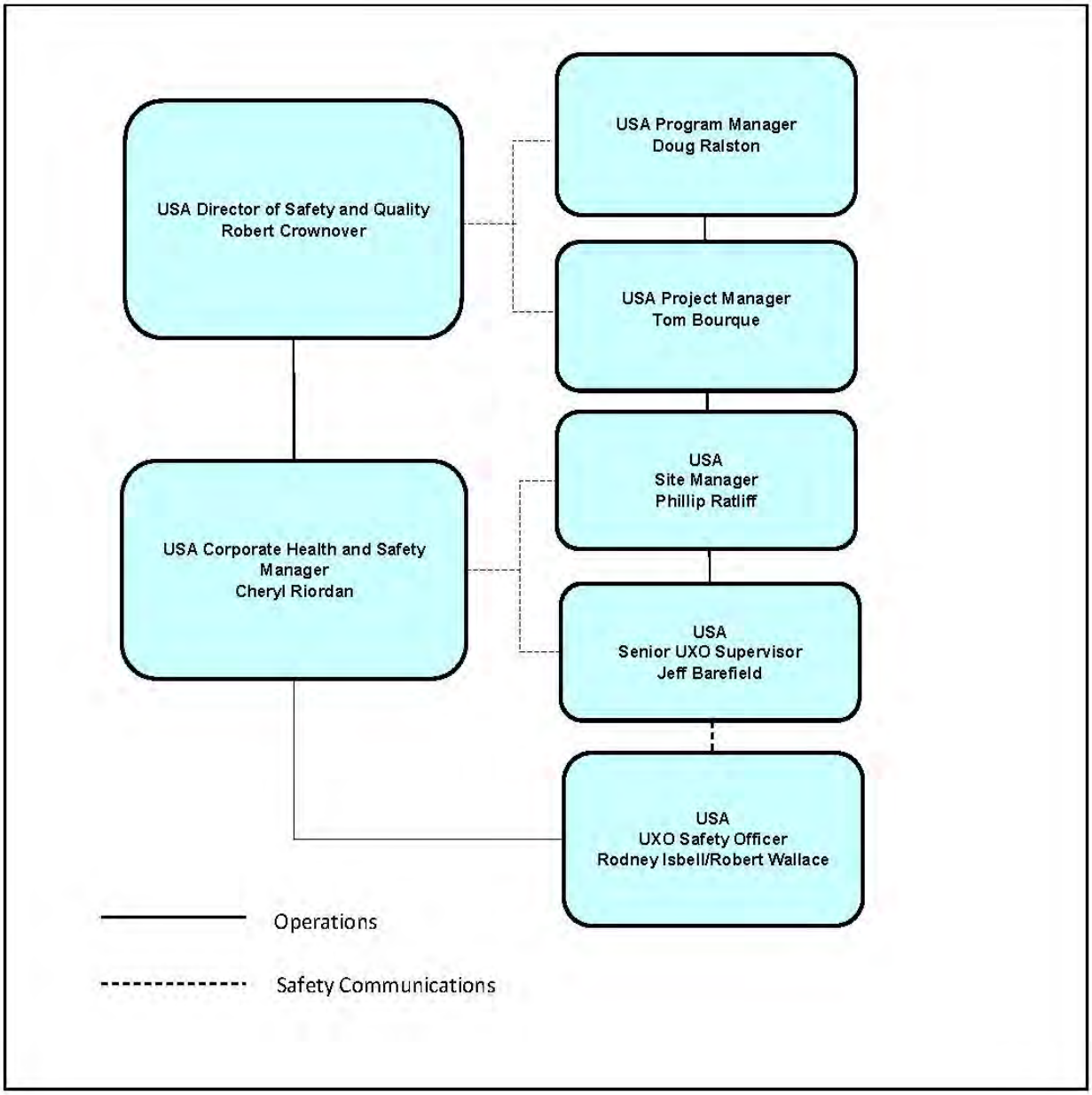

Figure C-3: Lines of Authority for USA Corporate and Site Activities

C.4.6 USA's Written Procedures for Holding Managers and Supervisors Accountable for Safety

USA's commitment to health and safety is documented and required from the time an offer is made to a job applicant. Managers and supervisors are made responsible for enforcing health and safety 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.

C.5 SUBCONTRACTORS AND SUPPLIERS

C.5.1 Identification of Subcontractors and Suppliers

USA will be the prime contractor for this work. USA will be using the services of Caribbean Marine Services (CMS), a local Puerto Rico-based subcontractor, who will be providing vessels and U.S. Coast guard (USCG) licensed Captains, a Biologist, water security operations, and vegetation removal teams. The other subcontractor, Agricultural Priority Pollutants Laboratory, Inc. (APPL) will be responsible for processing and analysis of post detonation soil samples, but will not be required to enter the site.

C.5.2 Means for Controlling and Coordinating Subcontractors and Suppliers

All subcontractor employees working on this site will be under the direct supervision of UXO-qualified personnel (UXO Technician II or UXO Technician III), who will be responsible for ensuring their safety while on the site. The UXO-qualified personnel will provide escort in order to ensure that the areas they will have to walk through are free of MEC. All subcontractor employees working on the site will receive a safety orientation training prior to starting work on the site, which includes MEC recognition training, and they will be required to follow the directions of the UXO-qualified personnel escorting them.

C.5.3 Safety Responsibilities of Subcontractors and Suppliers

All personnel working on the site, including subcontractors, must attend the daily safety briefing, which is held at the beginning of each work day. This briefing informs personnel about what operations are taking place, where these operations are to take place, emergency procedures and evacuation routes, in case an evacuation is required. The UXOSO/UXOQCS will ensure that the subcontractors are briefed on the site hazards, particularly the MEC site hazards. When working on site, subcontractor employees will be escorted by a USA UXO Technician II or III for the duration of the period when he/she will be on the site, and will be expected to follow all directions received from the UXO-qualified personnel.

C.6 TRAINING

Prior to commencement of site activities, the Director of Safety and Quality, CHSM, and the UXOSO/UXOQCS 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.

C.6.1 New Hire Safety and Occupational Health Orientation Training

The UXOSO/UXOQCS will conduct necessary on-the-job training (OJT) for all assigned personnel at the time of mobilization. This training will include classroom type instruction covering the topics specified for site-specific training, and on-site participation in the following:

- Performance Work Statement (PWS)
- Details of the APP/SSHP
- Employee rights and responsibilities
- Sequence of work events
- Identification of safety issues for the site
- Identify 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
- Emergency procedures for clean-up of chemical spills
- Location of medical services
- Site communication
- Evacuation routes
- Rules and regulations for vehicle use
- Safe use of field equipment
- Handling, storage, and transportation of hazardous materials
- Use, care, and limitations of personal protective equipment (PPE)
- Hazard communication per OSHA 29 CFR 1910.1200.

C.6.2 Mandatory Training and Certifications Applicable to this Project

C.6.2.1 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 authorized visitor requiring entry to the exclusion zone (EZ) will be escorted at all times by a qualified UXO Technician, and all MEC operations will stop for the duration of their visit.

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.

C.6.2.2 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. He/she will also receive an additional 8 hours of OSHA-required HAZWOPER 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:

- 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/UXOQCS, 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/UXOQCS will also receive the 30-hour OSHA Construction Safety class in accordance with Engineer Manual (EM) 385-1-1, 01.A.17.

C.6.3 Periodic Safety and Health Training for Supervisors and Employees

C.6.3.1 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
- Activity Hazard Analyses (AHAs) for site operations
- 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.

C.6.3.2 Daily Debriefing

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

C.6.3.3 Periodic Site Training

On the first workday of each work week/period or more frequently if needed (such as when new employees arrive at the job site), a pertinent topic will be selected and elaborated upon by the UXOSO/UXOQCS 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. The following is a general list of what will be discussed:

- Names and titles of key personnel responsible for site safety and health, and hazards present at the site
- Components of the APP/SSHP
- 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)
- AHAs for site operations

- 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.

C.6.4 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 nearest hospital, the location of all site fire extinguishers, proper use of fire extinguishers, identify the location of First Aid kits and bloodborne pathogens kits, and review the emergency procedures.

C.6.4.1 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 with fire extinguisher. Procedures will be reviewed with all site personnel.

C.6.4.2 MEC Training

All USA UXO Technicians meet the requirements for performing MEC operations. All USA employees performing work involving the handling and destruction of MEC meet the requirements of Department of Defense Explosives Safety Board (DDESB) Technical Paper 18 (TP-18 Table 4.1). A copy of their certificate of graduation will be kept on file at corporate headquarters. UXO qualified personnel will have knowledge and experience in military ordnance, ordnance components and explosives location, identification, render safe, recovery/removal, transportation, and disposal safety precautions. UXO personnel will have the knowledge and experience to ensure 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.

C.6.4.3 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, as well as safe procedures for storage and handling of the product, and response to emergencies. Personnel may request a Material Safety Data Sheet (MSDS)/Safety Data Sheet (SDS) for any hazardous material on the site at any time. USA personnel will be informed of the location of the MSDSs/SDSs. The MSDS/SDS binder will be kept in the UXOSO/UXOQCS site vehicle or on the boat. This training will occur as part of the initial mobilization training at the site.

D.6.5 Visitors

All visitors to the site, even if escorted, must receive as a minimum, a briefing of on-site conditions, hazards, and emergency response procedures. The UXOSO/UXOQCS will generally be the one providing the visitor briefing. All visitors to the EZ will be escorted at all times. When authorized visitors who are not UXO qualified enter the EZ, all MEC operations will cease, and will resume again after the visitor has left the EZ.

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.6.6 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.

C.7 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/UXOQCS will be responsible for daily safety inspections of the project. In addition to extensive site experience, the UXOSO/UXOQCS has also received the OSHA 30-hour Construction Safety training, as well as specific safety training from the USA Corporate Safety office. During periods when the UXOSO/UXOQCS 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.

USA Corporate Safety staff may conduct periodic safety program audits at project sites, which would include an inspection of site conditions and operations.

C.7.1 External Inspections/Certifications

External inspections are expected for this project. The U.S. Army Corps of Engineers (USACE) Project Manager and/or the USACE site representative assigned to the project may choose to conduct external inspections.

C.8 ACCIDENT REPORTING

This section provides the requirements for implementing the accident reporting provisions of USA. This APP requirement applies to all work performed by USA for the project.

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, Florida office. Accidents/incidents will be reported in accordance with EM 385-1-1. All accident/incident reports will be reviewed by the Director of Safety and Quality and the CHSM 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 USA Project Manager and the USA CHSM will be notified immediately by telephone of any accidents, and will follow up with USA's Accident Report Form. USA's Project Manager will notify the USACE Project Manager immediately and fill out and submit the Accident Report Form and/or ENG Form 3394 to the USACE Contracting Officer or designated representative for review within one working day after the event. USA will thoroughly investigate all accidents.

Any accident involving a fatality, an in-patient hospitalization, an amputation or loss of an eye will be reported by the CHSM telephonically to the nearest OSHA Area office within 8 hours for a fatality and within 24 hours for the other injury categories. 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.

Person(s) who become ill or injured during work activities must immediately inform the SUXOS or UXOSO/UXOQCS, regardless of the severity of the illness or injury. The victim(s) will be decontaminated if the injury occurred in an area where contamination is an issue. In the event that the medical emergency is severe enough, the SUXOS or UXOSO/UXOQCS will order a cessation of work and will either contact the helicopter emergency service from St. Thomas to transport the victim to the hospital in Culebra, or the First Responders will assist the victim (or carry the victim on a spring board) to the boat and provide transportation by boat to the Ferry Landing where off-site emergency personnel will meet the boat to transport of the victim to the hospital. 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, Emergency Medical Services (EMS) will be notified. In the event that a cessation of work is ordered, all personnel should:

- Assist the UXOSO/UXOQCS, if required, in decontaminating the victim and/or administering First Aid
- Assist in transporting the injured victim to the boat or helicopter as required
- Assist emergency response personnel when requested.

In the event of an accident that results in a lost workday or $5,000 or more in property damage, an accident report (ENG Form 3394) will be completed and submitted within one workday after the event, and a copy will be provided to the USACE Contracting Officer or Government Designated Authority (GDA).

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 USACE Project Manager.

C.8.1 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/SUXOS. 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/SUXOS. These man-hours will be annotated on the Daily Operations Summary and/or the Weekly Operations Summary forms (see Appendix B of the Work Plan for forms) and transmitted to the Project Manager. The USA UXOSO/UXOQCS will document and review with the Director of Safety and Quality and/or CHSM the potential exposure data versus the man-hours worked per day to evaluate the association to site accidents or injury. The most current OSHA 300 form will be posted on site and is presented in Attachment 1 of this APP.

C.8.2 Accident Investigations, Reports, and Logs

Investigation and documentation of emergency responses will be initiated by the UXOSO/UXOQCS. 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 or ENG Form 3394, as appropriate, will be completed and forwarded to the CHSM.

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

C.8.3 Immediate Notification of Major Accidents

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

- A fatal injury or illness
- Permanent totally disabling injury or illness
- Permanent partial disabling injury or illness
- One (1) or more persons hospitalized as inpatients as a result of a single occurrence
- $500,000 or more in accidental property damage
- Three (3) or more individuals become ill or have a medical condition which is suspected to be related to a site condition, or a hazardous or toxic agent on the site
- Possible adverse publicity to the USACE.

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

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

All recordable mishaps will be reported to the client Contracting Officer and/or Project Manager within 24 hours after notification. In addition, the following will be reported within 24 hours:

- Property damage exceeding $5,000
- Days away injuries
- Days away illnesses
- Restricted/transfer injuries.

C.9 PLANS, PROGRAMS, AND PROCEDURES

The following subsections describe the plans, programs, and procedures that will be used during site operations.

C.9.1 Fatigue Management Plan

Due to sometimes severe weather and/or sea conditions, USA plans to maximize the capability to move operations between the Cays as much as feasible in order to maintain the operations schedule. When conditions are hazardous at one Cay, the other Cay may be more safely accessed. However, there will also be times (particularly during hurricane season) when neither of the Cays can be accessible by sea. Due to this situation, there may be times when there may be variations in the work hours from week to week in order to maintain the schedule. For this reason, a Fatigue Management Plan has been created for work on this site. USA is committed to ensuring employees do not compromise safety performance by undertaking work while impaired by fatigue or stress. The Fatigue Management Plan is required to be implemented whenever site personnel may be required to work in excess of 10 hours per day for more than 4 consecutive days; in excess of 50 hours per week in a 7-day work week; in excess of 12 hours per day for more than 3 consecutive days.

Specific operator limitations are as follows: Boat operators will not be permitted to work in excess of 12 hours in any 24-hour period (including time worked at another occupation), and a minimum of 8 hours rest is required between shifts in any 24-hour period. Rest is defined as a period of time during which the person concerned is off duty; is not performing work, including administrative tasks; and is afforded the opportunity for uninterrupted sleep. This does not include time for breaks, meals, or travel time to/from work.

C.9.1.1 Symptoms

Fatigue can cause personnel to become less attentive to their actions and potentially increase the likelihood of accidents. Signs of fatigue and stress include the following:

- Sore or aching muscles or feeling of muscle weakness
- Headache
- Moodiness, irritability or easily agitated
- Dizziness and blurred vision
- Loss of appetite
- Difficulties with short term memory
- Inability to concentrate or focus on tasks
- Slowed reflexes or difficulty making decisions
- Feeling as if your actions are useless or that you cannot change your situation
- Lack of motivation.

C.9.1.2 Management Responsibility

Fatigue from physical exertion can be easily managed with proper food and rest and workers should be rotated through tasks that require high physical exertion. Everyone will have a different ability to cope with stress and their symptoms of stress fatigue will be different. Workers performing tasks with high levels of physical exertion and/or high stress tasks should be monitored regularly for signs of fatigue and stress. Personnel with conditions such as narcolepsy or sleep apnea may be more likely to experience fatigue, however many do not seek medical treatment for this type of condition and go undiagnosed. Workers will be encouraged to notify their supervisors if they have any such conditions likely to make them more susceptible to fatigue, so that supervisors can be aware of the situation and monitor them more closely for symptoms of fatigue.

The SUXOS, UXOSO/UXOQCS and Team Leaders will observe workers throughout the day for signs of fatigue. Long hours, particularly strenuous activities, and hot temperatures can increase levels of fatigue. If personnel are exhibiting signs of fatigue, supervisors will ensure they take adequate breaks. During breaks, personnel will be encouraged to drink plenty of cool water to remain properly hydrated. Personnel will also be encouraged to maintain nutrition and to make an effort to get at least 7 – 8 hours of sleep each night. Personnel working extended hours will need additional breaks to maintain alertness.

C.9.1.3 Training

All personnel will receive training on fatigue management and this fatigue management plan as part of their mobilization training. Training will include:

- Symptoms of fatigue
- Habits and actions workers can take to avoid fatigue
- Actions workers should take if they observe fatigue in a co-worker
- Controls to prevent future fatigue.

This information will also be reinforced during daily safety briefings during times when the fatigue management plan is being implemented.

C.9.1.4 Controls to Prevent Fatigue

In order to prevent fatigue, personnel should be aware of the need for sleep to maintain good health and to plan to get at least 7 – 8 hours of sleep each night. In addition to maintaining a good sleep schedule, personnel should drink plenty of water in order to maintain hydration. They should also maintain nutrition levels, as good, healthy food will be processed by the body more efficiently than junk food that does not provide the body with the nutrition it needs. Unhealthy foods often contain excess carbohydrates, which also tend to increase sleepiness.

Supervisors will schedule work shifts with fatigue factors in mind, ensuring that site workers will have enough time to maintain a healthy sleep schedule. No MEC work will take place during hours of darkness. MEC work will be limited to 10 hours per day.

The buddy system will also be implemented. Buddies will watch each other for signs of fatigue. If signs of fatigue are exhibited, buddies will encourage each other to take a break, and the Team Leader will be made aware of the situation. Site management personnel will also be closely observing the field staff for signs and symptoms of fatigue, in order to take action to implement additional breaks as needed in order to address the issue before it becomes a problem.

Driving during hours of darkness going to or from work can also create a fatigue issue, particularly when working excess hours. Workers will be encouraged to drive to the site in groups, so that while in the vehicle, co-workers can converse with the driver in order to ensure his/her alertness is maintained while behind the wheel. If driving alone, the driver should be aware of fatigue and pull off the road to take a break if necessary. Coffee, tea, or other caffeinated beverages can also be used in order to increase alertness.

C.9.2 Emergency Plans

The UXOSO/UXOQCS 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/rescue personnel and the nearest hospital. Pre-emergency planning meetings will be used to inform local authorities of the nature of site activities that will be performed under the PWS and the potential hazards that activities may pose to site workers, the environment, and the public.

C.9.2.1 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/UXOQCS will verify all on-site emergency services information, to include procedures for requesting services. It will be the UXOSO/UXOQCS'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 call numbers at accessible telephone locations
- Inspect all emergency equipment and supplies to ensure they are available and 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 hospital marked and highlighted, with copies of this map posted in all site vehicles
- Prepare and maintain a landing zone on the beach for use of Med Evac helicopter in case of emergency on the site.
- 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 PWS affect the ERCP

- Before normal activities are resumed, onsite personnel must be prepared and equipped to handle another emergency. These follow-up activities should be completed:
  - The CHSM will notify appropriate government agencies as required (Reminder: OSHA must be notified if there have been any fatalities, inpatient hospitalizations, amputations, or loss of an eye)
  - All equipment and supplies restocked, serviced and inspected
  - 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, all personnel will review the points of contact list and where it is posted as well as location of the nearest hospital. A meeting place off site will be identified in case of emergency evacuation and the responsibilities of all persons on site.

- 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.

C.9.2.2 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/UXOQCS 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. Chemicals brought to the site will be in small quantity containers, in order to limit the amount of material spilled, should a spill occur. As part of mobilization training, all site personnel will be trained in the procedures for clean-up of small spills.

In the event of a spill or leak of any potentially harmful material (regardless of quantity), on-site personnel will:

- Notify the UXOSO/UXOQCS immediately
- The UXOSO/UXOQCS will notify the Project Manager of the spill/leak with relative 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/UXOQCS)
- Begin containment and recovery of spilled material (as directed by the UXOSO/UXOQCS), using appropriate PPE and spill clean-up equipment and materials
- Determine if quantities meet or exceed the reporting requirements of federal EPA or Puerto Rico DEP for spills
- Once notified, the Project Manager will in turn notify the USACE Project Manager and the Contracting Officer. The USACE Project Manager may advise USA if any additional actions are necessary.

C.9.2.3 Firefighting Plans

Due to the fact that Cayo del Agua is uninhabited, there is no Fire Department available to respond. In the event of a fire, USA personnel on site will attempt to fight the fire using fire extinguishers. The UXOSO/UXOQCS will also contact the USACE site representative and Project Manager to inform them of the situation. The UXOSO/UXOQCS will determine the extent of the fire, coordinate and manage fire suppression efforts. Available on-site fire extinguishers will be used on incipient stage fires only. First Aid will be provided by USA's First Responders, as needed. Site personnel will not fight fires containing explosives. In the event of a large fire, or a fire involving explosives, personnel will evacuate the site via boats.

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

C.9.2.3.1 Small Fires

A small fire is defined as a fire that can most likely be extinguished by site personnel using portable extinguishers of 10B:C and 20B:C size. A small fire must also be free and clear of explosive materials, especially MEC. If a small fire occurs, the UXOSO/UXOQCS 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 USCG, med-evac helicopter, ambulance, hospital, etc.) as needed.

If a fire extinguisher is used, this must be immediately reported to the UXOSO/UXOQCS. The fire extinguisher must be immediately removed from service until it can be recharged. Another fire extinguisher must be made available to the operating area. The area around where the fire occurred must be watched for a minimum of one hour after the fire has been extinguished to ensure re-ignition does not occur. If personnel are not working in the area, the UXOSO/UXOQCS should check the area of the fire periodically to ensure re-ignition does not occur.

C.9.2.3.2 Large Fires

A large fire is defined as a fire, which cannot be extinguished, or which, due to 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/UXOQCS 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 any required emergency response services (USCG, med-evac helicopter, 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.

C.9.2.3.3 Fires Involving Explosive Materials

If a fire occurs that involves explosive materials such as chemicals, fuels or MEC, the UXOSO/UXOQCS will order the immediate evacuation of all site personnel to an upwind assembly point at least fragmentation distance from the fire site. The UXOSO/UXOQCS will then notify the USCG and any other emergency services (med-evac helicopter, 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 Coast Guard will be notified of the fragmentation distance and will be asked to keep boat traffic away.

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 SUXOS and UXOSO/UXOQCS will inspect the site. Any MEC that is observed on the surface will be disposed of in a blow in place operation as it will be considered to be too hazardous to move. All MEC must be 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.

C.9.2.3.4 Explosions

In the event of an explosion, the UXOSO/UXOQCS will order the evacuation of all site personnel to a safe, upwind assembly point at least fragmentation distance away. The UXOSO/UXOQCS will then notify all necessary emergency response services. After an explosion has occurred the site will remain barricaded a minimum of 30 minutes before entry is permitted. The UXOSO/UXOQCS will enter the site with the SUXOS or a qualified team member and inspect for presence and condition of MEC. If material is deemed to be non-hazardous, it will be removed to a secured collection point for later sale to a qualified recycler. If material is deemed to be hazardous, it will be disposed of in place. Non-UXO qualified personnel may not enter the area until all known MEC has been identified, marked, removed or destroyed. If non-UXO qualified personnel 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 an UXO-qualified employee of USA. 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.

C.9.2.4 Contingency Plan for Severe Weather

Thunderstorms, squalls and severe wind conditions can constitute a safety hazard to field operations at this site. The UXOSO/UXOQCS 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/UXOQCS determines it to be safe to continue.

No MEC 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. MEC operations will cease when an electrical storm is within 10 miles of the site, and will not resume again until the UXOSO/UXOQCS determines that the electrical storm is at least 10 miles past the site. If an electrical storm is approaching, the boats will return to shore until the storm has passed, or if applicable, move the vessel to another work site, or move the vessel out of the path of the storm and allow it to pass by. Culebra often has small thunderstorms that pass quickly through the area.

Daily weather conditions will be a part of the daily briefing. Many people incur injuries or are killed due to misinformation and inappropriate behavior during severe weather. During severe weather, project personnel will seek shelter in an appropriate location (i.e., 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.

C.9.2.4.1 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, 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, and 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.

While on Cayo del Agua, there are no substantially constructed buildings. If an electrical storm is approaching, personnel may evacuate the island and return to Culebra, or transit to Cay Botella if it is not in the path of the thunderstorm and perform field work. After the storm has passed, personnel can return to work on Cayo del Agua.

C.9.2.4.2 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 will remove you from the elements.

When available, pay attention to weather warning devices such as National Oceanic and Atmospheric Administration weather radio and/or credible weather detection systems. However, do not let this information override good common sense.

C.9.2.4.3 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/UXOQCS 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 waterborne operations would be considerably more hazardous.

Personnel should seek shelter in a substantial building. The UXOSO/UXOQCS 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/UXOQCS 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/UXOQCS, who will ensure 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.

C.9.2.5 Posting of Emergency Telephone Numbers

Emergency resources are listed in Table C-4. These emergency contact numbers must be posted with each telephone, and in each site vehicle.

Table C-4: Emergency Contact Numbers

Contact	Phone Number
Fire	787-742-3530
Police	787-742-3501
Hospital: Culebra Health Center	787-742-3521
AERO Med Medical Evacuation Flight	787-756-3480
Emergency Management Office - Culebra	787-742-3849
Poison Control Hotline	1-800-222-1222
USEPA National Response Center	1-800-424-8802

Contact	Phone Number
CHEMTREC	1-800-424-9300
Federal OSHA Emergency Hotline	1-800-321-OSHA (6742)
USA Program Manager, Doug Ralston	813-343-6368
USA Project Manager, Tom Bourque	941-746-5375
USA Director of Safety and Quality, Robert Crownover	813-343-6364
USA Corporate Health and Safety Manager, Cheryl M. Riordan, CSP	813-426-2112

In the event of an on-site emergency the individual Team Leader or first person aware of the emergency will contact the UXOSO/UXOQCS. The UXOSO/UXOQCS will normally be responsible for contacting the first responders to administer First Aid services and the med-evac helicopter or ambulance to transport the victim to the hospital, should that be needed. 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 will render emergency First Aid treatment and the UXOSO/UXOQCS will authorize site personnel to assist, where required. On Cayo del Agua, the Coast Guard would be called by the UXOSO/UXOQCS to alert them if there is a danger to watercraft in the area due to conditions on the site. On the island of Culebra, the Fire Department may be called.

C.9.3 Site Sanitation/Housekeeping Plan

An adequate supply of potable (drinkable) water will be provided on site at all times. 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), as follows:

- Containers used for potable water will be capable of being tightly closed, equipped with a tap and maintained in a clean and sanitary condition.
- A container used for distribution of drinking water will be clearly labeled as to its contents and not used for any other purpose.
- Water will not be dipped from the container and use of a common cup will not be allowed.
- Where single service cups are provided, separate sanitary containers will be provided for the storage of the unused cups and for the disposal of the used cups.
- 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 firefighting or decontamination will be clearly labeled to indicate that the water is not suitable for drinking with the following: “CAUTION – WATER UNSAFE FOR DRINKING, WASHING, OR COOKING.” There will at no time be a cross connection or open potential between a system furnishing potable water and a system furnishing non-potable water.
- Toilet facilities will be available on the boat.
- Hand and face washing facilities will be available on the boat. Washing facilities will consist of potable running water, soap, and drying towels. These will be used by all personnel exiting the EZ prior to eating, drinking, tobacco use or other hand to face activities. A portable eyewash will be available with site First Aid kits.

C.9.3.1 Housekeeping and Waste Disposal:

All equipment will be placed in appropriate storage location when not in use. 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.

C.9.4 Medical Support Agreement

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 by phone to provide occupational specific information in case medical treatment is needed. Dr. Scott Hecking can be reached at telephone number (813) 960-1100.

A First Aid kit, emergency eyewash kit, and bloodborne pathogens kit will be kept in the boat and with each team. Personnel who have any type of injury (including First Aid injuries) will report to the UXOSO/UXOQCS so that he can replace used supplies in the First Aid kit, and can investigate to determine the root cause(s) of the accident in order to prevent recurrences. The UXOSO/UXOQCS will also be responsible for making the determination as to whether professional medical assistance will be required.

At the start of site operations, a surface clearance of MEC/MPPEH will be performed on the beach and a landing zone will be established and maintained for use by a Med-Evac helicopter, should it be required.

The UXOSO/UXOQCS will summon a med-evac helicopter or an ambulance, as required, and will direct emergency personnel to the victim, and provide any assistance required by the emergency personnel. The med-evac helicopter will transport the patient to the Culebra Medical Clinic or other designated hospital for treatment based on the type and severity of the injury or condition of the patient. For injuries not as severe, the victim will be transported by boat to the Culebra Ferry dock, and the ambulance would be called to meet the boat at the dock to transport the patient to Culebra Medical Clinic. Maps displaying the route to the hospital will be maintained in each site vehicle. A map with directions to the hospital can be found in Attachment 3.

All treatment will be recorded and any necessary forms completed for documentation of the injury or illness.

C.9.5 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 blood-borne pathogens. The philosophy of universal precautions will 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 clean-up procedures will be implemented accordingly.

C.9.5.1 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 will observe "universal precautions," and treat all body fluids as potentially infectious materials. USA will 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 will be provided. USA employees will wash their hands and any other potentially exposed skin with soap and running water as soon as possible:

- After removing gloves or other PPE
- After contact with potentially infectious materials
- Even after washing with antiseptic as described

- USA employees will flush eyes or other mucous membranes with copious amounts of water as soon as possible after contact of these areas with potentially infectious materials.

For emergency First Aid situations involving multiple victims, equipment will not be used on different victims unless it has been properly decontaminated or if the victim's medical condition would be seriously affected by a delay in treatment.

C.9.5.2 Safe Work Practices

Safe work practices will be implemented whenever possible to eliminate or reduce the potential for employee exposure.

- Employees will wash their hands immediately or as soon as feasible after removal of gloves or other PPE
- Employees will wash hands and any other skin with soap and water, or flush mucous membranes with water immediately following contact with blood or potentially infectious materials
- If potentially contaminated sharps are encountered, the item will immediately be disposed of in an appropriate container for decontamination and disposal
- 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.

C.9.5.3 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 will provide appropriate PPE including gloves, face masks, eye protection, mouthpieces, etc., for protection against potentially infectious materials. PPE will not allow potentially infectious materials to pass through or reach an employee's clothes, skin, eyes, mouth, or other mucous membranes during normal use for the expected duration of time for which the PPE will be used.

Employees will use the appropriate PPE unless, in unusual circumstances, the employee believes that using the protective equipment will prevent the administering of First Aid or would pose an increased risk. Any incident where the use of protective equipment is declined will be investigated and documented by the UXOSO/UXOQCS and be approved by the CHSM.

Single-use protective equipment, such as surgical gloves, will be disposed of after each use, or as soon as possible after the equipment has become damaged. Multi-use protective equipment, such as coveralls or utility gloves, will be cleaned and decontaminated after each use or when they become contaminated in order to maintain its effectiveness. Multi-use protective equipment will be removed, then disposed of or repaired as soon as possible after becoming damaged.

When PPE is removed, it will be placed in an appropriately designated area or container for storage, washing, decontamination or disposal. PPE will be removed and disposed 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 glove 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.

C.9.5.4 Decontamination Procedures

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

- Contaminated sharp objects will be cleaned up using mechanical means, such as a brush and dustpan
- Sharp objects will not be picked up directly with the hands
- Two pairs of gloves, inner surgical gloves and outer utility gloves, will be worn for cleaning contaminated surfaces
- A smock or apron and eye protection will also be worn
- Only those employees directly involved with the decontamination efforts will be allowed in the work area while cleaning is taking place
- All cleaning equipment will be disinfected or disposed of in accordance with this program
- For minor injuries where the employee is able to return to work, the injured employee will clean up his/her own blood or other potentially infectious materials.

C.9.5.5 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 will be decontaminated with an appropriate disinfectant immediately after they become contaminated in accordance with the decontamination section of this program. Regulated waste, other than contaminated sharps, will be placed in containers which are: closable, constructed to contain all contents and prevent leakage, properly labeled or color-coded, and closed prior to removal or replacement. Labels or color-coding will be fluorescent orange or orange-red, and display the biohazard symbol in a contrasting color.

Regulated waste containing contaminated sharps will be placed in containers which are: closable, puncture resistant and leak proof on sides and bottom, properly labeled or color-coded, and closed prior to removal or replacement. Contaminated clothing, equipment and other materials will be handled as little as possible and with minimum agitation. Bags containing contaminated materials will not be carried or handled from the bottom. All regulated waste will be disposed of in accordance with applicable federal, state, and local regulations.

C.9.6 Exposure Control Plan

The exposure control plan for prevention of exposure to bloodborne pathogens is described in Section C.9.5, above.

C.9.7 Automatic External Defibrillator (AED) Program

AEDs are not provided for this work site.

C.9.8 Site Layout Plans

Layout plans are not applicable for this Project, as temporary structures will not be constructed.

C.9.9 Access and Haul Road Plan

There are no plans to create access and haul roads for this project, so the Access and Haul Road Plan is not required.

C.9.10 Hearing Conservation Program

Protection against the effects of noise exposure will be provided when the sound levels exceed those shown in Table C-5, 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 C-5, feasible administrative or engineering controls will be utilized. If such controls fail to reduce sound to a safe level, PPE will be provided and used to reduce sound exceeding protective levels. If the variations in noise level involve maximal intervals of 1 second or less, it is to be considered continuous.

USA will make hearing protection available to all employees exposed to an 8-hour time-weighted average of 85 decibels or greater. Hearing protection will be replaced as necessary. Hearing protection will be required for all personnel working in and around any operations likely to produce high noise levels, such as during the use of chain saws and weed-eaters used for vegetation clearance operations. Where required, sound pressure level measurements will be made by the UXOSO/UXOQCS or other qualified personnel using calibrated instruments. Personnel required to use a sound level meter will be trained in its use and calibration requirements prior to use on site.

Table C-5: 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.

C.9.11 Respiratory Protection Plan

Due to the type of work taking place, respirators will not be required on this site.

C.9.12 Health Hazard Control Program

Due to 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.

C.9.13 Hazard Communication Program

The Hazard Communication 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/SDSs. All MSDSs/SDSs are requested from the suppliers at the time of order. If one is not provided by the supplier, then a recent MSDS/SDS will be downloaded from the Internet.

- As part of the USA Hazard Communication Program, an MSDS/SDS binder will be maintained onsite, which includes copies of MSDSs/SDSs for all hazardous materials brought onto the site by USA. The UXOSO/UXOQCS will establish a location for the binder, and all USA personnel will be made aware of that location. This MSDS/SDS binder will be available on request to all site personnel during all working hours of the site. If site workers have further questions about any of the hazardous materials they come into contact with, the USA CHSM 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/SDS for any hazardous material on the site at any time. This training will occur as part of the initial mobilization training at the site and will be documented on the USA Documentation of Training Form.

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

C.9.14 Process Safety Management Program

Due to the type of work in this PWS, a Process Safety Management Program is not applicable.

C.9.15 Lead Compliance Plan

Lead is not expected to be a contaminant on this site.

C.9.16 Asbestos Abatement Plan

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

C.9.17 Radiation Safety Program

A Radiation Safety Program is not applicable to this PWS.

C.9.18 Abrasive Blasting

Abrasive blasting is not required on this project.

C.9.19 Heat Stress Monitoring Plan

The Heat Stress Monitoring Plan can be found in the Site Specific Safety and Health Plan at Section C.3.8.

C.9.20 Cold Stress Monitoring Plan

Due to the location of this project site, a cold stress monitoring plan is not required.

C.9.21 Indoor Air Quality Management

As this is an outdoor site, indoor air quality management is not applicable.

C.9.22 Mold Remediation Plan

A Mold Remediation Plan is not applicable to this PWS.

C.9.23 Chromium (VI) Exposure Evaluation

Chromium exposure is not anticipated at this site.

C.9.24 Lighting Plan for Night Operations

Night operations are not anticipated under this PWS.

C.9.25 Traffic Control Plan

As Cayo del Agua is uninhabited, a Traffic Control Plan is not required.

C.9.26 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. There will be trash cans with lids at the site, which 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.

C.9.26.1 Fire Protection

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 in this location. 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.

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. Fire extinguishers found to be effective on more than one class of fire have multiple letter classifications (Example: A:B:C:D).

The rating of hand-portable fire extinguishers is based on the following:

- Class A fire extinguisher is used for ordinary combustible materials
- Class B fire extinguisher is for flammable liquids
- Class C fire extinguisher is for electrical fires
- Class D fire extinguisher is for combustible metal fires.

Many fires are small at origin and may be extinguished by the use of proper hand-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, which may occur
- The fire is discovered while 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-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 user.

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. Because of its corrosive nature, dry chemical is not recommended for use on computerized, electronic, or other equipment with extensive circuitry.

C.9.26.2 Wild Land Fire Management 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 feet 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 maximum fragmentation distance from the site. As Cayo del Agua is not inhabited, there is no Fire Department to respond to a large fire on this site. Site personnel will be instructed to evacuate the site via boat and to notify the USCG of the situation in order to keep watercraft from entering within fragmentation distance of the Cayo.

C.9.27 Arc Flash Hazard Analysis

Arc flash is not applicable to this PWS.

C.9.28 Assured Equipment Grounding Control Program

Electrical equipment is not expected to be used under this PWS. During the transfer of flammable liquids into equipment, such as for equipment fueling operations, grounding and bonding procedures will be implemented.

C.9.29 Hazardous Energy Control Program and Procedures

The work on this project should not require the use of equipment that would require a Hazardous Energy Control Program.

C.9.30 Standard Pre-Lift Plan – Load Handling Equipment

As load handling equipment is not required under this PWS, a Standard Pre-Lift Plan is not applicable.

C.9.31 Critical Lift Plan – Load Handling Equipment

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

C.9.32 Naval Architectural Analysis – Load Handling Equipment (Floating)

A Naval Architectural Analysis is not applicable to this PWS.

C.9.33 Floating Plant Inspection and Certification

A floating plant is not applicable to this PWS.

C.9.34 Severe Weather Plan for Marine Activities

The overall Contingency Plan for Severe Weather for the site can be found at paragraph C.9.2.4. There will be marine activities on this site including the transport of personnel and equipment by boat to the site, boats used to patrol the EZ during MEC operations, and barges used to transport tires and BDUs (safe for transport), BDU remnants, and munitions debris to Soldado Point for processing.

All water vessels will be equipped with emergency radios and extra batteries. They will also monitor NOAA weather advisories. There will also be an electrical storm detector in use in order to detect the location of approaching storms. The plan is to evacuate the site prior to the storm hitting Cayo del Agua. Depending on the direction of the approaching storm, personnel may move to Cayo del Agua and perform work in that location, or wait for the storm to pass. Another option is to evacuate to Culebra to wait for the storm to pass, based on the direction of the storm. In the event of an approaching hurricane, operations will be suspended and personnel will follow the hurricane procedures per Section C.9.2.4.3.

C.9.35 Emergency Plan for Marine Activities

In the event of a medical emergency, the UXOSO/UXOQCS will also be responsible for making the determination as to whether professional medical assistance will be required. The First Responders will provide assistance for minor injuries where only First Aid assistance is required. For more serious medical emergencies, the UXOSO/UXOQCS will summon a med-evac helicopter or an ambulance, as required, and will direct emergency personnel to the victim, and provide any assistance required by the emergency personnel. The med-evac helicopter will transport the patient to the Culebra Medical Clinic or other designated hospital for treatment based on the type and severity of the injury or condition of the patient. For injuries not as severe, the victim will be transported by boat to the Culebra Ferry dock, and the ambulance would be called to meet the boat at the dock to transport the patient to Culebra Medical Clinic.

In the event of a fire, fire extinguishers will be provided and personnel will use them on incipient stage fires. As Cayo del Agua is uninhabited, there is no local Fire Department to respond to a large fire. In the case of a large fire, personnel will evacuate to the boat and then evacuate Cayo del Agua until the fire has burned itself out. The USCG will be notified of the situation and asked to notify all watercraft in the area to remain beyond the fragmentation distance of Cayo del Agua in order to protect them in the event MEC is detonated during the fire event. When the fire has burned itself out, personnel can resume MEC operations on Cayo del Agua.

C.9.35.1 Man Overboard/Abandon Ship Procedures

All personnel will be required to wear a personal floatation device (PFD) and remain seated whenever the boats are in operation. They will be required to keep all parts of the body within the boat. Should someone fall overboard, the Captain will be immediately notified to stop the boat. The boat is required to be equipped with rescue equipment to include a ring buoy with rope, and any additional equipment required for the vessel type and size. Personnel will be trained in the use of this equipment and prepared to use it in the event of a man overboard situation in order to quickly bring the person back onto the boat.

Communications equipment is well maintained and checked daily prior to launching of the boat to ensure that personnel 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 USCG 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. In the event of a fire, personnel will fight the fire from an upwind position. The USCG will be notified of a fire situation immediately and not wait until the fire becomes uncontrollable. Should the fire become out of control, the Captain will give the order to abandon ship and personnel will

abandon ship with PFDs donned and stay together in the water awaiting rescue from the USCG. If they are within swimming distance of land, the Captain may order all personnel to swim to land together to await USCG rescue.

C.9.36 Float Plan for Launches, Motorboats and Skiffs

Float plans must be prepared by operators of motorboats engaged in patrolling or inspections activities that are remote and are expected to take longer than 4 hours or when the operator is travelling alone. Float Plans will be filed with the Site Manager or Project Manager the boat operator's supervisor. Boats patrolling the EZ during MEC operations will be required to also file float plans with their supervisor. The Captain of the boat used to transport personnel to and from the site, as well as the operator of the vessel which will tow the barge will also file float plans with their employer (CMS) to ensure they are aware of when they leave, where they are going, what they will be doing, and when they are expected to return. Float plans will be required to include the following information, as a minimum:

- Vessel information (make/model or local identified)
- Personnel on-board
- Activity to be performed
- Expected time of departure, route, and time of return
- Means of communication.

All motorboat operators will be required to complete and document the following training:

- A boating safety course meeting the criteria of the USCG Auxiliary, National Association of Safe Boating Law Administrators (NASBLA), or equivalent
- Motorboat handling training, based on the type of boat they will operate, provided by qualified instructors. Operators must pass a written and operational test
- Current USCG licensed personnel are recommended to captain the personnel transport exempt from the boating safety training, but they shall complete the written exam and operational test.

The USA UXOQCS will inspect required documentation to ensure it meets requirements and is current.

C.9.37 Fall Protection and Prevention Plan

As work will be occurring at ground level, a Fall Protection Plan is not applicable to this PWS.

C.9.38 Demolition/Renovation Plan

Demolition/renovation operations are not applicable to this PWS.

C.9.39 Rope Access Work Plan

Rope access work is not applicable to this PWS.

C.9.40 Excavation/Trenching Plan

Excavation operations will be in accordance with the Excavation Operations section of the SSHP at paragraph C.3.2.1.5.

C.9.41 Fire Prevention and Protection Plan for Underground Construction

As underground construction is not required under this PWS, the Underground Construction Fire Prevention and Protection Plan is not required.

C.9.42 Compressed Air Work Plan for Underground Construction

As underground construction is not required under this PWS, this plan is not required.

C.9.43 Erection and Removal Plan for Formwork and Shoring

As this project will not involve formwork or shoring erection and removal, this plan will not be required.

C.9.44 Precast Concrete Plans

Use of precast concrete is not applicable to this PWS.

C.9.45 Lift-Slab Plans

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

C.9.46 Masonry Bracing Plan

Masonry bracing is not applicable to this PWS.

C.9.47 Steel Erection Plan

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

C.9.48 Explosives Safety Submission

An approved Explosives Safety Submission (ESS) can be found as a standalone document. It includes the siting of a Type II ATFE explosives magazine with attached cap box for the storage of required donor explosives for MEC disposal operations to be conducted. Additional specific detailed procedures for operations involving explosives can be found in the AHA for MEC Demolition as well as SOPs in the MEC QAPP.

C.9.49 Blasting Plan

As the work on this project does not involve underground blasting operations, a blasting plan will not be required.

C.9.50 Dive Operations Plan

As the work on this project does not involve diving operations, a Dive Operations Plan will not be required.

C.9.51 Safe Practices Manual for Diving Activities

As the work on this project does not involve diving activities, a Safe Practices Manual for Diving Activities will not be required.

C.9.52 Emergency Management Plan for Diving

As the work on this project does not involve diving activities, an Emergency Management Plan for Diving will not be required.

C.9.53 Tree Felling and Maintenance Program

Tree felling and maintenance are not applicable to this PWS.

C.9.54 Aircraft/Airfield Construction Safety & Phasing Plan (CSPP)

Aircraft/airfield construction are not applicable to this PWS.

C.9.55 Aircraft/Airfield Safety Plan Compliance Document (SPCD

Aircraft/airfield work is not applicable to this PWS.

C.9.56 Site Safety and Health Plan for Hazardous, Toxic, and Radioactive Waste (HTRW)

The SSHP can be found at Attachment 3 of this APP.

C.9.57 Confined Space Entry Procedures

Work in confined spaces is not expected to occur on this project.

C.9.58 Confined Space Program

Work in confined spaces is not expected to occur on this project.

C.10 RISK MANAGEMENT PROCESS

Site-specific hazards and controls are detailed in the AHAs for each activity of the operation. These AHAs can be found in Attachment 2. The specific activities on this site are as follows:

- I Boat Operations
- Digital Geophysical Mapping
- Instrument Verification Strip
- MEC Disposal
- MEC Investigation
- MEC Surface Clearance
- MPPEH Inspection and Certification
- Quality Control
- Soil Sampling
- Vegetation Removal
- Transportation of Explosives via Vessel
- Vehicle Operations.

APPENDIX C. ATTACHMENT 1: OSHA 300 FORM

This appendix contains a copy of the OSHA 300 form.

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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 2016

U.S. Department of Labor
Occupational Safety and Health Administration

You must record information about every work-related injury or illness that involves loss of consciousness, restricted work activity or job transfer, days away from work, or medical treatment beyond first aid. You must also record significant work-related injuries and illnesses that are diagnosed by a physician or licensed health care professional. You must also record work-related injuries and illnesses that meet any of the specific recording criteria listed in 29 CFR 1904.8 through 1904.12. Feel free to use two lines for a single case if you need to. You must complete an injury and illness incident report (OSHA Form 301) or equivalent form for each injury or illness recorded on this form. If you're not sure whether a case is recordable, call your local OSHA office for help.

Form approved OMB no. 1218-0176

Establishment name 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)	(L)	(1)	(2)	(3)	(4)	(5)	(6)
					Page totals	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*

Be sure to transfer these totals to the Summary page (Form 300A) before you post it.

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.

APPENDIX C. ATTACHMENT 2: ACTIVITY HAZARD ANALYSIS

This appendix contains the following Activity Hazard Analyses:

- Boat Operations
- Digital Geophysical Mapping
- Instrument Verification Strip
- MEC Disposal
- MEC Investigation
- MEC Surface Clearance
- MPPEH Inspection and Certification
- Quality Control
- Soil Sampling
- Transportation of Explosives via Vessel
- Vegetation Removal
- Vehicle Operations.

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Activity Hazard Analysis (AHA)

Activity/Work Task: Boat Transportation	Overall Risk Assessment Code (RAC) (Use highest code) **L**
Project Location: Cayo del Agua, Culebra Island, Puerto Rico	Risk Assessment Code (RAC) Matrix
Contract Number: W912DY-10-D-0026, TO No. 0027	
Date Prepared: 10 / 25 / 2016	
Prepared by (Name/Title): Cheryl M. Riordan, CSP	
Reviewed by (Name/Title): Robert Crownover, Director of Safety and Quality, USA Environmental, Inc.	
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
1. Identify the hazards associated with boat operations. Inspect boat. Load cargo onto boat. 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	1.1 Weather hazards	1.1.1 Use weather radio to detect oncoming storms and boat will evacuate the area when squalls or thunderstorms are approaching. 1.1.2 Maintain good emergency communications system. There should be two forms of communication and extra batteries on hand. 1.1.3 Directions for contacting the U.S. Coast Guard (USCG) and hospital will be posted with each radio and cell phone.	L
	1.2 Boat hazards	1.2.1 Boat Operator will assure that the boat is well maintained and in good condition prior to taking on passengers. 1.2.2 Experienced crew will inspect boat on a daily basis to ensure a safe operating vessel. Conduct proper repairs or replacement of parts as necessary to maintain safe vessel operation. 1.2.3 A USCG licensed Captain will operate the Personnel Transport Boat Work boats will not require USCG Captain as coxswain. 1.2.4 Boat Captain will file afloat plan prior to departing from the dock.	

Job Steps	Hazards	Controls	RAC
		1.2.5 Personnel will attend daily safety briefing by Captain prior to transport by boat, and will obey all directions from the Captain during transport. 1.2.6 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. 1.2.7 Directions for contacting the USCG and hospital will be posted with each radio and cell phone 1.2.8 All passengers will wear personal flotation device at all times while boat is in operation and when experiencing inclement weather. When not in transit, personal flotation devices are not required but will be available and readily accessible. 1.2.9 Boat will be equipped with rescue equipment to handle a man overboard situation (life ring with rope, or similar equipment) and personnel trained in its use 1.2.10 Be alert. Cease operations if unsafe conditions arise. 1.2.11 Use Personal Protective Equipment (PPE) in accordance with (IAW) this AHA.	
	1.3 Fire hazards	1.3.1 Ensure First Aid kits and fire extinguishers are in place 1.3.2 All personnel will be trained in the use of fire extinguishers. 1.3.3 No smoking, except in designated areas.	
	1.4. Slip, trip, and fall hazards	1.4.1 Be observant while walking. Use sturdy protective work boots with composite toe, ankle support and non-slip soles. Avoid wet or potentially slippery locations on boat. 1.4.2 Wear leather or canvas work gloves when loading and offloading vessel.	
	1.5. Heat stress	1.5.1 Heat stress monitoring, drinking water, work-rest cycles, and cool shelter for breaks.	
	1.6 Biological hazards – insects and spiders	1.6.1 Training in biological hazards avoidance. 1.6.2 Use insect repellents as necessary. 1.6.3 Wear long or short sleeved shirts and long pants	
	1.7 Muscle strain in loading cargo	1.7.1 Follow appropriate lifting/carrying procedures: lift with legs and not with back, use gloves and ensure a good grip, and avoid twisting the back when lifting/carrying, never lift more than you can	

Job Steps	Hazards	Controls	RAC
		safety handle and ask for assistance on large/heavy lifts. 1.7.2 Block, brace, and secure cargo from movement during transportation. 1.7.3 Good housekeeping standards will be enforced. Cargo will be properly staged on the boat to prevent tripping hazards.	
	1.8 Sunburn	1.8.1 Wear cap and use sunscreen.	
2. Captain will operate boat to transport personnel and equipment to and from desired destination.	2.1 Weather hazards	2.1.1 Using a weather channel on vessels VHF, local weather will be monitored and boat operations will be delayed or vessel will avoid approaching storms as practical. Vessel will not be operated in unsafe sea conditions for the vessel used 2.1.2 The vessel will avoid approaching electrical storms, or seek safe harbor 2.1.3 Maintain good emergency communications system. There should be two forms of communication and extra batteries on hand. 2.1.4 Directions for contacting the USCG and hospital will be posted with each radio and cell phone.	L
	2.2 Potential for boat accidents during field operations	2.2.1 Boat Operator will assure that boat is well maintained and in good condition prior to taking on passengers. 2.2.2 Experienced crew to inspect boat on a daily basis to ensure a safe operating vessel. Conduct proper repairs or replacement of parts as necessary to maintain safe vessel operation. 2.2.3 A USCG licensed Captain will operate the Personnel Transport Boat. Work boats will not require USCG Captain as coxswain. 2.2.4 Boat Captain will file afloat plan prior to departing from the dock. 2.2.5 Personnel will attend daily safety briefing by Captain prior to transport by boat, and will obey all directions from the Captain during transport. 2.2.6 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. 2.2.7 Directions for contacting the USCG and hospital will be posted with each radio and cell phone 2.2.8 All passengers will wear personal flotation device at all times while boat is in operation and when experiencing inclement	

Job Steps	Hazards	Controls	RAC
		weather. When not in transit, personal flotation devices will be available and readily accessible. 2.2.9 Passengers should remain seated while boat is in motion. 2.2.10 Boat will be equipped with rescue equipment to handle a man overboard situation (life ring with rope, or similar equipment) and personnel trained in its use 2.2.11 Be alert. Cease operations if unsafe conditions arise. 2.2.12 Use PPE IAW this AHA.	
	2.3 Fire hazards	2.3.1 Ensure First Aid kits and fire extinguishers are in place 2.3.2 All personnel will be trained in the use of Fire Extinguishers. 2.3.3 No smoking, except in designated areas.	
	2.4. Slip, trip, and fall hazards	2.4.1 Be observant while walking. Use sturdy protective work boots with composite toe, ankle support and non-slip soles. Avoid wet or potentially slippery locations on boat. 2.4.2 Wear leather or canvas work gloves when loading and offloading vessel.	
	2.5 Heat stress	2.5.1 Heat stress monitoring, drinking water, work-rest cycles, and cool shelter for breaks.	
	2.6 Biological hazards – insects and spiders	2.6.1 Training in biological hazards avoidance. 2.6.2 Use insect repellents as necessary. 2.6.3 Wear long or short sleeved shirts and long pants.	
	2.7 Sunburn	2.7.1 Wear cap and use sunscreen.	

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
• Sturdy protective work boots with composite toe, ankle support and non-slip soles. • Appropriate clothing and PPE to include: cotton long or short sleeved shirt and long pants, personal flotation device, safety glasses with side shields or goggles, leather or canvas work gloves and cap. Hearing protection (NRR 30 or greater, as required due to noise of boat engine). • Boat • Ring buoy with rope or suitable alternative • Storm monitor • Communications equipment (Satellite phone, cell phone, radios) • First Aid kit • Fire extinguishers • Wet Bulb Globe Temperature monitor as necessary	• PPE Training • Captain of personnel transport boat is experienced and USCG Licensed • Boat crew experienced in inspection, maintenance and operation of boat • Training in boat safety procedures • Equipment familiarity training • Site-specific training on slip, trip, and fall hazards • Training in lifting/carrying techniques • Emergency response and notification procedures • At least two USA personnel will be trained in First Aid/CPR • Heat stress symptoms and First Aid • Site specific training on flora/fauna including First Aid • Fire extinguisher training	• PPE inspected daily prior to use by the user with checks by the UXOSO • UXOSO will ensure that all controls are being followed, all equipment is being correctly utilized, and all personnel have received appropriate training. • Boat inspected daily prior to use by Captain/crew with checks by UXOSO. • Equipment inspected daily prior to use by the user with checks by the UXOSO. • Rescue equipment inspected daily prior to boat leaving the dock by UXOSO. • Communications equipment checked daily prior to use by the UXOSO. • First Aid kits checked daily and inspected weekly by the UXOSO. • Fire extinguishers checked daily and inspected weekly by the UXOSO.

Class Title: _____ Given by: _____ Date: _____

Printed Name	Signature	Date

Activity Hazard Analysis (AHA)

Activity/Work Task: Digital Geophysical Mapping (DGM)	Overall Risk Assessment Code (RAC) (Use highest code) **L**
Project Location: Cayo del Agua, Culebra Island, Puerto Rico	Risk Assessment Code (RAC) Matrix
Contract Number: W912DY-10-D-0026, TO No. 0027	
Date Prepared: 10 / 25 / 2016	
Prepared by (Name/Title): Cheryl M. Riordan, CSP Corporate Health and Safety Manager	
Reviewed by (Name/Title): Robert Crownover Director of Safety and Quality USA Environmental, Inc.	Digitally signed by Robert D. Crownover DN: cn=Robert D. Crownover, o=USA Environmental, Inc., ou=Director Safety and Quality, email=rcrownover@usatampa.com, c=US Date: 2016.10.27 08:53:55 -04'00'
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
1. The Geophysicist will perform a DGM survey of the site, escorted by a UXO Technician. Lanes will be established for performance of the MEC surface/subsurface clearance. This is a MEC avoidance operation. If MEC is encountered, it will be marked with a pin flag for later disposal to be performed by a UXO team. Map with DGM data will be prepared and submitted at	1.1 Munitions and Explosives of Concern (MEC) hazards	1.1.1 On-site MEC training. 1.1.2 Identify and minimize all hazards and take proper safety precautions. 1.1.3 Keep personnel to a minimum during operations. 1.1.4 Use and enforce the buddy system. 1.1.5 This is a MEC avoidance operation. MEC will not be moved or handled in any way. If MEC is encountered, path will be routed around it. 1.1.6 Prior to any intrusive operations, such as placing a pin flag, the Geophysicist will use geophysical equipment to ensure there are no anomalies in that location, and if anomalies are present, he will place the pin flag in another nearby location that is anomaly-free. 1.1.7 Be alert. Cease operations if unsafe conditions arise. 1.1.8 Use Personal Protective Equipment (PPE) in accordance with (IAW) this AHA.	L

Job Steps	Hazards	Controls	RAC
completion of DGM survey. Map will be used to identify anomalies for MEC subsurface investigation.		1.1.9 Ensure First Aid kits and Fire Extinguishers are in place. 1.1.10 No smoking, except in designated areas. 1.1.11 Do not allow smoking or flame producing devices in the vicinity of MEC	
	1.2 Unauthorized personnel entering site during operations	1.2.1 Establish exclusion zone (EZ) 1.2.2 Maintain positive site control; cease operations if unauthorized entry is made. 1.2.3 Control measures will be implemented (security boats enforcing EZ on approaching water vessels). 1.2.4 Cease operations if unauthorized entry is made.	
	1.3. Uneven working surfaces – slip, trip, and fall hazards	1.3.1 Be observant while walking. Use sturdy protective work boots with composite toe, ankle support and non-slip soles. 1.3.2 Wear leather or canvas work gloves.	
	1.4. Heat stress	1.4.1 Heat stress monitoring, drinking water, work-rest cycles, and cool shelter for breaks.	
	1.5 Biological hazards – hazardous plants, trees, insects, and spiders	1.5.1 Training in biological hazards avoidance. 1.5.2 Use barrier creams/insect repellents as necessary. 1.5.3 Wear cotton coveralls or long or short sleeved shirts and long pants.	
	1.6 Muscle strains carrying instruments	1.6.1 Follow appropriate lifting/carrying procedures: lift with legs and not with back, use gloves and ensure a good grip, and avoid twisting the back when lifting/carrying, never lift more than you can safety handle and ask for assistance on large/heavy lifts.	
	1.7 Sunburn	1.7.1 Wear cap and use sunscreen.	

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
• Sturdy protective work boots with composite toe, ankle support and non-slip soles • Appropriate clothing and PPE to include: cotton long or short sleeved shirts and long pants, safety glasses with side shields or goggles, leather or canvas work gloves and cap • Geophysical equipment • Pin flags • Communications equipment • First Aid kit • Fire extinguishers • Wet Bulb Globe Temperature monitor as necessary	• PPE Training • Trained Geophysicist • UXO personnel will meet training and experience requirements outlined in DDESB TP 18 • Site-specific MEC training will be presented to all site personnel • Safe work practices and precautions associated with task being performed • Equipment familiarity training • Site-specific training on slip, trip, and fall hazards • Site-specific training in lifting/carrying techniques • Emergency response and notification procedures • All site personnel will have current HAZWOPER training • Heat stress symptoms and First Aid • Site specific flora/fauna to include First Aid	• PPE inspected daily prior to use by user and checked by UXOSO. • UXOSO will ensure that all controls are being followed, all equipment is being correctly utilized, and all personnel have received appropriate training. • Equipment inspected daily prior to use by user and checked by UXOSO. • Daily serviceability check of magnetometers by user and checked by UXOQCS. • Communications equipment checked daily prior to use by UXOSO. • First Aid kits checked daily and inspected weekly by UXOSO. • Fire extinguishers checked daily and inspected weekly by UXOSO.

Class Title: _____ Given by: _____ Date: _____

Printed Name	Signature	Date

Activity Hazard Analysis (AHA)

Activity/Work Task: Instrument Verification Strip (IVS)	Overall Risk Assessment Code (RAC) (Use highest code) **L**
Project Location: Cayo del Agua, Culebra Island, Puerto Rico	Risk Assessment Code (RAC) Matrix
Contract Number: W912DY-10-D-0026; TO No. 0027	
Date Prepared: 10 / 25 / 2016	
Prepared by (Name/Title): Cheryl M. Riordan, CSP Corporate Health and Safety Manager	
Reviewed by (Name/Title): Robert Crownover Director of Safety and Quality USA Environmental, Inc.	Digitally signed by Robert D. Crownover DN: cn=Robert D. Crownover, o=USA Environmental, Inc., ou=Director Safety and Quality, email=rcrownover@usatampa.com, c=US Date: 2016.10.27 08:54:14 -04'00'
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
1. Using geophysical equipment, the UXOQCS will locate a plot of land where an IVS can be prepared and ensure there are no buried anomalies in the area.	1.1 Munitions and Explosives of Concern (MEC) hazards	1.1.1 On-site MEC training. 1.1.2 Identify and minimize all hazards and take proper safety precautions. 1.1.3 Keep personnel to a minimum during operations. 1.1.4 Use and enforce the buddy system. 1.1.5 This is a MEC avoidance operation. MEC will not be moved or handled in any way. If MEC is encountered, path will be routed around it. 1.1.6 Be alert. Cease operations if unsafe conditions arise. 1.1.7 Use Personal Protective Equipment (PPE) in accordance with (IAW) this AHA. 1.1.8 Ensure First Aid kits and fire extinguishers are in place. 1.1.9 No smoking, except in designated areas. 1.1.10 Do not allow smoking or flame producing devices in the vicinity of MEC.	L

Job Steps	Hazards	Controls	RAC
	1.2. Uneven working surfaces – slip, trip, and fall hazards	1.2.1 Be observant while walking. Use sturdy protective work boots with composite toe, ankle support and non-slip soles. 1.2.2 Wear leather or canvas work gloves.	
	1.3. Heat stress	1.3.1 Heat stress monitoring, drinking water, work-rest cycles, and cool shelter for breaks.	
	1.4 Biological hazards – hazardous plants, trees, insects, and spiders	1.4.1 Training in biological hazards avoidance. 1.4.2 Use barrier creams/insect repellents as necessary. 1.4.3 Wear cotton long or short sleeved shirt and long pants.	
	1.5 Muscle strain carrying instruments	1.5.1 Follow appropriate lifting/carrying procedures: lift with legs and not with back, use gloves and ensure a good grip, and avoid twisting the back when lifting/carrying, never lift more than you can safety handle and ask for assistance on large/heavy lifts.	
	1.6 Sunburn	1.6.1 Wear cap and use sunscreen.	
2. Using inert ordnance or other items that would give off a similar signature, the UXOQCS will bury these items at differing depths and directions throughout the IVS. The UXOQCS will prepare a map of the IVS showing all of the buried items.	2.1 Uneven working surfaces – slip, trip, and fall hazards	2.1.1 Be observant while walking. Use sturdy protective work boots with composite toe, ankle support and non-slip soles. 2.1.2 Wear leather or canvas work gloves.	L
	2.2 Heat stress	2.2.1 Heat stress monitoring, drinking water, work-rest cycles, and cool shelter for breaks.	
	2.3 Biological hazards – hazardous plants, trees, insects, and spiders	2.3.1 Training in biological hazards avoidance. 2.3.2 Use barrier creams/insect repellents as necessary. 2.3.3 Wear cotton long or short sleeved shirt and long pants.	
	2.4 Muscle strain carrying instruments, using shovels	2.4.1 Follow appropriate lifting/carrying procedures: lift with legs and not with back, use gloves and ensure a good grip, and avoid twisting the back when lifting/carrying, never lift more than you can safety handle and ask for assistance on large/heavy lifts.	
	2.5 Sunburn	2.5.1 Wear cap and use sunscreen.	

Job Steps	Hazards	Controls	RAC
3. Each day, prior to use of geophysical equipment, each person will test the equipment on the IVS. If the geophysical equipment is able to locate all buried items in the IVS, it will be used for work that day. If the geophysical equipment is unable to locate all buried items in the IVS, it will be removed from service until repairs can be made. Another piece of equipment will be tried until one is found that can detect all buried items.	3.1 Uneven working surfaces – slip, trip, and fall hazards	3.1.1 Be observant while walking. Use sturdy protective work boots with composite toe, ankle support and non-slip soles. 3.1.2 Wear leather or canvas work gloves.	L
	3.2 Heat stress	3.2.1 Heat stress monitoring, drinking water, work-rest cycles, and cool shelter for breaks.	
	3.3 Biological hazards – hazardous plants, trees, insects, and spiders	3.3.1 Training in biological hazards avoidance. 3.3.2 Use barrier creams/insect repellents as necessary. 3.3.3 Wear cotton long or short sleeved shirt and long pants.	
	3.4 Muscle strain carrying instruments	3.4.1 Follow appropriate lifting/carrying procedures: lift with legs and not with back, use gloves and ensure a good grip, and avoid twisting the back when lifting/carrying, never lift more than you can safety handle and ask for assistance on large/heavy lifts.	
	3.5 Sunburn	3.5.1 Wear cap and use sunscreen.	

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
• Sturdy protective work boots with composite toe, ankle support and non-slip soles • Appropriate Level D PPE to include: cotton long or short sleeved shirt and long pants, safety glasses with side shields or goggles, leather or canvas work gloves and cap • Appropriate geophysical equipment • Hand tools • Communications equipment • First Aid kit • Fire extinguishers • Wet Bulb Globe Temperature monitor as necessary	• PPE Training • 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 • Safe work practices and precautions associated with task being performed • Site-specific training on slip, trip, and fall hazards • Training in lifting/carrying techniques • Emergency response and notification procedures • All site personnel will have current HAZWOPER training • Heat stress symptoms and First Aid • Site-specific flora/fauna to include first aid	• PPE inspected daily prior to use by the user and checked by UXOSO. • UXOSO will ensure that all controls are being followed, all equipment is being correctly utilized, and all personnel have received appropriate training. • Equipment inspected daily prior to use by the user and checked by UXOSO. • Communications equipment checked daily prior to use by UXOSO. • First Aid kits checked daily and inspected weekly by UXOSO. • Fire extinguishers checked daily and inspected weekly by UXOSO.

Class Title: _____ Given by: _____ Date: _____

Printed Name	Signature	Date

Activity Hazard Analysis (AHA)

Activity/Work Task: MEC Disposal	Overall Risk Assessment Code (RAC) (Use highest code) **M**
Project Location: Cayo del Agua, Culebra Island, Puerto Rico	Risk Assessment Code (RAC) Matrix
Contract Number: W912DY-10-D-0026, TO No. 0027	
Date Prepared: 10 / 25 / 2016	
Prepared by (Name/Title): Cheryl M. Riordan, CSP Corporate Health and Safety Manager	
Reviewed by (Name/Title): Robert Crownover Director of Safety and Quality USA Environmental, Inc.	Digitally signed by Robert D. Crownover DN: cn=Robert D. Crownover, o=USA Environmental, Inc., ou=Director Safety and Quality, email=rcrownover@usatampa.com, c=US Date: 2016.10.27 08:54:34 -04'00'
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
1. All MEC disposal operations will be blow-in-place or consolidated shot disposals. Evacuate area around disposal operation for required fragmentation distance per the ESS, except for personnel involved in disposal operation. Alert security vessel to clear all watercraft within the EZ and ensure no further unauthorized entry is made into the site.	1.1 Munitions and Explosives of Concern (MEC) hazards	1.1.1 On-site MEC training. 1.1.2 Identify and minimize all hazards and take proper safety precautions. 1.1.3 All work will be in compliance with the project ESS. 1.1.4 Keep personnel to a minimum during operations. 1.1.5 Use and enforce the buddy system. 1.1.6 Use engineering controls to reduce or eliminate fragmentation/overpressure hazards such as sandbags. 1.1.7 Be alert. Cease operations if unsafe conditions arise. 1.1.8 Observe all MEC safety precautions, such as movement, heat, shock, and friction, and follow safe work practices. 1.1.9 Do not handle MEC unnecessarily. 1.1.10 Only UXO qualified personnel will perform MEC disposal operations. 1.1.11 Observe safe work practices, operating precautions	L

Job Steps	Hazards	Controls	RAC
		and instructions for equipment in use. 1.1.12 Controlled use of radios and cell phones 1.1.13 Use Personal Protective Equipment (PPE) in accordance with (IAW) this AHA. 1.1.14 Ensure First Aid kits and fire extinguishers are in place. 1.1.15 No smoking, except in designated areas. 1.1.16 Do not allow smoking or flame producing devices in the vicinity of explosives.	
	1.2 Unauthorized personnel entering site during operations	1.2.1 Establish and enforce EZ based on type of shot IAW DoD 6055.09M. 1.2.2 Maintain positive site control; cease operations if unauthorized entry is made. 1.2.3 Site control measures will be implemented (security boats enforcing EZ on approaching water vessels).	
	1.3. Uneven working surfaces – slip, trip, and fall hazards	1.3.1 Be observant while walking. Use sturdy protective work boots with composite toe, ankle support and non-slip soles 1.3.2 Wear leather or canvas work gloves.	
	1.4. Heat stress	1.4.1 Heat stress monitoring, drinking water, work-rest cycles, and cool shelter for breaks.	
	1.5 Biological hazards – hazardous plants, trees, insects, and spiders	1.5.1 Training in biological hazards avoidance. 1.5.2 Use barrier creams/insect repellents as necessary. 1.5.3 Wear cotton long or short sleeved shirt and long pants.	
	1.6 Sunburn	1.6.1 Wear cap and use sunscreen.	
2. . Identify item. Prepare shot. Make notifications of impending shot. Personnel performing disposal evacuate to fragmentation distance or to a shielded area. Observe area for potential unauthorized entrants.	2.1 Munitions and Explosives of Concern (MEC) hazards	2.1.1 On-site MEC training. 2.1.2 Identify and minimize all hazards and take proper safety precautions. 2.1.3 All work will be in compliance with the project ESS. 2.1.4 Keep personnel to a minimum during operations. 2.1.5 Use and enforce the buddy system.	M

Job Steps	Hazards	Controls	RAC
If any are observed, halt operation until they are removed.		2.1.6 Use engineering controls to reduce or eliminate fragmentation/overpressure hazards such as sandbags. 2.1.7 Be alert. Cease operations if unsafe conditions arise. 2.1.8 Observe all MEC safety precautions, such as movement, heat, shock, and friction, and follow safe work practices. 2.1.9 Do not handle MEC unnecessarily. 2.1.10 Only UXO qualified personnel will perform MEC disposal operations. 2.1.11 Observe safe work practices, operating precautions and instructions for equipment in use. 2.1.12 Controlled use of radios and cell phones 2.1.13 Use PPE IAW this AHA. 2.1.14 Ensure First Aid kits and fire extinguishers are in place. 2.1.15 No smoking, except in designated areas. 2.1.16 Do not allow smoking or flame producing devices in the vicinity of explosives.	
	2.2 Unauthorized personnel entering site during operations	2.2.1 Establish and enforce EZ based on type of shot IAW DoD 6055.09M. 2.2.2 Maintain positive site control; cease operations if unauthorized entry is made. 2.2.3 Site control measures will be implemented (security boats enforcing EZ on approaching water vessels).	
	2.3 Uneven working surfaces – slip, trip, and fall hazards	2.3.1 Be observant while walking. Use sturdy protective work boots with composite toe, ankle support and non-slip soles. 2.3.2 Wear leather or canvas work gloves.	
	2.4 Heat stress	2.4.1 Heat stress monitoring, drinking water, work-rest cycles, and cool shelter for breaks.	
	2.5 Biological hazards – hazardous plants, insects, spiders, snakes, and rodents	2.5.1 Training in biological hazards avoidance. 2.5.2 Use barrier creams/insect repellents as necessary. 2.5.3 Wear cotton long or short sleeved shirts and long pants.	

Job Steps	Hazards	Controls	RAC
	2.6 Sunburn	2.6.1 Wear cap and use sunscreen.	
3. Sound signal for impending shot. Perform disposal operation. Check to see that disposal operation was successful. If not successful, repeat disposal operation. Give signal that operation is complete.	3.1 Munitions and Explosives of Concern (MEC) hazards	3.1.1 On-site MEC training. 3.1.2 Identify and minimize all hazards and take proper safety precautions. 3.1.3 All work will be in compliance with the project ESS. 3.1.4 Keep personnel to a minimum during operations. 3.1.5 Use and enforce the buddy system. 3.1.6 Use engineering controls to reduce or eliminate fragmentation/overpressure hazards such as sandbags. 3.1.7 Be alert. Cease operations if unsafe conditions arise. 3.1.8 Observe all MEC safety precautions, such as movement, heat, shock, and friction, and follow safe work practices. 3.1.9 Do not handle MEC unnecessarily. 3.1.10 Only UXO qualified personnel will perform MEC disposal operations. 3.1.11 Observe safe work practices, operating precautions and instructions for equipment in use. 3.1.12 Controlled use of radios and cell phones 3.1.13 Use PPE IAW this AHA. 3.1.14 Ensure First Aid kits and fire extinguishers are in place. 3.1.15 No smoking, except in designated areas. 3.1.16 Do not allow smoking or flame producing devices in the vicinity of explosives.	M
	3.2 Unauthorized personnel entering site during operations	3.2.1 Establish and enforce EZ based on type of shot IAW DoD 6055.09M. 3.2.2 Maintain positive site control; cease operations if unauthorized entry is made. 3.2.3 Site control measures will be implemented (security boats enforcing EZ on approaching water vessels).	
	3.3 Uneven working surfaces – slip, trip, and fall hazards	3.3.1 Be observant while walking. Use sturdy protective work boots with composite toe, ankle support and non-slip soles. 3.3.2 Wear leather or canvas work gloves.	

Job Steps	Hazards	Controls	RAC
	3.4 Heat stress	3.4.1 Heat stress monitoring, drinking water, work-rest cycles, and cool shelter for breaks.	
	3.5 Biological hazards – hazardous plants, trees, insects, and spiders	3.5.1 Training in biological hazards avoidance. 3.5.2 Use barrier creams/insect repellents as necessary. 3.5.3 Wear cotton long or short sleeved shirt and long pants.	
	3.6 Noise	3.6.1 Use PPE IAW this AHA.	
	3.7 Sunburn	3.7.1 Wear cap and use sunscreen.	

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
• Sturdy protective work boots with composite toe, ankle support and non-slip soles • Appropriate Level D PPE to include: cotton long or short sleeved shirt and long pants, safety glasses with side shields or goggles, leather or canvas work gloves, hearing protection (NRR 30 or greater) and cap • Demolitions equipment • Explosives • Communications equipment • First Aid kit • Fire extinguishers • Wet Bulb Globe Temperature monitor	• PPE Training • UXO personnel will meet training and experience requirements outlined in DDESB TP 18 • Site-specific MEC training will be presented to all site personnel • Training in disposal operations for items expected to be encountered • Site-specific training on slip, trip, and fall hazards • Emergency response and notification procedures • All site personnel will have current HAZWOPER training • Heat stress symptoms and First Aid • Site-specific flora/fauna to include First Aid	• PPE inspected daily prior to use by the user with checks by the UXOSO. • UXOSO will ensure that all controls are being followed, all equipment is being correctly utilized, and all personnel have received appropriate training. • Equipment inspected daily prior to use by the user with checks by the UXOSO. • Communications equipment checked daily prior to use by the UXOSO. • First Aid kits checked daily and inspected weekly by the UXOSO. • Fire extinguishers checked daily and inspected weekly by the UXOSO.

Class Title: _____ Given by: _____ Date: _____

Printed Name	Signature	Date

Activity Hazard Analysis (AHA)

Activity/Work Task: MEC Investigation	Overall Risk Assessment Code (RAC) (Use highest code) **M**
Project Location: Cayo del Agua, Culebra Island, Puerto Rico	Risk Assessment Code (RAC) Matrix
Contract Number: W912DY-10-D-0026, TO No. 0027	
Date Prepared: 10 / 25 / 2016	
Prepared by (Name/Title): Cheryl M. Riordan, CSP	
Reviewed by (Name/Title): Robert Crownover, Director of Safety and Quality, USA Environmental, Inc.	
Notes: (Field Notes, Review Comments, etc.)	

Digitally signed by Robert D. Crownover
DN: cn=Robert D. Crownover, o=USA Environmental, Inc., ou=Director Safety and Quality, email=rcrownover@usatampa.com, c=US
Date: 2016.10.27 08:55:02 -04'00'

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
1. Reacquire selected anomalies from DGM dig sheet.	1.1 Munitions and Explosives of Concern (MEC) hazards	1.1.1 On-site MEC training. 1.1.2 Establish minimum separation distance between teams. 1.1.3 Identify and minimize all hazards and take proper safety precautions. 1.1.4 Daily UXO safety briefing prior to personnel entering EZ. 1.1.5 All work will be in compliance with the project ESS. 1.1.6 Observe all MEC safety precautions, such as movement, heat, shock, and friction, and follow safe work practices. 1.1.7 Keep personnel to a minimum during operations. 1.1.8 Use and enforce the buddy system. 1.1.9 Be alert. Cease operations if unsafe conditions arise. 1.1.10 Only qualified UXO Technicians may inspect/handle MEC/MPPEH. 1.1.11 Use Personal Protective Equipment (PPE) in accordance with (IAW) this AHA. 1.1.12 Ensure First Aid kits and fire extinguishers are in place.	L

Job Steps	Hazards	Controls	RAC
		1.1.13 No smoking, except in designated areas. 1.1.14 Do not allow smoking or flame producing devices in the vicinity of MEC.	
	1.2 Unauthorized personnel entering site during operations	1.2.1 Establish and enforce Exclusion Zone (EZ). 1.2.2 Maintain positive site control; cease operations if unauthorized entry is made. 1.2.3 Site control measures will be implemented (security boats enforcing EZ on approaching water vessels).	
	1.3. Uneven working surfaces – slip, trip, and fall hazards	1.3.1 Be observant while walking. Use sturdy protective work boots with composite toe, ankle support and non-slip soles. 1.3.2 Wear leather or canvas work gloves.	
	1.4. Heat stress	1.4.1 Heat stress monitoring, drinking water, work-rest cycles, and cool shelter for breaks.	
	1.5 Biological hazards – hazardous plants, trees, insects, and spiders	1.5.1 Training in biological hazards avoidance. 1.5.2 Use barrier creams/insect repellents as necessary. 1.5.3 Wear cotton long or short sleeved shirts and long pants	
	1.6 Muscle strain carrying/using instruments	1.6.1 Follow appropriate lifting/carrying procedures: lift with legs and not with back, use gloves and ensure a good grip, and avoid twisting the back when lifting/carrying, never lift more than you can safety handle and ask for assistance on large/heavy lifts.	
	1.7 Sunburn	1.7.1 Wear cap and use sunscreen.	
2. Carefully dig up MEC using hand tools and identify its type and condition.	2.1 MEC Hazards	2.1.1 On-site MEC training. 2.1.2 Establish minimum separation distance between teams. 2.1.3 Identify and minimize all hazards and take proper safety precautions. 2.1.4 Daily UXO safety briefing prior to personnel entering EZ. 2.1.5 All work will be in compliance with the project ESS. 2.1.6 Observe all MEC safety precautions, such as movement, heat, shock, and friction, and follow safe work practices. 2.1.7 Keep personnel to a minimum during operations. 2.1.8 Use and enforce the buddy system.	M

Job Steps	Hazards	Controls	RAC
		2.1.9 Be alert. Cease operations if unsafe conditions arise. 2.1.10 Do not handle MEC unnecessarily. 2.1.11 Only qualified UXO Technicians will identify/handle MEC. 2.1.12 Use PPE IAW this AHA. 2.1.13 Ensure First Aid kits and Fire Extinguishers are in place. 2.1.14 No smoking, except in designated areas. 2.1.15 Do not allow smoking or flame producing devices in the vicinity of MEC.	
	2.2 Unauthorized personnel entering site during operations	2.2.1 Establish and enforce Exclusion Zone (EZ). 2.2.2 Maintain positive site control; cease operations if unauthorized entry is made. 2.2.3 Site control measures will be implemented (security boats enforcing EZ on approaching water vessels).	
	2.3 Uneven working surfaces – slip, trip, and fall hazards	2.3.1 Be observant while walking. Use sturdy protective work boots with composite toe, ankle support and non-slip soles. 2.3.2 Wear leather or canvas work gloves.	
	2.4 Heat stress	2.4.1 Heat stress monitoring, drinking water, work-rest cycles, and cool shelter for breaks.	
	2.5 Biological hazards – hazardous plants, trees, insects, and spiders	2.5.1 Training in biological hazards avoidance. 2.5.2 Use barrier creams/insect repellents as necessary. 2.5.3 Wear cotton long or short sleeved shirts and long pants.	
	2.6 Muscle strain carrying/using instruments and tools	2.6.1 Follow appropriate lifting/carrying procedures: lift with legs and not with back, use gloves and ensure a good grip, and avoid twisting the back when lifting/carrying, never lift more than you can safety handle and ask for assistance on large/heavy lifts. 2.6.2 Tools and equipment will be used in the manner for which it was designed to be used	
	2.7 Sunburn	2.7.1 Wear cap and use sunscreen.	

Job Steps	Hazards	Controls	RAC
3. MPPEH will be inspected by two UXO Technicians, and MDAS will be removed and placed in a secured container for storage until the end of the project, when it will be shipped to a qualified recycler, per AHA for Inspection and Certification of MPPEH.	3.1 IAW AHA for MPPEH Inspection and Certification	3.1.1 IAW AHA for MPPEH Inspection and Certification	L
4. UXO Technicians will perform MEC disposal operations on MEC that is encountered, in accordance with AHA for MEC Disposal Operations.	4.1 IAW AHA for MEC Disposal	4.1.1 IAW AHA for MEC Disposal	M

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
• Sturdy protective work boots with composite toe, ankle support and non-slip soles. • Appropriate cotton clothing (long or short sleeved shirt and long pants) and PPE to include safety glasses with side shields or goggles, leather or canvas work gloves and cap. • Geophysical equipment • DGM dig sheet • Hand tools (shovels) • Communications equipment • First Aid kit • Fire extinguishers • Wet Bulb Globe Temperature monitor as necessary	• PPE Training • UXO personnel will meet training and experience requirements outlined in DDESB TP 18 • Site-specific MEC training will be presented to all site personnel • Safe work practices and precautions associated with task being performed • Site-specific training on slip, trip, and fall hazards • Hearing protection program training • Site-specific training/lifting techniques • Equipment familiarity training • Emergency response and notification procedures • All site personnel will have current HAZWOPER training • Heat stress symptoms and First Aid • Site specific training on flora/fauna including First Aid	• PPE inspected daily prior to use by the user with checks by the UXOSO. • UXOSO will ensure that all controls are being followed, all equipment is being correctly utilized, and all personnel have received appropriate training. • Equipment inspected daily prior to use by the user with checks by the UXOSO. • Geophysical equipment check daily at IVS by the user prior to operation, with additional checks by the UXOQCS. • Communications equipment checked daily prior to use by the UXOSO. • First Aid kits checked daily and inspected weekly by the UXOSO. • Fire extinguishers checked daily and inspected weekly by the UXOSO.

Class Title: _____ Given by: _____ Date: _____

Printed Name	Signature	Date

Activity Hazard Analysis (AHA)

Activity/Work Task: MPPEH Inspection and Certification	Overall Risk Assessment Code (RAC) (Use highest code) **L**
Project Location: Cayo del Agua, Culebra Island, Puerto Rico	Risk Assessment Code (RAC) Matrix
Contract Number: W912DY-10-D-0026, TO No. 0027	
Date Prepared: 10 / 25 / 2016	
Prepared by (Name/Title): Cheryl M. Riordan, CSP	
Reviewed by (Name/Title): Robert Crownover, Director of Safety and Quality, USA Environmental, Inc.	Digitally signed by Robert D. Crownover DN: cn=Robert D. Crownover, o=USA Environmental, Inc., ou=Director Safety and Quality, email=rcrownover@usatampa.com, c=US Date: 2016.10.27 08:55:38 -04'00'
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
1. When material potentially presenting an explosives hazard (MPPEH) is encountered, two qualified UXO Technicians will inspect it and re-inspect it to verify that it is material documented as safe (MDAS).	1.1 Munitions and Explosives of Concern (MEC) hazards	1.1.1 On-site MEC training. 1.1.2 Identify and minimize all hazards and take proper safety precautions. 1.1.3 Daily UXO safety briefing prior to personnel entering EZ. 1.1.4 Observe all MEC safety precautions, such as movement, heat, shock, and friction, and follow safe work practices. 1.1.5 Keep personnel to a minimum during operations. 1.1.6 Use and enforce the buddy system. 1.1.7 Be alert. Cease operations if unsafe conditions arise. 1.1.8 Do not handle MEC unnecessarily. 1.1.9 Only qualified UXO Technicians will identify/handle MEC. 1.1.10 Use Personal Protective Equipment (PPE) in accordance with (IAW) this AHA. 1.1.11 Ensure First Aid kits and fire extinguishers are in place. 1.1.12 No smoking, except in designated areas. 1.1.13 Do not allow smoking or flame producing devices in the vicinity of MEC.	L

Job Steps	Hazards	Controls	RAC
	1.2 Unauthorized personnel entering site during operations	1.2.1 Establish and enforce Exclusion Zone (EZ). 1.2.2 Maintain positive site control; cease operations if unauthorized entry is made. 1.2.3 Site control measures will be implemented (security boats enforcing EZ on approaching water vessels).	
	1.3. Uneven working surfaces – slip, trip, and fall hazards	1.3.1 Be observant while walking. Use sturdy protective work boots with composite toe, ankle support and non-slip soles. 1.3.2 Wear leather or canvas work gloves.	
	1.4. Heat stress	1.4.1 Heat stress monitoring, drinking water, work-rest cycles, and cool shelter for breaks.	
	1.5 Biological hazards – hazardous plants, trees, insects, and spiders	1.5.1 Training in biological hazards avoidance. 1.5.2 Use barrier creams/insect repellents as necessary. 1.5.3 Wear cotton shirts and long pants	
	1.6 Cuts and abrasions from handling MPPEH/MDAS	1.6.1 Use PPE IAW this AHA.	
	1.7 Sunburn	1.7.1 Wear cap and use sunscreen.	
2. MDAS will be placed in secured bins at the approved MDAS holding area until the completion of site operations. The bins will remain secured to prevent intermingling of MDAS and MEC. Bins will be periodically inspected to assure procedures are followed and no MEC is intermingled with MDAS. At the end of site operations, bins will be sent to a qualified recycling facility for processing/disposal.	2.1 Unauthorized personnel entering site during operations	2.1.1 Establish and control work zone. 2.1.2 Maintain positive site control; cease operations if unauthorized entry is made. 2.1.3 Site control measures will be implemented (security boats enforcing EZ on approaching water vessels).	L
	2.2 Uneven working surfaces – slip, trip, and fall hazards	2.2.1 Be observant while walking. Use sturdy protective work boots with composite toe, ankle support and non-slip soles. 2.2.2 Wear leather or canvas work gloves.	
	2.3 Heat stress	2.3.1 Heat stress monitoring, drinking water, work-rest cycles, and cool shelter for breaks.	
	2.4 Biological hazards – hazardous plants, trees, insects, and	2.4.1 Training in biological hazards avoidance. 2.4.2 Use barrier creams/insect repellents as necessary. 2.4.3 Wear cotton shirts and long pants.	

Job Steps	Hazards	Controls	RAC
	2.5 Cuts and abrasions from handling MDAS	2.5.1 Use PPE IAW this AHA.	
	2.6 Sunburn	2.6.1 Wear cap and use sunscreen.	
3. MEC/MDEH will undergo a disposal operation IAW the AHA for MEC Disposal.	3.1 IAW AHA for MEC Disposal	3.1.1 IAW AHA for MEC Disposal	

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
• Sturdy protective work boots with composite toe, ankle support and non-slip soles. • Appropriate cotton clothing (long or short sleeved shirt and long pants) and PPE to include safety glasses with side shields or goggles, leather or canvas work gloves and cap • MDAS bin(s), securable • Hand tools • Communications equipment • First Aid kit • Fire extinguishers • Wet Bulb Globe Temperature monitor as necessary	• PPE Training • UXO personnel will meet training and experience requirements outlined in DDESB TP 18 • Site-specific MEC training will be presented to all site personnel • Site-specific training on slip, trip, and fall hazards • Equipment familiarity training • Requirements under DoD 4160.21-M • Required documents for inspection, certification, and verification of MPPEH related scrap • Emergency response and notification procedures • All site personnel will have current HAZWOPER training • Heat stress symptoms and First Aid • Site specific training on flora/fauna including First Aid	• PPE inspected daily prior to use by the user with checks by the UXOSO. • UXOSO will ensure that all controls are being followed, all equipment is being correctly utilized, and all personnel have received appropriate training. • Equipment inspected daily prior to use by the user with checks by the UXOSO. • Serviceability inspection of containers by UXOQCS. • Daily check for security of scrap to prevent MEC intermingling with inspected scrap by UXOQCS. • Communications equipment checked daily prior to use by the UXOSO. • First Aid kits checked daily and inspected weekly by the UXOSO. • Fire extinguishers checked daily and inspected weekly by the UXOSO.

Class Title: _____ Given by: _____ Date: _____

Printed Name	Signature	Date

Activity Hazard Analysis (AHA)

Activity/Work Task: Quality Control	Overall Risk Assessment Code (RAC) (Use highest code) **L**
Project Location: Cayo del Agua, Culebra Island, Puerto Rico	Risk Assessment Code (RAC) Matrix
Contract Number: W912DY-10-D-0026, TO No. 0027	
Date Prepared: 10 / 25 / 2016	
Prepared by (Name/Title): Cheryl M. Riordan, CSP Corporate Health and Safety Manager	
Reviewed by (Name/Title): Robert Crownover Director of Safety and Quality USA Environmental, Inc. Digitally signed by Robert D. Crownover DN: cn=Robert D. Crownover, o=USA Environmental, Inc., ou=Director Safety and Quality, email=rcrownover@usatampa.com, c=US Date: 2016.10.27 08:55:56 -04'00'	
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
1. Inspection of project documentation, site conditions, work performance and operations.	1.1 Munitions and Explosives of Concern (MEC) hazards	1.1.1 On-site MEC training. 1.1.2 Establish minimum separation distance between teams. 1.1.3 Identify and minimize all hazards and take proper safety precautions. 1.1.4 Daily UXO safety briefing prior to personnel entering EZ. 1.1.5 All work will be in compliance with the project ESS. 1.1.6 Observe all MEC safety precautions, such as movement, heat, shock, and friction, and follow safe work practices. 1.1.7 Keep personnel to a minimum during operations. 1.1.8 Use and enforce the buddy system. 1.1.9 Be alert. Cease operations if unsafe conditions arise. 1.1.10 Only qualified UXO Technicians may perform MEC operations. 1.1.11 Only UXO qualified personnel will escort non-UXO personnel. 1.1.12 Inspection of MEC will be made by UXO qualified personnel.	L

Job Steps	Hazards	Controls	RAC
		1.1.13 Use Personal Protective Equipment (PPE) in accordance with (IAW) this AHA. 1.1.14 Ensure First Aid kits and fire extinguishers are in place. 1.1.15 No smoking, except in designated areas. 1.1.16 Do not allow smoking or flame producing devices in the vicinity of MEC. 1.1.17 Use Personal Protective Equipment (PPE) in accordance with (IAW) this AHA. 1.1.18 Ensure First Aid kits and fire extinguishers are in place. 1.1.19 No smoking, except in designated areas. 1.1.20 Do not allow smoking or flame producing devices in the vicinity of MEC.	
	1.2 Unauthorized personnel entering site during operations	1.2.1 Establish and enforce Exclusion Zone (EZ). 1.2.2 Maintain positive site control; cease operations if unauthorized entry is made. 1.2.3 Site control measures will be implemented (security boats enforcing EZ on approaching water vessels).	
	1.3. Uneven working surfaces – slip, trip, and fall hazards	1.3.1 Be observant while walking. Use sturdy protective work boots with composite toe, ankle support and non-slip soles. 1.3.2 Wear leather or canvas work gloves.	
	1.4 Heat stress	1.4.1 Heat stress monitoring, drinking water, work-rest cycles, and cool shelter for breaks.	
	1.5 Biological hazards – hazardous plants, trees, insects, and spiders	1.5.1 Training in biological hazards avoidance. 1.5.2 Use barrier creams/insect repellents as necessary. 1.5.3 Wear cotton long or short sleeved shirt and long pants.	
	1.6 Muscle strain carrying instruments/equipment	1.6.1 Follow appropriate lifting/carrying procedures: lift with legs and not with back, use gloves and ensure a good grip, and avoid twisting the back when lifting/carrying, never lift more than you can safety handle and ask for assistance on large/heavy lifts.	
	1.7 Noise	1.7.1 Use hearing protection when working around vegetation clearance or other operations with noise levels at or above 85dBA.	

Job Steps	Hazards	Controls	RAC
	1.8 Sunburn	1.8.1 Wear cap and use sunscreen.	
2. Inspection of material and packaging of containers.	2.1 Uneven working surfaces – slip, trip, and fall hazards	2.1.1 Be observant while walking. Use sturdy protective work boots with composite toe, ankle support and non-slip soles. 2.1.2 Wear leather or canvas work gloves.	L
	2.2 Heat stress	2.2.1 Heat stress monitoring, drinking water, work-rest cycles, and cool shelter for breaks.	
	2.3 Biological hazards – hazardous plants, trees, insects, and spiders	2.3.1 Training in biological hazards avoidance. 2.3.2 Use barrier creams/insect repellents as necessary. 2.3.3 Wear cotton long or short sleeved shirt and long pants.	
	2.4 Muscle strain carrying instruments/equipment	2.4.1 Follow appropriate lifting/carrying procedures: lift with legs and not with back, use gloves and ensure a good grip, and avoid twisting the back when lifting/carrying, never lift more than you can safety handle and ask for assistance on large/heavy lifts.	
	2.5 Sunburn	2.5.1 Wear cap and use sunscreen.	
3. Inspection of Completed Project Documentation	3.1 Uneven working surfaces – slip, trip, and fall hazards	3.1.1 Be observant while walking. Use sturdy protective work boots with composite toe, ankle support and non-slip soles. 3.1.2 Wear leather or canvas work gloves.	L
	3.2 Heat stress	3.2.1 Heat stress monitoring, drinking water, work-rest cycles, and cool shelter for breaks.	
	3.3 Biological hazards – hazardous plants, trees, insects, and spiders	3.3.1 Training in biological hazards avoidance. 3.3.2 Use barrier creams/insect repellents as necessary. 3.3.3 Wear cotton long or short sleeved shirt and long pants.	
	3.4 Sunburn	3.4.1 Wear cap and use sunscreen.	

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
• Sturdy protective work boots with composite toe, ankle support and non-slip soles • Appropriate clothing and PPE to include: cotton long or short sleeved shirt and long pants, safety glasses with side shields or goggles, leather or canvas work gloves and cap • Appropriate geophysical equipment • Communications equipment • First Aid kit • Fire extinguishers • Wet Bulb Globe Temperature monitor as necessary	• PPE Training • 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 • Safe work practices and precautions associated with task being performed • Site-specific training on slip, trip, and fall hazards • Training in lifting/carrying techniques • Emergency response and notification procedures • All site personnel will have current HAZWOPER training • Heat stress symptoms and First Aid • Site-specific flora/fauna to include first aid	• PPE inspected daily prior to use by the user with checks by the UXOSO. • UXOSO will ensure that all controls are being followed, all equipment is being correctly utilized, and all personnel have received appropriate training. • Equipment inspected daily prior to use by the user with checks by the UXOSO. • Geophysical equipment check daily at IVS by the user prior to operation, with additional checks by the UXOQCS. • Communications equipment checked daily prior to use by the UXOSO. • First Aid kits checked daily and inspected weekly by the UXOSO. • Fire extinguishers checked daily and inspected weekly by the UXOSO.

Class Title: _____ Given by: _____ Date: _____

Printed Name	Signature	Date

Activity Hazard Analysis (AHA)

Activity/Work Task: Soil Sampling	Overall Risk Assessment Code (RAC) (Use highest code) **L**
Project Location: Cayo del Agua, Culebra Island, Puerto Rico	Risk Assessment Code (RAC) Matrix
Contract Number: W912DY-10-D-0026, TO No. 0027	
Date Prepared: 10 / 25 / 2016	
Prepared by (Name/Title): Cheryl M. Riordan, CSP Corporate Health and Safety Manager	
Reviewed by (Name/Title): Robert Crownover Director of Safety and Quality USA Environmental, Inc.	Digitally signed by Robert D. Crownover DN: cn=Robert D. Crownover, o=USA Environmental, Inc., ou=Director Safety and Quality, email=rcrownover@usatampa.com, c=US Date: 2016.10.27 08:56:16 -04'00'
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
1. UXO Technician will accompany sampling team to site, and lead sampling team to area where sampling is to occur. UXO Technician will clear the path of entry to the sampling site, and if MEC is encountered, path will be routed around it. If MEC is encountered, the area will be marked for later disposal.	1.1 Munitions and Explosives of Concern (MEC) hazards	1.1.1 On-site MEC training. 1.1.2 Identify and minimize all hazards and take proper safety precautions. 1.1.3 Keep personnel to a minimum during operations. 1.1.4 Use and enforce the buddy system. 1.1.5 Establish minimum separation distance between teams. 1.1.6 This is a MEC avoidance operation. MEC will not be moved or handled in any way. If MEC is encountered, path will be routed around it. 1.1.7 Be alert. Cease operations if unsafe conditions arise. 1.1.8 Use Personal Protective Equipment (PPE) in accordance with (IAW) this AHA. 1.1.9 Ensure First Aid kits and fire extinguishers are in place. 1.1.10 No smoking, except in designated areas. 1.1.11 Do not allow smoking or flame producing devices in the vicinity of MEC.	L

Job Steps	Hazards	Controls	RAC
	1.2. Uneven working surfaces – slip, trip, and fall hazards	1.2.1 Be observant while walking. Use sturdy protective work boots with composite toe, ankle support and non-slip soles. 1.2.2 Wear leather or canvas work gloves.	
	1.3. Heat stress	1.3.1 Heat stress monitoring, drinking water, work-rest cycles, and cool shelter for breaks.	
	1.4 Biological hazards – hazardous plants, trees, insects, and spiders	1.4.1 Training in biological hazards avoidance. 1.4.2 Use barrier creams/insect repellents as necessary. 1.4.3 Wear cotton coveralls or long sleeved shirt and long pants.	
	1.5 Sunburn	1.5.1 Wear cap and use sunscreen.	
2. After a MEC disposal operation is conducted, post detonation soil sampling will take place. Prior to the sampling team performing soil sampling, the UXO Technician, using geophysical equipment, will determine if there are anomalies beneath the ground surface. If anomalies are present beneath the ground surface, the sampling team will exit the area as the MEC team clears any subsurface anomalies. The soil sampling team will return to collect soil samples after the sampling area has been cleared of anomalies.	2.1 MEC hazards	2.1.1 On-site MEC training. 2.1.2 Identify and minimize all hazards and take proper safety precautions. 2.1.3 Keep personnel to a minimum during operations. 2.1.4 Use and enforce the buddy system. 2.1.5 Establish minimum separation distance between teams. 2.1.6 This is a MEC avoidance operation. MEC will not be moved or handled in any way. If MEC is encountered, path will be routed around it. 2.1.7 Be alert. Cease operations if unsafe conditions arise. 2.1.8 Use PPE IAW this AHA. 2.1.9 Ensure First Aid kits and fire extinguishers are in place. 2.1.10 No smoking, except in designated areas. 2.1.11 Do not allow smoking or flame producing devices in the vicinity of MEC.	L
	2.2 Uneven working surfaces – slip, trip, and fall hazards	2.2.1 Be observant while walking. Use sturdy protective work boots with composite toe, ankle support and non-slip soles. 2.2.2 Wear leather or canvas work gloves.	
	2.3 Heat stress	2.3.1 Heat stress monitoring, drinking water, work-rest cycles, and cool shelter for breaks.	

Job Steps	Hazards	Controls	RAC
	2.4 Biological hazards – hazardous plants, trees, insects, and spiders	2.4.1 Training in biological hazards avoidance. 2.4.2 Use barrier creams/insect repellents as necessary. 2.4.3 Wear cotton coveralls or long sleeved shirt and long pants.	
	2.5 Muscle strain carrying and using instruments and shovels	2.5.1 Follow appropriate lifting/carrying procedures: lift with legs and not with back, use gloves and ensure a good grip, and avoid twisting the back when lifting/carrying, never lift more than you can safety handle and ask for assistance on large/heavy lifts. 2.5.2 Tools and equipment will be used in the manner for which it was designed to be used	
	2.6 Sunburn	2.6.1 Wear cap and use sunscreen.	
3. Soil samples are collected in accordance with EPA requirements, with clean, stainless steel implements; labeled as to sample number, location, date, time and person taking sample; and the samples will be sent to a certified laboratory for analysis.	3.1 Uneven working surfaces – slip, trip, and fall hazards	3.1.1 Be observant while walking. Use sturdy protective work boots with composite toe, ankle support and non-slip soles. 3.1.2 Wear leather or canvas work gloves.	L
	3.2 Heat stress	3.2.1 Heat stress monitoring, drinking water, work-rest cycles, and cool shelter for breaks.	
	3.3 Biological hazards – hazardous plants, trees, insects, and spiders	3.3.1 Training in biological hazards avoidance. 3.3.2 Use barrier creams/insect repellents as necessary. 3.3.3 Wear cotton coveralls or long sleeved shirt and long pants.	
	3.4 Muscle strain carrying and using instruments and shovels	3.4.1 Follow appropriate lifting/carrying procedures: lift with legs and not with back, use gloves and ensure a good grip, and avoid twisting the back when lifting/carrying, never lift more than you can safety handle and ask for assistance on large/heavy lifts. 3.4.2 Tools and equipment will be used in the manner for which it was designed to be used	
	3.5 Sunburn	3.5.1 Wear cap and use sunscreen.	

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
• Sturdy protective work boots with composite toe, ankle support and non-slip soles. • Appropriate clothing and PPE to include: cotton long or short sleeved shirt and long pants, safety glasses with side shields or goggles, leather or canvas work gloves and cap • Geophysical equipment • Sampling equipment • Labels • Communications equipment • First Aid kit • Fire extinguishers • Wet Bulb Globe Temperature monitor as necessary	• PPE Training • 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 • Safe work practices and precautions associated with task being performed • Site-specific training on slip, trip, and fall hazards • Training in lifting/carrying techniques • Emergency response and notification procedures • All site personnel will have current HAZWOPER training • Heat stress symptoms and First Aid • Site-specific flora/fauna to include First Aid	• PPE inspected daily prior to use by the user with checks by the UXOSO. • UXOSO will ensure that all controls are being followed, all equipment is being correctly utilized, and all personnel have received appropriate training. • Equipment inspected daily prior to use by the user with checks by the UXOSO. • Geophysical equipment check daily at IVS by the user prior to operation, with additional checks by the UXOQCS. • Communications equipment checked daily prior to use by the UXOSO. • First Aid kits checked daily and inspected weekly by the UXOSO. • Fire extinguishers checked daily and inspected weekly by the UXOSO.

Class Title: _____ Given by: _____ Date: _____

Printed Name	Signature	Date

Activity Hazard Analysis (AHA)

Activity/Work Task: Transportation of Explosives via Vessel	Overall Risk Assessment Code (RAC) (Use highest code) **M**
Project Location: Cayo del Agua, Culebra Island, Puerto Rico	Risk Assessment Code (RAC) Matrix
Contract Number: W912DY-10-D-0026, TO No. 0027	
Date Prepared: 10 / 25 / 2016	
Prepared by (Name/Title): Cheryl M. Riordan, CSP	
Reviewed by (Name/Title): Robert Crownover, Director of Safety and Quality, USA Environmental, Inc.	
Notes: (Field Notes, Review Comments, etc.)	

Digitally signed by Robert D. Crownover
DN: cn=Robert D. Crownover, o=USA Environmental, Inc., ou=Director Safety and Quality, email=rcrownover@usatampa.com, c=US
Date: 2016.10.27 08:56:34 -04'00'

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
1. Load containers of explosives onto the vessel and store/stow the containers in a secure manner to prevent movement during transport.	1.1 MEC hazards	1.1.1 On-site MEC training. 1.1.2 Identify and minimize all hazards and take proper safety precautions. 1.1.3 Only the amount of explosives needed for that day's operations will be transported to the site. 1.1.4 Ensure explosive materials are properly packaged for transport in secured IME-22 containers during storage and movement. The locked container will require two keys, kept by the SUXOS and UXOQCS. 1.1.5 All IME-22 containers will be inspected every 24 hours while on board and after heavy seas for damage to container, locks or securing means. 1.1.6 Observe all MEC safety precautions, such as movement, heat, shock, and friction, and follow safe work practices. 1.1.7 Do not handle MEC unnecessarily. 1.1.8 Be alert. Cease operations if unsafe conditions arise.	M

Job Steps	Hazards	Controls	RAC
		1.1.9 Only UXO qualified personnel will package, load and stow explosive materials. 1.1.10 Ensure flammable/combustible materials are not stored in the vicinity of explosive materials. 1.1.11 No smoking or ignition sources will be permitted in the presence of explosive cargo. 1.1.12 Controlled use of radios and cell phones. 1.1.13 SUXOS will be the responsible person. 1.1.14 Use Personal Protective Equipment (PPE) in accordance with (IAW) this AHA. 1.1.15 Ensure First Aid kits and fire extinguishers are in close proximity to explosives container. There must be two 30B:C dry chemical or foam filled fire extinguishers 1.1.16 Ensure placards are in place on explosive containers. 1.1.17 Ensure vessel meets all requirements for transport of explosives and all required permits for use, transportation and storage of explosives are in place. 1.1.18 An emergency notification list will be kept on the vessel and inside the container door. 1.1.19 Explosive compatibility will be maintained.	
	1.2 Weather hazards	1.2.1 Use weather radio to detect oncoming storms and boat will evacuate the area when squalls or thunderstorms are approaching. 1.2.2 Maintain good emergency communications system. There should be two forms of communication and extra batteries on hand. 1.2.3 Directions for contacting the U.S. Coast Guard (USCG) and hospital will be posted with each radio and cell phone. 1.2.4 Explosives will not be transported if severe weather or heavy seas are anticipated.	
	1.3 Boat hazards	1.3.1 Boat Operator will assure that the boat is well maintained and in good condition IAW requirements of DOT (49 CFR) and US Coast Guard standards (33 and 46 CFR) prior to taking on explosive cargo. 1.3.2 Experienced crew will inspect boat on a daily basis to ensure a safe operating vessel. Conduct proper repairs or replacement of parts as necessary to maintain safe vessel operation. 1.3.3 A USCG licensed Captain will operate the vessel. 1.3.4 Boat Captain will file afloat plan prior to departing from the	

Job Steps	Hazards	Controls	RAC
		dock. 1.3.5 Personnel will attend daily safety briefing by Captain prior to transport by boat, and will obey all directions from the Captain during transport. 1.3.6 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. 1.3.7 Directions for contacting the USCG and hospital will be posted with each radio and cell phone 1.3.8 Vessel is in a non-passenger mode of operation. All authorized personnel on board will wear personal flotation device at all times while boat is in operation and when experiencing inclement weather. 1.3.9 Boat will be equipped with rescue equipment to handle a man overboard situation (life ring with rope, or similar equipment) and personnel trained in its use 1.3.10 Be alert. Cease operations if unsafe conditions arise. 1.3.11 Use Personal Protective Equipment (PPE) in accordance with (IAW) this AHA. 1.3.12 No other cargo will be transported while explosive cargo is on board.	
	1.4 Fire hazards	1.4.1 Ensure First Aid kits and two 30B:C fire extinguishers are in close proximity to explosives container. 1.4.2 All personnel will be trained in the use of fire extinguishers. 1.4.3 No smoking, except in designated areas.	
	1.5. Slip, trip, and fall hazards	1.5.1 Be observant while walking. Use sturdy protective work boots with composite toe, ankle support and non-slip soles. Avoid wet or potentially slippery locations on boat. 1.5.2 Wear leather or canvas work gloves when loading and offloading vessel.	
	1.6. Heat stress	1.6.1 Heat stress monitoring, drinking water, work-rest cycles, and cool shelter for breaks.	
	1.7 Biological hazards – insects and spiders	1.7.1 Training in biological hazards avoidance. 1.7.2 Use insect repellents as necessary. 1.7.3 Wear long or short sleeved shirts and long pants	

Job Steps	Hazards	Controls	RAC
	1.8 Muscle strain in loading cargo	1.8.1 Follow appropriate lifting/carrying procedures: lift with legs and not with back, use gloves and ensure a good grip, and avoid twisting the back when lifting/carrying, never lift more than you can safety handle and ask for assistance on large/heavy lifts. 1.8.2 Block, brace, and secure cargo from movement during transportation. 1.8.3 Good housekeeping standards will be enforced. Cargo will be properly staged on the boat to prevent tripping hazards.	
	1.9 Sunburn	1.9.1 Wear cap and use sunscreen.	
2. Captain will operate boat to transport explosives cargo to desired destination at Cayo Botella. Explosive cargo will be removed from the vessel and transported in day boxes by two qualified UXO Technicians to the MEC disposal site for use.	2.1 MEC hazards	2.1.1 On-site MEC training. 2.1.2 Identify and minimize all hazards and take proper safety precautions. 2.1.3 Only the amount of explosives needed for that day's operations will be transported to the site. 2.1.4 Ensure explosive materials are properly packaged for transport in secured IME-22 containers during storage and movement. The locked container will require two keys, kept by the SUXOS and UXOQCS. 2.1.5 All IME-22 containers will be inspected every 24 hours while on board and after heavy seas for damage to container, locks or securing means. 2.1.6 Observe all MEC safety precautions, such as movement, heat, shock, and friction, and follow safe work practices. 2.1.7 Do not handle MEC unnecessarily. 2.1.8 Be alert. Cease operations if unsafe conditions arise. 2.1.9 Only UXO qualified personnel will package, load and stow explosive materials. 2.1.10 Ensure flammable/combustible materials are not stored in the vicinity of explosive materials. 2.1.11 No smoking or ignition sources will be permitted in the presence of explosive cargo. 2.1.12 Controlled use of radios and cell phones. 2.1.13 SUXOS will be the responsible person. 2.1.14 Use Personal Protective Equipment (PPE) in accordance with (IAW) this AHA. 2.1.15 Ensure First Aid kits and fire extinguishers are in close proximity to explosives container. There must be two 30B:C dry	L

Job Steps	Hazards	Controls	RAC
		chemical or foam filled fire extinguishers 2.1.16 Ensure placards are in place on explosive containers. 2.1.17 Ensure vessel meets all requirements for transport of explosives and all required permits for use, transportation and storage of explosives are in place. 2.1.18 An emergency notification list will be kept on the vessel and inside the container door. 2.1.19 Explosive compatibility will be maintained. 2.1.20 Day boxes will be properly placarded. 2.1.21 Explosives remaining on the vessel will be observed and secured by a UXO Technician II or above, without access to container keys. 2.1.22 Loading and unloading explosives from the vessel will be under the supervision of a competent vessel crew member and a responsible UXO Technician. 2.1.23 Communications between the demolition operations personnel and the vessel UXO Technician will be in place prior to explosives leaving the vessel. 2.1.24 Explosives not used that day will be returned to the USA Magazine at Flamenco Camp Ground.	
	2.2 Weather hazards	2.2.1 Using a weather channel on vessels VHF, local weather will be monitored and boat operations will be delayed or vessel will avoid approaching storms as practical. Vessel will not be operated in unsafe sea conditions for the vessel used 2.2.2 Maintain good emergency communications system. There should be two forms of communication and extra batteries on hand. 2.2.3 Directions for contacting the U.S. Coast Guard (USCG) and hospital will be posted with each radio and cell phone. 2.2.4 Explosives will not be transported if severe weather or heavy seas are anticipated.	
	2.3 Boat hazards	2.3.1 Boat Operator will assure that the boat is well maintained and in good condition IAW requirements of DOT (49 CFR) and US Coast Guard standards (33 and 46 CFR) prior to taking on explosive cargo. 2.3.2 Experienced crew will inspect boat on a daily basis to ensure a safe operating vessel. Conduct proper repairs or replacement of parts as necessary to maintain safe vessel operation.	

Job Steps	Hazards	Controls	RAC
		2.3.3 A USCG licensed Captain will operate the vessel. 2.3.4 Boat Captain will file afloat plan prior to departing from the dock. 2.3.5 Personnel will attend daily safety briefing by Captain prior to transport by boat, and will obey all directions from the Captain during transport. 2.3.6 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. 2.3.7 Directions for contacting the USCG and hospital will be posted with each radio and cell phone 2.3.8 Vessel is in a non-passenger mode of operation. All authorized personnel on board will wear personal flotation device at all times while boat is in operation and when experiencing inclement weather. 2.3.9 Boat will be equipped with rescue equipment to handle a man overboard situation (life ring with rope, or similar equipment) and personnel trained in its use 2.3.10 Be alert. Cease operations if unsafe conditions arise. 2.3.11 Use PPE IAW this AHA. 2.3.12 No other cargo will be transported while explosive cargo is on board.	
	2.4 Fire hazards	2.4.1 Ensure First Aid kits and two 30B:C fire extinguishers are in close proximity to explosives container. 2.4.2 All personnel will be trained in the use of fire extinguishers. 2.4.3 No smoking, except in designated areas..	
	2.5. Slip, trip, and fall hazards	2.5.1 Be observant while walking. Use sturdy protective work boots with composite toe, ankle support and non-slip soles. Avoid wet or potentially slippery locations on boat. 2.5.2 Wear leather or canvas work gloves when loading and offloading vessel.	
	2.6 Heat stress	2.6.1 Heat stress monitoring, drinking water, work-rest cycles, and cool shelter for breaks.	

Job Steps	Hazards	Controls	RAC
	2.7 Biological hazards – insects and spiders	2.7.1 Training in biological hazards avoidance. 2.7.2 Use insect repellents as necessary. 2.7.3 Wear long or short sleeved shirts and long pants.	
	2.8 Sunburn	2.8.1 Wear cap and use sunscreen.	

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
• Sturdy protective work boots with composite toe, ankle support and non-slip soles. • Appropriate clothing and PPE to include: cotton long or short sleeved shirt and long pants, personal flotation device, safety glasses with side shields or goggles, leather or canvas work gloves and cap. Hearing protection (NRR 30 or greater, as required due to noise of boat engine). • Boat • Ring buoy with rope or suitable alternative • Storm monitor • Communications equipment (Satellite phone, cell phone, radios) • First Aid kit • Fire extinguishers • Wet Bulb Globe Temperature monitor as necessary	• PPE Training • Captain of boat is experienced and USCG Licensed • Boat crew experienced in inspection, maintenance and operation of boat • Training in boat safety procedures • Equipment familiarity training • Site-specific training on slip, trip, and fall hazards • Training in lifting/carrying techniques • Emergency response and notification procedures • At least two USA personnel will be trained in First Aid/CPR • Heat stress symptoms and First Aid • Site specific training on flora/fauna including First Aid • Fire extinguisher training	• PPE inspected daily prior to use by the user with checks by the UXOSO. • UXOSO will ensure that all controls are being followed, all equipment is being correctly utilized, and all personnel have received appropriate training. • Boat inspected daily prior to use by Captain/crew with checks by UXOSO. • Equipment inspected daily prior to use by the user with checks by the UXOSO. • Rescue equipment inspected daily prior to boat leaving the dock by UXOSO. • Communications equipment checked daily prior to use by the UXOSO. • First Aid kits checked daily and inspected weekly by the UXOSO. • Fire extinguishers checked daily and inspected weekly by the UXOSO. • MEC containers inspected for security, placards, and proper stowage by UXOSO.

Class Title: _____ Given by: _____ Date: _____

Printed Name	Signature	Date

Activity Hazard Analysis (AHA)

Activity/Work Task: Vegetation Removal	Overall Risk Assessment Code (RAC) (Use highest code) **M**
Project Location: Cayo del Agua, Culebra Island, Puerto Rico	Risk Assessment Code (RAC) Matrix
Contract Number: W912DY-10-D-0026, TO No. 0027	
Date Prepared: 10 / 25 / 2016	
Prepared by (Name/Title): Cheryl M. Riordan, CSP Corporate Health and Safety Manager	
Reviewed by (Name/Title): Robert Crownover Director of Safety and Quality USA Environmental, Inc.	Digitally signed by Robert D. Crownover DN: cn=Robert D. Crownover, o=USA Environmental, Inc., ou=Director Safety and Quality, email=rcrownover@usatampa.com, c=US Date: 2016.10.27 08:56:58 -04'00'
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
1. If there are areas on the site where dense vegetation prevents a visual check of the area for surface MEC or DGM operations, vegetation removal will be conducted as needed using gasoline-powered weed eaters, chain saws, pole saws, etc. UXO Technicians will perform a magnetometer survey in the areas of dense vegetation in order to determine if MEC is present prior to vegetation removal operations. If MEC is encountered, avoidance will be practiced. It will be flagged and the vegetation clearance operations will be routed around the MEC until a	1.1 Munitions and Explosives of Concern (MEC) hazards	1.1.1 On-site MEC training. 1.1.2 Identify and minimize all hazards and take proper safety precautions. 1.1.3 Daily UXO safety briefing prior to personnel entering EZ. 1.1.4 All work will be in compliance with the project ESS. 1.1.5 Observe all MEC safety precautions, such as movement, heat, shock, and friction, and follow safe work practices. 1.1.6 Keep personnel to a minimum during operations. 1.1.7 Use and enforce the buddy system. 1.1.8 Be alert. Cease operations if unsafe conditions arise. 1.1.9 Do not handle MEC unnecessarily. 1.1.10 Only qualified UXO Technicians will identify/handle MEC. 1.1.11 Use Personal Protective Equipment (PPE) in accordance with (IAW) this AHA. 1.1.12 Ensure First Aid kits and fire extinguishers are in place. 1.1.13 No smoking, except in designated areas. 1.1.14 Do not allow smoking or flame producing devices in the vicinity of	M

Job Steps	Hazards	Controls	RAC
disposal can take place.		MEC.	
	1.2 Unauthorized personnel entering site during operations	1.2.1 Establish and enforce exclusion zone (EZ). 1.2.2 Maintain positive site control; cease operations if unauthorized entry is made. 1.2.3. Site control measures will be implemented (security boats enforcing EZ on approaching water vessels). 1.2.4 Cease operations if unauthorized entry is made.	
	1.3. Uneven working surfaces – slip, trip, and fall hazards	1.3.1 Be observant while walking. Use sturdy protective work boots with composite toe, ankle support and non-slip soles. 1.3.2 Wear leather or canvas work gloves.	
	1.4. Heat stress	1.4.1 Heat stress monitoring, drinking water, work-rest cycles, and cool shelter for breaks.	
	1.5 Biological hazards – hazardous plants, trees, insects, and spiders	1.5.1 Training in biological hazards avoidance. 1.5.2 Use barrier creams/insect repellents as necessary. 1.5.3 Wear cotton long or short sleeved shirt and long pants.	
	1.6 Muscle strain carrying and using instruments/equipment	1.6.1 Follow appropriate lifting/carrying procedures: lift with legs and not with back, use gloves and ensure a good grip, and avoid twisting the back when lifting/carrying, never lift more than you can safety handle and ask for assistance on large/heavy lifts. 1.6.2 Have engine in either the off or idling position when walking with it.	
	1.7 Lacerations and cuts from vegetation clearing equipment	1.7.1 Know and observe the safe work practices and operating instructions of the equipment. 1.7.2 Have firm grip on equipment and don't use chain saw higher than waist high. 1.7.3 Assure a good grip and steady footing prior to turning on vegetation removal equipment. 1.7.4 Face shields and leather work gloves will be used with all vegetation removal equipment. 1.7.5 Leg chaps will be used with chain saw operations.	
	1.8 Noise	1.8.1 Hearing protection (NRR 30 or above) will be used when operating vegetation clearance equipment.	

Job Steps	Hazards	Controls	RAC
	1.9 Fire/burn hazards	1.9.1 Fuel will be kept in an approved flammable liquid container 1.9.2 Ensure proper grounding/bonding of fueling operation 1.9.3 No smoking within 50 feet of fueling operation. 1.9.4 No flammable/combustible materials in the vicinity of fueling operations. 1.9.5 Guard against splashes of fuel and oil. Spill clean-up materials (absorbent materials, shovel, and DOT-approved containers) will be available near equipment fueling operations in order to react immediately to perform a spill clean-up if required. 1.9.6 Guard against burns from hot equipment. 1.9.7 Allow equipment to cool down before fueling, sharpening, adjusting or replacing items for repair of equipment. 1.9.8 Don't fuel equipment in the back of a pick-up truck with bed-liner due to static electricity concerns around gasoline. 1.9.9 Ensure First Aid kits and fire extinguishers are in place.	
	1.10 Sunburn	1.10.1 Use sunscreen.	

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
• Sturdy protective work boots with composite toe, ankle support and non-slip soles. • Appropriate cotton clothing (long or short sleeved shirt and long pants) and PPE to include safety glasses with side shields or goggles, leather or canvas work gloves, hearing protection (NRR 30 or above), hard hat, and reflective vest. Leg chaps will also be used during chainsaw operations, and a face shield will be used with all hand-held vegetation clearance equipment. • Hand-held vegetation clearance equipment (chain saws, weed wackers, etc.) • Geophysical equipment • Pin flags • Communications equipment • First Aid kit • Fire extinguishers • Wet Bulb Globe Temperature monitor as necessary	• PPE Training • UXO personnel will meet training and experience requirements outlined in DDESB TP 18 • Site-specific MEC training will be presented to all site personnel • Training in hazards of hand-held vegetation clearance equipment for all operators and personnel working in the vicinity of these operations • Site-specific training on slip, trip, and fall hazards • Emergency response procedures • All site personnel will have current HAZWOPER training • Heat stress symptoms and First Aid • Site specific training on flora/fauna including First Aid	• PPE inspected daily prior to use by the user with checks by the UXOSO. • UXOSO will ensure that all controls are being followed, all equipment is being correctly utilized, and all personnel have received appropriate training. • Equipment inspected daily prior to use by the user with checks by the UXOSO. • Daily serviceability check of magnetometers by the user and checked by UXOQCS. • Communications equipment checked daily prior to use by the UXOSO. • First Aid kits checked daily and inspected weekly by the UXOSO. • Fire extinguishers checked daily and inspected weekly by the UXOSO.

Class Title: _____ Given by: _____ Date: _____

Printed Name	Signature	Date

Activity Hazard Analysis (AHA)

Activity/Work Task: Vehicle Operations	Overall Risk Assessment Code (RAC) (Use highest code) **L**
Project Location: Cayo del Agua, Culebra Island, Puerto Rico	Risk Assessment Code (RAC) Matrix
Contract Number: W912DY-10-D=0026, TO No. 0027	
Date Prepared: 07 / 20 / 2016	
Prepared by (Name/Title): Cheryl M. Riordan, CSP	
Reviewed by (Name/Title): Robert Crownover, Director of Safety and Quality, USA Environmental, Inc.	
Notes: (Field Notes, Review Comments, etc.)	

Digitally signed by Robert D. Crownover
DN: cn=Robert D. Crownover, o=USA Environmental, Inc., ou=Director Safety and Quality, email=rcrownover@usatampa.com, c=US
Date: 2016.08.03 13:45:45 -04'00'

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
1. Identify the hazards associated with vehicle operations and inspect vehicle	1.1 General vehicle hazards	1.1.1 Use the parking brake if parked on inclines and/or as necessary. 1.1.2 Daily vehicle inspections will be performed to ensure a safe operating vehicle, and documented with a written checklist. 1.1.3 Operator must have a valid driver's license. If transporting explosives on public roads, must have a CDL. 1.1.4 Never leave the vehicle running unattended. 1.1.5 Never fuel a vehicle loaded with explosive cargo. 1.1.6 No smoking is permitted in vehicles.	L
	1.2 Fire hazards	1.2.1 Fire extinguisher and First Aid kit must be with vehicle. If transporting explosives, two fire extinguishers are required.	
2. Load cargo onto vehicle	2.1 General vehicle hazards	2.1.1 Use the parking brake if parked on inclines and/or as necessary.	L

Job Steps	Hazards	Controls	RAC
		2.1.2 Daily vehicle inspections will be performed to ensure a safe operating vehicle, and documented with a written checklist. 2.1.3 Operator must have a valid driver's license. If transporting explosives on public roads, must have a CDL. 2.1.4 Never leave the vehicle running unattended. 2.1.5 Load and unload vehicles in designated areas only. 2.1.6 Ensure vehicle is chocked while loading/unloading cargo. 2.1.7 Block, brace, and secure cargo from movement during transportation.	
	2.2 Fire hazards	2.2.1 Fire extinguisher and First Aid kit must be with vehicle. If transporting explosives, two fire extinguishers are required.	
	2.3 Muscle strain carrying and loading cargo	2.3.1 Follow appropriate lifting/carrying procedures: lift with legs and not with back, use gloves and ensure a good grip, and avoid twisting the back when lifting/carrying, never lift more than you can safety handle and ask for assistance on large/heavy lifts.	
	2.4 MEC hazards	2.4.1 Daily UXO safety briefing prior to personnel entering EZ. 2.4.2 Observe all MEC safety precautions, such as movement, heat, shock, and friction 2.4.3 Only UXO trained personnel will transport explosives. 2.4.4 Transport explosives using approved containers and methods 2.4.5 When transporting explosive materials over public roads, ensure vehicle is properly placarded on all four sides of vehicle 2.4.6 Never fuel a vehicle loaded with explosive cargo.	
3. Drive to destination	3.1 General vehicle hazards	3.1.1 Use the parking brake if parked on inclines and/or as necessary. 3.1.2 Daily vehicle inspections will be performed to ensure a safe operating vehicle, and documented with a written checklist. 3.1.3 Operator must have a valid driver's license. If transporting explosives on public roads, must have a CDL. 3.1.4 Always wear a seat belt. 3.1.5 Use a ground guide when reversing and/or as needed.	

Job Steps	Hazards	Controls	RAC
		3.1.6 Obey the speed limit. 3.1.7 Obey all traffic signs. 3.1.8 Use established roads. 3.1.9 Never leave the vehicle running unattended. 3.1.10 No passengers will be transported in back of a pick-up truck. All passengers will be in a seat with a seat-belt in use during vehicle operation. 3.1.11 Operator of vehicle will not use electronic wireless devices while operating a vehicle (cell phone, I-pad, use of Internet, check or send email, check or send text messages, etc.). 3.1.12 If use of electronic wireless devices is required, operator will pull vehicle off to the side of the road or other safe parking place, park the vehicle and then proceed to use the device. No electronic devices will be used under any circumstance if vehicle is loaded with explosive cargo.	
	3.2 MEC Hazards	3.2.1 Daily UXO safety briefing prior to personnel entering EZ. 3.2.2Use only authorized explosive routes when transporting explosives. 3.2.3 When transporting explosive materials over public roads, ensure vehicle is properly placarded on all four sides of vehicle. 3.2.4 Never fuel a vehicle loaded with explosive cargo. 3.2.5 No electronic devices will be used under any circumstances if vehicle is loaded with explosive cargo.	
	3.3 Fire hazards	3.3.1 Fire Extinguisher and First Aid kit must be with vehicle. If transporting explosives, two Fire Extinguishers are required. 3.3.2 No smoking is permitted in vehicles.	

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
• Vehicle • Placards • Blocking and bracing materials • Communications equipment • First Aid kit • Fire extinguishers	• UXO personnel will meet training and experience requirements outlined in DDESB TP 18 • All site personnel will have current HAZWOPER training • Valid Driver's license (CDL for transporting explosives) • Vehicle familiarity training • Knowledge of the Emergency Response and Notification procedures • Fire extinguisher training • Site-specific training/lifting techniques	• UXOSO will ensure that all controls are being followed, all equipment is being correctly utilized, and all personnel have received appropriate training. • Equipment inspected daily prior to use by the user with checks by the UXOSO. • Vehicle inspected daily prior to use by the user, and documented with a written checklist. UXOSO will also do checks. • Communications equipment checked daily prior to use by the UXOSO. • First Aid kits checked daily and inspected weekly by the UXOSO. • Fire extinguishers checked daily and inspected weekly by the UXOSO.

Class Title: _____ Given by: _____ Date: _____

Printed Name	Signature	Date

APPENDIX C. ATTACHMENT 3: SITE SAFETY AND HEALTH PLAN

This appendix contains the Site Safety and Health Plan.

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SITE SAFETY AND HEALTH PLAN
Time Critical Removal Action
Cayo del Agua, Culebra Island, Puerto Rico

Plan Approval:

Cheryl M. Riordan

Date: 11/21/2016

Cheryl M. Riordan, CSP
Corporate Health and Safety Manager
USA Environmental, Inc.
(813) 426-2112

Plan Concurrence:

Robert D. Crownover

Date: 11/21/2016

Robert Crownover
Director of Safety and Quality
USA Environmental, Inc.
(813) 343-6364

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ATTACHMENT: Map and Directions to Hospital

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ACRONYMS AND ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
AHA	Activity Hazard Analysis
APP	Accident Prevention Plan
bpm	Beats per Minute
CDC	Centers for Disease Control
CFR	Code of Federal Regulations
CHSM	Corporate Health and Safety Manager
CPR	cardiopulmonary resuscitation
CWM	Chemical Warfare Materiel
°F	Degree Fahrenheit
°C	Degree Celsius
dBA	decibel Ampere
DGM	Digital Geophysical Mapping
DoD	Department of Defense
ERT	Emergency Response Team
EMS	Emergency Medical Services
EPA	Environmental Protection Agency
ERCP	Emergency Response Plan and Contingency Procedures
ESS	Explosives Safety Submission
EZ	Exclusion Zone
ft	foot, feet
HAZWOPER	Hazardous Waste Operations and Emergency Response
HFD	Hazardous Fragmentation Distance
HE	High Explosive
IAW	In Accordance With
IVS	Instrument Verification Strip
MC	Munitions Constituents
MEC	Munitions and Explosives of Concern
MGFD	Munition with the Greatest Fragmentation Distance
MK	Mark
mm	millimeter
MPPEH	Material Potentially Presenting an Explosive Hazard
MSD	Minimum Separation Distance
MSDS	Material Safety Data Sheet
NOTMAR	Notice to Mariners

OSHA	Occupational Safety and Health Administration
PAHO	Pan American Health Organization
PEL	permissible exposure limits
PFD	personal flotation device
PHEIC	Public Health Emergency of International Concern
PR	Pulse Rate
PPE	Personal Protective Equipment
PWS	Performance Work Statement
QC	Quality Control
RMSF	Rocky Mountain Spotted Fever
SDS	Safety Data Sheet
SSHP	Site Safety and Health Plan
SUXOS	Senior Unexploded Ordnance Supervisor
SZ	Support Zone
TCRA	Time Critical Removal Action
TLV	Threshold Limit Values
USA	USA Environmental, Inc.
USACE	U.S. Army Corps of Engineers
USFWS	U. S. Fish and Wildlife Service
UXO	Unexploded Ordnance
UXOSO/UXOQCS	Unexploded Ordnance Safety Officer/Unexploded Ordnance Quality Control Specialist
VHF	Very High Frequency
WBGT	Wet Bulb Globe Temperature
WHO	World Health Organization

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C.3 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 Time Critical Removal Action (TCRA) at Cayo del Agua, Culebra Island, Puerto Rico.

C.3.1 SITE DESCRIPTION AND CONTAMINATION CHARACTERIZATION

C.3.1.1 Site Description

Cayo del Agua is a Cayo of Culebra Island, Puerto Rico that is accessible by boat or barge. It is uninhabited and is currently used as a bird sanctuary. It is occasionally visited by personnel from the U.S. Fish and Wildlife Service (USFWS) checking on critical seabird nesting habitat. This TCRA will occur on a 3.93-acre terrestrial site. Parts of the Cayo are flat, while other parts are rocky with cliffs. It is mostly open terrain with sometimes heavy growth of grass and underbrush. It was formerly used as a military range, and Munitions and Explosives of Concern (MEC) continues to present a hazard at this site.

C.3.1.2 Contaminant Characteristics

Munitions and Explosives of Concern (MEC) contaminants are expected to include significant quantities of MK 76 practice bombs and possesses the potential for MEC discoveries of MK 80 series bombs, 5 inch Zuni Rockets and naval projectiles.

Chemical Warfare Materiel (CWM): The site is not expected to contain CWM. However, if suspect CWM is encountered during any phase of site activities, USA Environmental, Inc. (USA) personnel will immediately withdraw upwind from the work area, secure the site, and contact the U.S. Army Corps of Engineers (USACE) Project Manager. USA will maintain security at the site until written direction is provided by USACE regarding the procedure to be followed for performing further MEC remediation work at the site.

C.3.2 ACTIVITY HAZARD ANALYSIS (AHA)

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

- Instrument Verification Strip (IVS)
- Vegetation Removal
- MEC Surface Clearance
- Digital Geophysical Mapping (DGM)
- MEC Investigation
- Material Potentially Presenting an Explosive Hazard (MPPEH) Inspection and Certification
- MEC Disposal
- Munitions Constituents (MC) Sampling
- Quality Control (QC)
- Boat Transportation
- Vehicle Operations.

Should conditions, equipment, or types of operations change during the course of the project work, the Corporate Health and Safety Manager (CHSM) will update an existing AHA for continuing work, or prepare a new AHA for new operations. The site exclusion zone (EZ) will be based on the hazardous fragment distance (HFD) of the Munition with the Greatest Fragmentation Distance (MGFD) of each area where the work will take place. The HFD around the site footprint is for the protection of the general public. A separation distance will also be established between Unexploded Ordnance (UXO) teams based on the

K40 distance of the MGFD, to protect individual operating units in the event of an accidental detonation while site operations are underway.

Risk management is and will continue to be integrated into the planning, preparation, and execution of all operations at the Cayo del Agua 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 Senior Unexploded Ordnance Supervisor (SUXOS) or Unexploded Ordnance Safety Officer/Unexploded Ordnance Quality Control Specialist (UXOSO/ UXOQCS). Control measures will be developed and coordinated by USA Environmental, Inc. (USA) safety personnel. All site personnel are responsible for continuous assessment of variable hazards and the implementation of risk controls.

C.3.2.1 Classic Safety

Due to 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 AHAs.

C.3.2.1.1 Slip, Trip, and Fall Hazards

Site slip, trip, and fall hazards include uneven walking/working surfaces, rocks and vegetation. Site personnel will 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. Barricades will be placed around open pits to prevent accidental falls into them.

C.3.2.1.2 Cuts and Laceration Hazards

Cuts and lacerations can be caused by a number of issues on the site to include handling MEC, rocks and vegetation, as well as the use of tools and equipment. Personnel will be instructed to wear leather or canvas work gloves during site operations to prevent injury to hands.

C.3.2.1.3 Hand Tool Operation

Use of improper or defective tools can contribute significantly to the occurrence of accidents on site. Therefore, the safe work practices listed below will be observed when using hand tools:

- Hand tools will be inspected for defects prior to each use.
- Defective hand tools will be removed from service and repaired or discarded.
- Tools will be selected and used in the manner for which they were designed.
- Be sure of footing and grip before using any tool.
- Do not use tools that have split handles, mushroom heads, worn jaws, or other defects.
- Gloves will be worn whenever they increase gripping ability or if cut, laceration, or puncture hazards 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.

C.3.2.1.4 Material Lifting

Many types of objects are handled in normal day-to-day operations. Care will be taken in lifting and handling heavy or bulky items because they are the cause of many joint and back injuries. The following fundamentals address the proper lifting of materials to avoid joint and back injuries:

- The size, shape, and weight of the object to be lifted must be considered. Site personnel will not lift more than they can handle comfortably.
- A firm grip on the object is essential; therefore, the hands and object will be free of oil, grease, and water, which might prevent a firm grip.
- The hands and especially the fingers will be kept away from any points that cause them to be pinched or crushed, especially when setting the object down.
- The item will be inspected for metal slivers, jagged edges, burrs, rough or slippery surfaces, and pinch points, and gloves will be used, if necessary, to protect the hands.
- The feet will be placed far enough apart for good balance and stability.
- Personnel will ensure that solid footing is available prior to lifting the object.
- When lifting, get as close to the load as possible, bend the legs at the knees, making sure that the back is kept as straight as possible.
- To lift the object, the legs are straightened from their bending position.
- Never carry a load that cannot be seen over or around.
- When placing an object down, the stance and position are identical to that for lifting, with the back kept straight, the legs bent at the knees and the object lowered.
- If the item to be lifted is too large, bulky, or heavy for one person to safely lift, ask a co-worker for assistance. If a piece of material handling equipment is available that can do the job, use the equipment instead of trying to lift it yourself.
- When two or more people are required to handle an object, coordination is essential to ensure that the load is lifted uniformly and that the weight is equally divided between the individuals carrying the load. When carrying the object, each person, if possible, will face the direction in which the object is being carried.

C.3.2.1.5 Excavation Operations

Excavation work will occur as part of this Performance Work Statement (PWS) for the purpose of investigation of MEC to required depths. Heavy equipment operations will not occur on this site. All excavation operations will be performed by qualified UXO Technicians using hand tools to investigate anomalies to the required depth. Barricades will be placed around open pits that are not immediately filled in after excavation to prevent personnel from falling into them. If excavation sites are to remain unfilled then cones or engineer tape will mark the hole as a barricade. Excavations are not expected to exceed 4 ft in depth. After excavations have been completed, the open pits will be backfilled.

C.3.2.2 Explosive Ordnance

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. 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 will 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 based on the quantity-distances in the approved Explosives Safety Submission (ESS). The Minimum Separation Distance (MSD) equivalent to the K40 distance of the MGFD will also be established between UXO teams to protect individual operating units in the event of an unintentional detonation while site operations are underway. Should a round with a greater fragmentation distance be encountered, these distances will be increased in accordance with (IAW) the approved ESS.

- When the EZ extends into the navigable areas surrounding the Cayo, USA will inform the USCG of the areas to be avoided, and will also employ the use of small boats to enforce these boundaries by informing watercraft attempting to enter the area.
- 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, entrance will be coordinated with the SUXOS and the individual(s) will be escorted at all times. All MEC operations will halt for the duration of time the person is within the EZ. Once the individual(s) have departed the area, MEC operations may resume.

C.3.2.3 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 Material Safety Data Sheet (MSDS)/Safety Data Sheet (SDS) for the appropriate use and storage of these materials. Recommended PPE will also be followed for those required to use chemicals. The UXOSO/UXOQCS will designate a location for the MSDS/SDS binder, and all site personnel will be informed of it. The MSDS/SDS binder will be available to all employees on request during all hours of operation. Chemical warfare materiel is not expected to be found on this site. Should CWM be found on the site, USA will secure the site and withdraw to an upwind safe position at least 450 ft away, and contact the USACE Project Manager.

C.3.2.4 Physical Hazards

C.3.2.4.1 Noise Hazards

See Section C.9.10 of the APP.

C.3.2.4.2 Vibration

Vibration can become a problem when using power tools. The use of chainsaws and other equipment in vegetation clearance operations can expose workers to vibration in the hands, which can lead to White Finger, which develops over time, and once developed cannot be cured. It is important to reduce exposure as much as possible in order to prevent White Finger or other vibration-related conditions from developing. At USA, the following precautions are taken when workers are required to use vibrating hand tools:

- Purchase sound, ergonomically designed equipment that reduces vibration transference to the hands.
- Use vibration absorbing gloves.
- Encourage workers to hold equipment loosely.
- Work in short durations, with frequent breaks. Workers are encouraged to take at least one 10-minute break every hour.
- Keep hands warm in order to keep blood flowing.
- Avoid smoking which inhibits blood flow.
- Avoid drugs that can inhibit blood flow.

Symptoms of vibration related disorders include:

- Tingling and slight loss of feeling or numbness in the fingers.
- Blanching or whitening of the fingers.
- Blue skin that feels cold and numb.
- Numb, prickly feeling or stinging pain, sometimes with redness upon warming or relief of stress.
- Sequence of color changes in the skin from white to blue to red.

If workers begin to develop symptoms related to vibration exposure, report immediately to the UXOSO/UXOQCS who will ensure worker is examined/treated by a physician.

C.3.2.5 Ionizing Radiation

Ionizing radiation is not applicable to this PWS.

C.3.2.6 Biological Hazards

Biological hazards, which are usually found on site, include hazardous plants, trees, insects, spiders, snakes, and marine life. Employee awareness and the safe work practices outlined in the following paragraphs should reduce the risk associated with these hazards.

C.3.2.6.1 Bees, Hornets, and Wasps

Contact with stinging insects like bees, hornets, and wasps may result in site personnel experiencing adverse health effects that range from being mildly uncomfortable to being life threatening. Therefore, stinging insects present a serious hazard to site personnel, and extreme caution must be exercised whenever site and weather conditions increase the risk of encountering stinging insects. Some of the factors related to stinging insects that increase the degree of risk associated with accidental contact are as follows:

- The nests for these insects are frequently found in remote wooded or grassy areas
- The nests can be situated in trees, rocks, and bushes or in the ground, and are usually difficult to see
- Accidental contact with these insects is highly probable, especially during warm weather conditions when the insects are most active
- If a site worker accidentally disturbs a nest, the worker may be inflicted with multiple stings, causing extreme pain and swelling which can leave the worker incapacitated and in need of medical attention
- Some people are hypersensitive to the toxins injected by a sting, and when stung, experience a violent and immediate allergic reaction resulting in a life-threatening condition known as anaphylactic shock
- Anaphylactic shock manifests itself very rapidly and is characterized by extreme swelling of the body, eyes, face, mouth and respiratory passages
- The hypersensitivity needed to cause anaphylactic shock, can in some people, accumulate over time and exposure, therefore even if someone has been stung previously, and 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/UXOQCS 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/UXOQCS 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/UXOQCS to obtain First Aid treatment and to allow the UXOSO/UXOQCS 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/UXOQCS and co-workers know where it is kept and how to administer it.

C.3.2.6.2 Mosquitoes

Mosquitoes (see photo shown in Figure C.3-1) are responsible for transmitting diseases such as Malaria, Zika, and West Nile Virus through bites to the skin. Malaria is not normally contracted in Puerto Rico. The known cases have all been brought to Puerto from people who contracted it while travelling to other countries. West Nile virus has been found in Puerto Rico, but it is rare. In warmer climates such as Puerto Rico where the temperatures are milder, West Nile virus can be transmitted year round.

Figure C.3-1: Mosquito

C.3.2.6.3 West Nile Virus

Mosquitoes become infected with the virus when they feed on infected birds, which may circulate the virus in their blood for a few days. Infected mosquitoes can then transmit the virus to humans and animals while biting to take blood. The virus is located in the mosquito's salivary glands, and may be injected into the animal or human, where it can multiply, possibly causing illness. Even in areas where the virus is circulating, few mosquitoes are infected with the West Nile virus. Even if the mosquito is infected, less than 1 percent of people who get bitten and become infected will get seriously ill. The majority of cases of West Nile virus have been identified in birds, it has also been found in horses, cats, bats, chipmunks, skunks, squirrels, and domestic rabbits. Once West Nile virus has been contracted, the survivor of this illness is believed to carry a lifelong immunity to it. At this time there is no vaccine against West Nile virus.

Be alert for dead animals on the site, particularly birds. If a dead bird or other animal is found on site, bare-handed contact should be avoided. Using gloves or double plastic bags, wrap animal and call the Health Department. If the Health Department wants to test the bird, they will come and pick it up. If they are not testing the bird, it should remain wrapped in the plastic and disposed of in accordance with established procedures.

Symptoms: West Nile virus is an encephalitis, which causes an inflammation of the brain. Following transmission by an infected mosquito, West Nile virus multiplies in the person's blood system and crosses the blood-brain barrier to reach the brain. The virus interferes with normal central nervous system functioning and causes inflammation of the brain tissue. Fatality rates range from 3% to 15% of persons who develop severe illness, and rates are highest among persons over 50 years of age and those with weakened immune systems. This disease is not transmitted from person-to-person, so touching or working in the vicinity of someone with the disease will not increase the risk.

The incubation period for West Nile virus is normally 3 to 15 days. Most infections are mild, and symptoms include fever, headache, and body aches, and occasionally skin rash and swollen lymph glands. More severe infection may be marked by headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, paralysis, and, rarely, death. If symptoms develop, seek medical attention immediately.

C.3.2.6.4 Zika Virus

Zika virus disease is a disease that is spread to people primarily through the bite of an infected *Aedes* species mosquito. In May 2015, the Pan American Health Organization (PAHO) issued an alert regarding the first confirmed Zika virus infection in Brazil and on 1 February 2016, the World Health Organization

(WHO) declared Zika virus a public health emergency of international concern (PHEIC). Local transmission has been reported in many other countries and territories, including outbreaks in Puerto Rico.

Some basic facts about the Zika Virus include:

- A mother already infected with Zika Virus near the time of delivery can pass on the virus to her newborn around the time of birth.
- A pregnant woman can pass Zika Virus to her fetus during pregnancy. The Centers for Disease Control (CDC) are studying the adverse pregnancy and infant outcomes associated with Zika virus infection during pregnancy. The virus is a particular hazard to a fetus with cases of microcephaly and other neurological disorders reported.
- See your healthcare provider if you are pregnant and develop a fever, rash, joint pain, or red eyes within 2 weeks after traveling to a place where Zika Virus has been reported. Be sure to tell your health care provider where you traveled.
- To date, there are no reports of infants getting Zika Virus through breastfeeding. Because of the benefits of breastfeeding, mothers are encouraged to breastfeed even in areas where Zika Virus is found
- The illness is usually mild with symptoms lasting for several days to a week after being bitten by an infected mosquito.
- People usually don't get sick enough to go to the hospital, and they very rarely die of Zika Virus. For this reason, many people might not realize they have been infected.
- Zika Virus usually remains in the blood of an infected person for about a week but it can be found longer in some people. It is known to remain longer in the semen of infected males.
- Zika Virus can be transmitted sexually by an infected male with or without symptoms of the virus.
- To date there have been no confirmed cases of transmission through blood transfusion in the United States, but that has occurred in other countries. In order to protect the blood supply, donors who have travelled to locations where Zika is known to exist are not permitted to donate blood until at least 30 days after their return.
- Once a person has been infected, he or she is likely to be protected from future infections.

Symptoms: Most people infected with Zika Virus won't even know they have the disease because they won't have symptoms. If symptoms do occur, the most common symptoms are fever, rash, joint pain, or conjunctivitis (red eyes). Other common symptoms include muscle pain and headache. The incubation period (the time from exposure to symptoms) is not known, but is likely to be a few days to a week.

Protective Measures: Prevention and control of mosquito-borne illnesses is most effectively accomplished through vector management programs. When in areas with Zika Virus and other diseases spread by mosquitoes, take the following steps:

- Wear long-sleeved shirts and long pants.
- Stay indoors at dawn, dusk, and in the early evening when mosquitoes are most active.
- Stay in places with air conditioning or that use window and door screens to keep mosquitoes outside.
- Sleep under a mosquito bed net if you are outside and are not able to protect yourself from mosquito bites.
- Mosquitoes typically lay eggs in and near standing water in things like buckets, bowls, animal dishes, flower pots, and vases, etc. Remove sources of standing water where mosquitoes can breed.
- Use Environmental Protection Agency (EPA)-registered insect repellents. When used as directed, EPA-registered insect repellents are proven safe and effective, even for pregnant and breast-feeding women.

  - Always follow the product label instructions.
  - Reapply insect repellent as directed.
  - Do not spray repellent on the skin under clothing.
  - If you are also using sunscreen, apply sunscreen before applying insect repellent.
- If you have a baby or child:
  - Do not use insect repellent on babies younger than 2 months of age.
  - Dress your child in clothing that covers arms and legs, or
  - Cover crib, stroller, and baby carrier with mosquito netting.
  - Do not apply insect repellent onto a child's hands, eyes, mouth, and cut or irritated skin.
  - Adults: Spray insect repellent onto your hands and then apply to a child's face.
- Treat clothing and gear with permethrin or purchase permethrin-treated items.
  - Treated clothing remains protective after multiple washings. See product information to learn how long the protection will last.
  - If treating items yourself, follow the product instructions carefully.
  - Do NOT use permethrin products directly on skin. They are intended to treat clothing.

If you have Zika Virus, protect others from getting sick:

- During the first week of infection, Zika Virus can be found in the blood and passed from an infected person to another mosquito through mosquito bites. An infected mosquito can then spread the virus to other people.
- To help prevent others from getting sick, avoid mosquito bites during the first week of illness.
- Zika Virus can be spread during sex by a man infected with Zika Virus to his sex partners.
  - We do not know how long the virus is present in the semen of men who have had Zika Virus.
  - We do know that the virus can stay in semen longer than in blood.
  - The Zika Virus can be spread by a man with or without symptoms of the virus.
- To help prevent spreading Zika Virus transmission from sex, you can use condoms the right way every time you have sex. Not having sex is the best way to be sure that someone does not get sexually transmitted Zika Virus.
- If your partner is pregnant, either use condoms the right way every time you have sex or do not have sex during the pregnancy.
- Even if they do not feel sick, travelers returning to the United States from an area with Zika Virus should take steps to prevent mosquito bites for 3 weeks so they do not spread Zika Virus to uninfected mosquitoes.

C.3.2.7 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 C.3-2 and Figure C.3-3).

Figure C.3-2: Black Widow Spider

Figure C.3-3: Recluse 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 (see Figure C.3-2). The black widow is usually found in dark moist locations, especially under rocks, 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 ⅝-inch long with a dark brown “violin” shape on the top (see Figure C.3-3). 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, pustulating 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/UXOQCS will brief site personnel as to the identification and avoidance of the spiders. As with stinging insects, site personnel will report to the UXOSO/UXOQCS if they locate either of these spiders on site or notice any type of bite while involved in site activities.

C.3.2.8 Snakes

Puerto Rico has no identified poisonous snakes. However, even non-poisonous snakes will strike in defense of themselves. When site activities are conducted in warm weather on sites that are located in wooded, grassy, or rocky environments, the potential for contact with snakes becomes a possibility. Normally, if a person is approaching a snake, the noise created by the person is usually sufficient to frighten the snake off. However, during the warm months, caution must be exercised when conducting site operations around areas where snakes might be found (e.g., rocks, bushes, logs, or in holes, crevices, and abandoned pipes). Proper care should be taken by site personnel during activities which may bring them in contact with local wildlife.

C.3.2.9 Ticks

C.3.2.9.1 General Information

Figure C.3-4: Tick

The CDC have noted the increase of Lyme disease and Rocky Mountain Spotted Fever (RMSF) which are caused by bites from infected ticks (see Figure C.3-4) that live in and near wooded areas, tall 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. The tick season extends from spring through summer. When embedded in the skin, they may look like a freckle.

The first symptoms of either disease are flu-like chills, fever, headache, dizziness, fatigue, stiff neck, and bone pain. If immediately treated by a physician, most individuals recover fully in a short period of time. If not treated, more serious symptoms can occur.

If you believe you have been bitten by a tick, or if any of the signs and symptoms noted above appear, contact the UXOSO/UXOQCS, who will authorize you to visit a physician for an examination and possible treatment.

C.3.2.9.2 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 will 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 hard 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.

C.3.2.10 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/UXOQCS 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.

C.3.2.11 Hazardous Plants

During the conduct of site activities the number and variety of hazardous plants that may be encountered is large and extensive. 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 reactions, skin and tissue injury, and poisoning.

C.3.2.11.1 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 vegetation clearance 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/UXOQCS for initial and continued observation and care of the injury.

C.3.2.11.2 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 ft or more. As illustrated in Figure C.3-5, poison ivy has shiny, pointed leaves that grow in clusters of three.

Poison Ivy

Leaves and Fruit of Manchineel Tree

Figure C.3-5 Examples of Hazardous Plants

The skin reaction associated with contacting these plants 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.

C.3.2.11.3 Poisonous Tree

The poisonous Manchineel Tree grows in the Caribbean region. The tree is also referred to as Manzanilla de la muerte, or, "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+ ft 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 secretes 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/UXOQCS, who will arrange for transport to the hospital emergency room for treatment.

C.3.2.12 Hazard Mitigation

The hazards listed above will be addressed through a combination of training, engineering controls, and Personal Protective Equipment (PPE).

- Implementation of Engineering Controls and Work Practices

Training in site procedures and the use of site equipment can prevent accidents from occurring. Training in recognition of MEC or MEC pieces that could be hazardous will be given to all site workers. When MEC or pieces of MEC are encountered, only UXO-qualified personnel will be able to identify and dispose of them. Other controls include the Minimum Separation Distance (MSD) of at least the K40 distance of the MGFD, which will provide protection of individual teams from nearby site operations, and the EZ surrounding the site footprint (IAW the quantity-distances in the approved ESS) which will protect the general public from the hazards of site operations.

- 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 a hard hat, leg chaps, face shield, safety glasses or goggles, hearing protection, leather or canvas work gloves, and sturdy leather work boots with ankle support and non-slip soles (steel-toe boots may not be worn in the vicinity of magnetometer operations). The hard hat, hearing protection and face shield will be

worn in the vicinity of vegetation clearance operations. Leg chaps will be used by chainsaw operators. Personnel not involved in vegetation clearance operations will wear a cap to protect the head from the sun. The boat crew will wear close-toed, rubber-soled footwear while on the boat. All personnel will wear a personal floatation device (PFD) while the boat is transporting them to and from the work site.

If site hazards are encountered that require additional PPE, the PPE level can be increased by the UXOSO/UXOQCS in consultation with the CHSM, who would base the decision on documented evidence of the hazards. If the site is not as hazardous as originally anticipated, the level of PPE can be downgraded by the CHSM. This decision would also be based on definitive data that confirms the PPE can be lessened. Normally, downgrading of PPE would require at least one week's worth of data demonstrating that the site is not as hazardous as originally suspected.

- 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/UXOQCS will be notified and will evaluate the situation. The UXOSO/UXOQCS will, in consultation with the Director of Safety and Quality and/or CHSM, determine what steps need to be taken to make the situation safe for operations to continue.

- 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/UXOQCS to evacuate the area. Personnel will assemble in the boat, and the boat will head for the dock docking area or an area beyond the EZ of the site. After evacuation, the UXOSO/UXOQCS will account for all personnel, ascertain information about the emergency, and advise responding on-site personnel. The UXOSO/UXOQCS will contact, advise, and coordinate with responding off-site emergency personnel to meet the boat at the dock if deemed necessary by the situation.

Potentially hazardous weather conditions will be closely monitored by the UXOSO/UXOQCS. The UXOSO/UXOQCS 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/UXOQCS.

In all situations that require evacuation, personnel will not re-enter the work area until:

- The conditions causing the emergency have been corrected.
- The hazard has been reassessed.
- The Site Specific Safety and Health Plan has been revised and reviewed with on-site personnel, if needed.
- Instructions have been given for authorized re-entry by the UXOSO/UXOQCS.

After the emergency situation has been controlled and eliminated, or has passed the Project Manager, UXOSO/UXOQCS, and CHSM will review the way the emergency was handled and change/update procedures if necessary.

- Prevention and/or Minimization of Public Exposure to Hazards Created by Site Activities

The creation of an EZ between the site footprint and the general public acts as a safety buffer to protect the public from site hazards. Controlling access to the site is a means of keeping the general public from potential impacts of site operations. In addition, the training of all site workers in the hazards and recognition of MEC will reduce the potential for public exposure to hazards. If unauthorized personnel are observed in the EZ, all MEC operations will cease until the area is cleared of unauthorized personnel. The Coast Guard will be notified of the established EZ. The Coast Guard will provide radio notification to mariners in the area through a "Notice to Mariners" (NOTMAR). USA will also have two boats with Spanish-speaking Captains to enforce the EZ during operations.

C.3.3 STAFF ORGANIZATION, QUALIFICATIONS AND RESPONSIBILITIES

See Section C.4 of the APP.

C.3.4 TRAINING

See Section C.6 of the APP.

C.3.5 PERSONAL PROTECTIVE EQUIPMENT (PPE)

When feasible, engineering controls and work practices, or a combination thereof, will be utilized 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 Permissible Exposure Limits (PEL) found in 29 Code of Federal Regulations (CFR) 1910 Subpart G and 29 CFR 1910.1000, or the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs). Other recognized published exposure levels, such as those found on MSDSs/SDSs, will be used if the substance is not listed by OSHA or the ACGIH. USA will not utilize a system of employee rotation as a means of complying with the PPE, PEL, TLV, or other published limits.

C.3.5.1 Types of PPE

Requirements for task and activity-specific levels of protective clothing are presented on the Activity Hazards Analyses located in Attachment 2 of this APP. Personnel performing site tasks will use the appropriate level and type of PPE specified in this plan for each individual task. This APP makes provisions for use of the following levels of PPE, in accordance with the hazards and contamination level anticipated for each task or operation: Level A, Level B, Level C, and Level D. The following sections describe the PPE requirements for activities and locations on the site, based on the requirements in EM 385-1-1 and EM 385-1-97.

C.3.5.1.1 Level A Protection

Level A Protection is not required.

C.3.5.1.2 Level B Protection

Level B Protection is not required.

C.3.5.1.3 Level C Protection

Level C Protection is not required.

C.3.5.1.4 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/UXOQCS may increase the level of protection due to 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, in the vicinity of vegetation clearance operations
- Face shield, in the vicinity of vegetation clearance operations
- Leg chaps – when working with chain saws
- Leather or canvas work gloves
- Safety glasses with side shields or safety goggles
- Hearing protection, where required by high noise levels, in the vicinity of vegetation clearance operations

- Leather or other protective work shoes/boots with composite toe with ankle support and non-slip soles (ANSI Z41 or ASTM 2413 standard). No steel-toe shoes may be used in the vicinity of magnetometer operations.
- Cotton long or short sleefed shirt and long pants
- Back supports (optional).

C.3.5.2 Eye/Face Protection

All personnel will use appropriate eye/face protection when exposed to eye hazards from flying particles, liquid chemicals, or other eye hazards. All personnel will use eye protection that provides side protection when there is a hazard from flying objects. Detachable side protectors (e.g., clip-on or slide-on side shields) meeting the pertinent requirements of this section are acceptable. Eye/face protection meets the requirements of ANSI/ASSE Z87.1 standard.

- All personnel who wear prescription lenses while engaged in operations that involve eye hazards will wear eye protection that incorporates the prescription in its design, or wear eye protection that can be worn over the prescription lenses without disturbing the proper position of the prescription lenses or the protective lenses.
- Eye protection will be distinctly marked to facilitate identification of the “Z.87” by the manufacturer.

C.3.5.3 Head Protection

When working in the vicinity of vegetation clearance and excavation operations, Type II hard hats will be worn, meeting the requirements of ANSI Z89.1 Standard. Due to outdoor operations and exposure to the sun, caps will be worn to protect the head from exposure to the sun during other operations where hard hats are not required.

C.3.5.4 Leg Protection

Leg chaps meeting the requirements of ASTM Standard F1987 will be worn by operators during chainsaw operations.

C.3.5.5 Foot Protection

Due to the uneven working surfaces and potential for tripping hazards, all USA personnel will wear sturdy composite toe work boots with ankle support and non-slip soles. Personnel using magnetometers for the detection of buried MEC will not wear steel-toe safety shoes, as they will affect the readings of the equipment. Safety toe work boots meeting the requirements of ASTM 2413 are required.

C.3.5.6 Hand Protection

USA selects and requires employees to use appropriate hand protection in accordance with ANSI/SEA 105 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 site, leather or canvas work gloves will provide adequate protection against minor cuts, which are a hazard in most site operations. Chemical-resistant gloves will be required in equipment fueling operations.

C.3.5.7 Hearing Protection

USA will make hearing protectors available to all employees exposed to an 8-hour time-weighted average of 85 dbA or greater for steady state time weighted average (TWA), or 140 dbA or greater for impulse noise. Hearing protectors will be replaced as necessary. Hearing protection will be required for all personnel working in and around any operations likely to produce high noise levels, such as during the use of chain saws and weed-eaters during vegetation clearance operations.

C.3.5.8 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 Director of Safety and Quality, CHSM, and UXOSO/UXOQCS will also take into consideration the following factors:

- Limitations of the equipment
- Work mission duration
- Temperature extremes
- Material flexibility
- Durability/integrity of the equipment.

C.3.5.9 Upgrading/Downgrading PPE

If work tasks are added or amended after completion and approval of the APP/SSHP, the UXOSO/UXOQCS will conduct the task hazard assessment and consult with the Director of Safety and Quality and/or the CHSM. The level and type of PPE to be used will be identified. The UXOSO/UXOQCS can increase the level of PPE when the situation warrants, due to an increase in hazardous exposure. Any decreases in the level of PPE must be approved by the Director of Safety and Quality and/or CHSM, only after review of documentation demonstrating that the conditions and/or potential for hazardous exposure are reduced enough to justify the downgrade. Normally the downgrading of PPE requires at least one week of data demonstrating the reduced hazard.

C.3.5.10 General Requirements

All PPE will be provided, used, and maintained in a sanitary and reliable condition where it is necessary. PPE is required due to 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.

C.3.5.11 Inspections

Each piece of PPE will be inspected daily prior to use. Defective or damaged PPE will not be used. It will be removed from service and turned in for repair, or removed from the site for disposal and replaced with

new PPE. During the work task, buddy teams should periodically inspect each other's PPE for evidence of chemical attack, such as discoloration, swelling, stiffening, or softening.

C.3.5.12 Cleaning and Decontamination

The UXOSO/UXOQCS 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 re-usable 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 when required and ensure that the PPE is properly decontaminated before removing the item from the EZ or Contamination Reduction Zone.

C.3.5.13 Maintenance

Maintenance of PPE can vary greatly, based upon the complexity of the PPE and the intricacy of the repair involved. The UXOSO/UXOQCS 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/UXOQCS will return the item to the manufacturer for repair, or procure a replacement.

C.3.5.14 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/UXOQCS will designate a specified area for the storage of PPE.

C.3.5.15 PPE Program Effectiveness

Based on the inhalation hazard and potential chemical exposures on this site, Level D PPE is considered adequate for the work that is to be accomplished at the site. If work tasks are added to the PWS after approval of this APP, the SUXOS and/or UXOSO/UXOQCS (as applicable) will identify and assess the task hazards and relay that information to the Director of Safety and Quality and CHSM. The Director of Safety and Quality or CHSM will prepare an amendment to the APP and submit the amendment for approval from USACE. The amendment will be added to the APP upon USACE approval.

The UXOSO/UXOQCS will ensure PPE use complies with all applicable OSHA 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.

C.3.5.16 Training

USA will provide training to each employee who is required by this section to use PPE. Each affected employee will demonstrate an understanding of the training, and the ability to use PPE properly, before being allowed to perform work requiring the use of PPE. Each such employee will be trained to know at least the following:

- The decisions and justifications used to select each piece of PPE
- The nature of the hazards and the consequences of not using PPE
- What PPE will be required for 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/UXOQCS supervising and visually inspecting each individual's ability to properly don and use the PPE during initial use of the PPE.

When the UXOSO/UXOQCS has reason to believe that any affected employee who has already been trained does not have the understanding and skill required, he 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/UXOQCS will complete the Training Form (see Table C.3-1). This form 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 C.3-1: USA Certification of PPE Training

SITE INFORMATION	
Site Name: TCRA	
Location: **Cayo del Agua, Culebra Island, Puerto Rico**	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:

C.3.6 MEDICAL SURVEILLANCE

Medical surveillance of USA employees will be conducted in accordance with the requirements of the Occupational Safety and Health Administration (OSHA) 29 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 EZ must participate in their employer's Medical Surveillance Program and must have a current physician's statement prior to entry.

C.3.6.1 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 CHSM, will ensure that all health assessments address the site-specific health hazards to which workers may be exposed.

Physicals will be scheduled through the Human Resources department of USA, 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 USA medical surveillance program examination consists of:

- Medical and occupational history questionnaire, which includes information on past gastrointestinal, hematological, renal, cardiovascular, reproductive, immunological, and neuralgic problems
- Information and history of respiratory disease and personal smoking habits
- Physical examination
- Blood pressure measurements
- Complete blood count and differential to include hemoglobin and hematocrit determinations, red cell indices, and smear of peripheral morphology
- Blood urea nitrogen and serum creatinine
- SMAC 24
- Chest x-ray
- Pulmonary function test
- Audiogram
- Echocardiogram for employees over 45 years old, or when other complications indicate the necessity
- Drug (HR Panel 10) and alcohol screening
- Visual acuity.

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 any 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 them from working at hazardous waste sites.

Subcontractors will certify that all their employees have successfully completed a physical examination by a qualified occupational health physician and will supply certification of medical clearance for each on-site employee.

C.3.6.2 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:

- 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.

C.3.6.3 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 on the type of injury, illness, and 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.

C.3.6.4 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.

C.3.6.5 Emergency and Non-emergency Medical Treatment

USA will have a minimum of two site workers certified in First Aid/cardiopulmonary resuscitation (CPR). These workers will act as the first responders on site in the event of an accident or injury. The UXOSO/UXOQCS will be contacted whenever an incident occurs. The UXOSO/UXOQCS will summon the

First Responders, who will provide emergency First Aid services or stabilize the patient until professional medical personnel arrive on site to take over the treatment. The First Responders will take care of all First Aid and non-serious injuries to site personnel and will inform the UXOSO/UXOQCS when such injuries occur. If professional medical assistance is required, based on the condition of the patient the UXOSO/UXOQCS will either contact the med-evac helicopter or will ask the Captain to return to the Ferry dock and summon the ambulance to meet the boat at the doc to transport the patient to the hospital. For serious injuries, the medical treatment facility for use at this project site will be Culebra Health Center, Font Final CII, Culebra, PR 775. This is a Community Health Center and the closest medical facility. For more serious emergencies, personnel would use the med-evac helicopter, which would transport them to a larger hospital on the main island of Puerto Rico.

C.3.6.6 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.

C.3.6.7 Record Keeping

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, FL. 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.

C.3.7 EXPOSURE MONITORING/AIR SAMPLING PROGRAM

There will be limited monitoring for hazardous exposures on this site. While personnel performing vegetation removal operations will be provided with hearing protection, noise monitoring may also be conducted. If the noise exposure level can be consistently demonstrated to be below the action level for noise (i.e., at least one week of readings below 85 dBA), the CHSM may decide to reduce this requirement based on monitoring results. See Section C.9.10 of the APP for additional information. Workers on this site will normally be in Level D PPE; however, heat stress monitoring will be required if the temperature goes above 75 °F. Should heat stress monitoring be required, site monitoring data will be recorded using the Site Monitoring Log and will be maintained as part of the project record. Meteorological monitoring may also be conducted to ensure that adverse weather conditions do not impact on site operations.

C.3.7.1 Heat Stress Monitoring

Heat stress monitoring will be conducted using temperature readings, obtained from an on-site WBGT, in order to ensure adequate work/rest cycles are determined and implemented at the site. When the temperature approaches 75 °F or above, heat stress monitoring is required. Monitoring will be performed by the UXOSO/UXOQCS and results will be documented. The WBGT readings may also be supplemented by pulse rate monitoring at the discretion of the UXOSO/UXOQCS, if he feels it is necessary to ensure all site personnel are adequately acclimatized to the site conditions. All site monitoring records for heat stress will be maintained on site for the duration of site operations, after which they will become part of the official project files. Plenty of cold drinking water will be available on site to maintain hydration of site personnel. See Section C.3.8 of this SSHP for additional information.

C.3.7.2 Meteorological Monitoring

Rain can constitute a safety hazard to field operations at this site. The UXOSO/UXOQCS 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, then site operations will cease until the UXOSO/UXOQCS determines the area is safe to continue.

No site operations will take place if an electrical storm is within 10 miles of the site. An electrical storm monitor, set to the proper distance, 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/UXOQCS determines that the electrical storm is at least 10 miles away from the site. Personnel will evacuate the site to the pre-designated evacuation point and will await the determination by the UXOSO/UXOQCS that it is safe to resume operations.

C.3.7.3 Perimeter Monitoring

No perimeter monitoring is required.

C.3.7.4 Ionizing Radiation Monitoring

Ionizing radiation monitoring is not required under this PWS.

C.3.8 HEAT AND COLD STRESS

C.3.8.1 Heat Stress

Heat stress is one of the most common (and potentially serious) illnesses that affect hazardous waste site workers. When site personnel are engaged in operations involving hot environments, a number of physiological responses can occur that may seriously affect the health and safety of the workers. These effects can be eliminated or controlled through the use of a comprehensive heat stress prevention and monitoring program. Therefore, it is the objective of this program to outline the methods and procedures by USA personnel for the prevention, control and/or treatment of heat related illnesses.

Causes of Heat Stress – The most common cause of heat stress during site activities is the effect that PPE has on the body's natural cooling mechanism. Individuals will vary in their susceptibility and degree of response to the stress induced by increased body heat. Heat stress can result in health effects ranging from transient heat fatigue to serious illness or death. Heat stress is caused by a number of interacting factors including environmental condition, 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 that 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 (i.e., 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, the benefit of each item 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:

- 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/UXOQCS 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/UXOQCS 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/UXOQCS throughout the day.

Heat Stress Disorders – This section outlines the major heat-related illnesses that may result from exposure to high heat environments. For the purpose of this Program, reference to "liquids" will indicate the use of water or an electrolyte replacement solution, and not tea or coffee (unless it is decaffeinated) or carbonated soft drinks.

- 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 are 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 water.

- 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 due to excessive loss of fluids from the body. This condition leads to inadequate blood supply and cardiac insufficiency. Heat exhaustion, while not as dangerous as heat stroke, 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, and 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's core temperature rises very rapidly to a point [105 + degrees Fahrenheit (°F)] where brain damage and death will result if the person is not cooled quickly.

Symptoms: The victim's skin is hot, red and dry; nausea; dizziness; confusion; extremely high body temperatures; rapid respiratory and pulse rate; delirium; convulsions; 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.

- 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/UXOQCS will 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/UXOQCS.

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 16 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 4- to 12-ounce cups and liquids or bottles of water 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 ratio 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/UXOQCS, 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 adequate 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 °F to 60 °F (10 °C to 15.6 °C).
- Provide small disposable cups that hold about 4 ounces (0.1 liter).
- Have workers drink 16 ounces (0.5 liter) 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.

  - 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.

- 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. USA uses portable heat stress Wet Bulb Globe Temperature (WBGT) instrumentation to determine level of work load and rest periods. Heart rate monitoring may be used as an additional means of monitoring at the discretion of the UXOSO/UXOQCS. The frequency of physiological monitoring depends on the air temperature adjusted for solar radiation and the level of physical work (see Table C.3-3). 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 American Conference of Governmental Industrial Hygienists (ACGIH) TLVs 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 in ambient temperatures greater than 75 °F, heat stress monitoring will be conducted. The goal of all heat stress monitoring is to ensure that the worker's body temperature does not exceed 100.4 °F. The monitoring methods listed below are to be implemented based upon the severity of the heat and workload. As a minimum, the UXOSO/UXOQCS will perform WBGT monitoring. The UXOSO/UXOQCS may also monitor the worker's heart rate as an indication of potential heat stress. The frequency of physiological monitoring will be determined using the information presented in Table C.3-3.

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/UXOQCS modifies the procedures and documents the log. Frequency of monitoring should increase as the ambient temperature increases or as slow recovery rates to baseline (pre-work) levels are indicated.

Table C.3-2: Suggested Frequency of Physiological Monitoring[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 or short sleeves and long pants.

– WBGT Monitoring

For site conditions where personnel are working in Level D PPE, and the ambient temperature is greater than 75 °F, the UXOSO/UXOQCS will conduct WBGT monitoring to assist in controlling the potential for site workers experiencing heat-related adverse health effects. The UXOSO/UXOQCS will use a real-time direct reading WBGT monitor, and after estimating the work load, use the values expressed in Table C.3-3 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.

Table C.3-3: Permissible WBGT Heat Exposure Threshold Limit Values

Work – Rest Regimen	WORK LOAD		
	Light*	Moderate	Heavy
Continuous work	86 (30.0)	80 (26.7)	77 (25.0)
75% Work - 25% Rest, each hour	87 (30.6)	82 (28.0)	78 (25.9)
50% Work - 50% Rest, each hour	89 (31.4)	85 (29.4)	82 (27.9)
25% Work - 75% Rest, each hour	90 (32.2)	88 (31.1)	86 (30.0)

* Consult the ACGIH TLV booklet for definitions of Light, Moderate and Heavy workloads.

Values are given in °F and (°C) WBGT, and are intended for workers wearing single layer summer type clothing. Use of semi-permeable or totally impermeable clothing requires monitoring IAW the USA Heat Stress Prevention Program.

As workload increases, the heat stress impact on an unacclimatized worker is exacerbated. For unacclimatized workers performing a moderate level of work, the permissible heat exposure TLV should be reduced by approximately 4.4 °F (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 thirty 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 one hundred and ten (110) beats per minute (bpm). If the PR is higher than 110 bpm, the next work period should be shortened by thirty-three 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 thirty-three percent. This procedure will be continued until the worker's PR at the beginning of the rest cycle is maintained below 110 bpm.

- Heat Stress Documentation

The UXOSO/UXOQCS will be responsible for recording all heat stress related information. This will include training sessions, 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 Checklist (Figure C.3-6), with the WBGT.

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Figure C.3-6: Heat Stress Field Monitoring and Alert Checklist

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

037 USA Form
Original: March 2011

C.3.8.2 Cold Stress

Cold stress is not expected to be an issue on this site due to the site location.

C.3.9 STANDARD OPERATING SAFETY PROCEDURES, ENGINEERING CONTROLS AND WORK PRACTICES

Using common sense and following safe practices can reduce hazards. Personnel must keep the prudent guidelines listed below in mind when conducting field activities.

- Hazard assessment is a continuous process. Personnel must be aware of their surroundings and constantly be aware of MEC, chemical and physical hazards that are or may be present.
- The number of personnel in the EZ 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.
- Detection or appearance of unusual or unknown liquids, odors or discolored soil could indicate the presence of contaminants and should be reported to the UXOSO/UXOQCS immediately.
- Site personnel are to report any other unusual or potentially hazardous condition to the UXOSO/UXOQCS for investigation and/or corrective action.

C.3.9.1 Site Rules and 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 Director of Safety and Quality or CHSM to include additional safe work practices and other control methods as needed.

C.3.9.1.1 Buddy System

The buddy system is a safety practice in which each individual is concerned with the health and wellbeing 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/UXOQCS. The UXOSO/UXOQCS will assign “buddies” to ensure accounting of all site personnel. Additional procedures include:

- A minimum of two personnel, with one being a UXO-qualified person, will be present during all MEC operations to ensure that one person will always act as a safety observer. During all MEC operations, only the minimum number of personnel required to safely perform the task will be allowed on site. All other personnel will evacuate to a pre-designated assembly point.
- 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 EZ together and frequently monitor one another for signs of fatigue, heat 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.

C.3.9.1.2 Eating/Drinking/Smoking Restrictions

Hand and face washing facilities will be set up at the USA site and will be utilized by all personnel exiting the EZ 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. Eating, drinking, and tobacco use will take place in the support zone (SZ).

Smoking will only be permitted 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.

C.3.9.1.3 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:

- 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/UXOQCS, receive an appropriate safety briefing, and be escorted by UXO-qualified personnel at all times while on site.

C.3.9.2 Work Permit Requirements

At this time USA does not anticipate work permits for the work associated with this project. Should this situation change, this SSHP will be updated to include these additional hazards, and will handle them in accordance with the USA Corporate Safety and Health Program, which addresses all of these issues.

C.3.9.2.1 Radioactive Work

Work involving ionizing radiation is not anticipated under this PWS.

C.3.9.2.2 Excavation Work

This is an uninhabited Cayo, with no buried utilities, so digging permits will not be required.

C.3.9.2.3 Hot Work

As there are no plans for welding operations on this site, there will be no requirement for hot work permits.

C.3.9.2.4 Confined Space

As there are no plans for confined space work on this site, confined space permits will not be required.

C.3.9.2.5 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 pounds) 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.

C.3.9.2.6 Soil Handling Procedures

If workers will be required to handle potentially contaminated soil, they will use appropriate personal protective equipment based on the specific type of chemical contamination. Chemical contamination in soil is not expected at this site, however soil sampling activities will be conducted for the presence of munitions constituents.

C.3.9.2.7 Liquid Handling Procedures

If workers will be required to handle liquid chemical materials, appropriate personal protective equipment will be used based on the specific type of chemical(s) to which they may be exposed. The chemicals expected to be brought to this site include fuels and lubricants for equipment. All flammable liquids will be stored in approved flammable liquid containers and stored in designated flammable liquid storage areas. Grounding and bonding procedures will be used when dispensing flammable liquids from one container to another or into equipment. No equipment will be fueled in the back of a pick-up truck with a bed liner due to static electricity concerns. No smoking will be permitted within at least 50 ft of flammable liquid use or storage.

C.3.9.2.8 Radioactive Materials Handling Procedures

Radioactive materials are not expected to be handled at this project site.

C.3.9.2.9 Spill Contingency

Small quantity containers of chemicals will be used at the work site, 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, oils and lubricants for use in vegetation clearance equipment. Spill clean-up kits will be available for use to clean up these chemicals and the impacted soils 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 drums or other secured location until such time as they can be removed from the site and sent to a certified disposition facility.

C.3.9.3 Drum, Container, and Tank Handling

USA does not anticipate the use of drums, containers, or tanks during activities under the PWS.

C.3.9.4 Comprehensive Activity Hazard Analysis of Treatment Technologies

Treatment technologies are not expected to be used on this project.

C.3.10 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 EZ 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.

C.3.10.1 Site Map

A site map (see Appendix B of the MEC QAPP for detailed site maps) will be utilized by the UXOSO/UXOQCS 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 will include:

- Site topography
- Site work zones
- Location of unusual/hazardous areas
- Prevailing winds
- Ingress and egress corridors
- Evacuation routes and assembly points
- Location of emergency supplies.

C.3.10.2 Work Zone Delineation and Access Points

Site work zones will be established by the UXOSO/UXOQCS prior to initiating operations to control site access. Establishment of site work zones is based upon site conditions, activities, and exposure potentials. A site EZ will be set up, which includes the footprint of the area where work will take place and a minimum distance around that, based on the HFD of the munition with the greatest fragmentation distance (MGFD), to protect areas outside the site from potential site hazards. The quantity-distances in the approved ESS will be adhered to throughout the TCRA.

The MSD is based on the K40 distance of the MGFD, and is designed to protect the teams from each other's operations.

C.3.10.3 On and Off-Site Communication System

On-site communication will be conducted by voice, radio or hand signals. There may also be an alarm signal, such as an air horn, used for the purpose of site evacuation. Radio communication will be used between teams.

If off-site communication is required, it will be established through the use of Puerto Rican cellular telephones and radio. The list of emergency telephone numbers will be posted with each cell phone. Communications equipment will be tested daily prior to the start of field work to ensure there is always a means of emergency communication available to each team.

C.3.10.4 Site Access Control

The UXOSO/UXOQCS will control access to each work zone 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. Cayo del Agua is uninhabited and is only accessible via boat or air. The following work zones will be established at this site:

- Exclusion Zone (EZ) – Area where a significant hazard does or could occur and includes all areas where PPE is required to control worker exposure to chemical or physical hazards. All personnel entering the EZ will be logged in/out by the UXOSO/UXOQCS. All visitors to the EZ must be escorted by a UXO-qualified USA employee (normally this would be the UXOSO/UXOQCS).

  The EZ is based on the MGFD for Cayo del Agua as described in the approved ESS. The MGFD for this site is the 2000-lb Mk 84 HE Bomb. When personnel who are not UXO qualified/Essential Personnel/Authorized Visitors (Authorized by the USACE in Writing) are required to enter within the EZ, all MEC operations will cease until all unrelated personnel are outside of the EZ. If a more hazardous MEC item is encountered, the EZ will be extended based on the HFD of the updated MGFD IAW DoD 6055.09M. The quantity-distances in the approved ESS will be adhered to throughout the TCRA.
- Support Zone (SZ) – Area outside the EZ where site support activities are conducted will be primarily on the boat. This zone includes break areas and sanitation facilities. Visitors desiring entry into the EZ must first meet with the UXOSO/UXOQCS and receive the appropriate safety and emergency procedures briefing in the SZ before travelling to the site on the boat and gaining admittance to the EZ. In addition, visitors will be escorted at all times by a UXO-qualified employee while in the EZ.

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
- Terrain
- Expected weather conditions
- Planned site activities

The degree of site access control will include the following:

- Controlled site ingress/egress points – Work area will be patrolled by a support vessel advising vessels of explosive hazards and Very High Frequency (VHF) warning them not to enter. Direct communication with encroaching vessels will be done via VHF Channel 16. USA will coordinate with the Coast Guard regarding our work location. The Coast Guard will issue repeated radio warnings to mariners to avoid the area through NOTMAR. USA will also have two security boats with Spanish-speaking Captains to patrol the perimeter of the EZ in order to turn away vessels attempting to enter the area. Only authorized personnel will be permitted within the EZ during MEC operations. All others will remain in the SZ.
- 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/UXOQCS. Visitors will be briefed on site hazards, PPE requirements, and emergency procedures. Visitors who are not UXO-qualified will not be permitted within the EZ during MEC operations. If visitors need to access the EZ, all MEC operations will cease while they are in the area, and the visitors will be escorted at all times.

- 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.

C.3.10.5 Security Procedures

Access to the site will be controlled by USA. Operations will be coordinated with the U.S. Coast Guard to ensure USA operations will not adversely impact watercraft in the area. The local authorities will be notified when a disposal operation is to take place. Local emergency response authorities will be contacted when an emergency occurs that will require the U.S. Coast Guard/med-evac helicopter/ambulance to respond. USA will continue to coordinate operations for the duration of this project to ensure that the EZ is maintained and to ensure that our operations do not adversely impact on the general public in the area.

C.3.11 PERSONNEL HYGIENE AND DECONTAMINATION

Sanitation facilities will be provided on the boat so that employees can wash prior to eating, drinking, smoking, or engaging in any other hand-to-face activities. 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):

- Toilet facilities will be provided on the boat.
- 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 consisting of bottled eyewash solution will also be located with each site First Aid kit, and with the First Aid kit on the boat.

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.
- If potentially contaminated sharps are encountered, the item will immediately be disposed of in an appropriate puncture-proof container or decontaminated.
- 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 or other hazardous 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.

C.3.12 EQUIPMENT DECONTAMINATION

Because chemical contamination is not anticipated to be a problem at this site, basic washing of equipment is all that will be required.

C.3.13 EMERGENCY EQUIPMENT AND FIRST AID

An approved emergency First Aid kit, blood-borne pathogen kit, CPR mask, stretcher, blankets, eyewash kits, trauma supplies, and basic emergency equipment will be kept on the boat. A First Aid kit, blood-borne pathogen kit, CPR mask 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. A minimum of two USA employees

on the site will be First Aid/CPR certified and will serve as the first responders to any site emergency. The UXOSO/UXOQCS will be charged with providing regular inspections of the emergency supplies, replacing any items that are used, and maintaining readiness. Any emergencies will be reported immediately to the UXOSO/UXOQCS, who will make the determination as to whether professional medical treatment is required. The UXOSO/UXOQCS will call for a med-evac helicopter in case of a serious emergency, or he will direct the Captain to transport the patient to Culebra Island Ferry dock and have the ambulance meet the patient there to provide transport to the hospital. for situations that are not life-threatening, but still require professional medical care.

Eyewash kits will be located in the work area. A 10B:C fire extinguisher will be kept in each site vehicle and on the boat for emergency use on site. A fire extinguisher will also be readily available for each operating team on the site. This equipment will be inspected on a weekly basis to ensure it is maintained and ready to use. Fire extinguishers located on vehicles must be readily available to the driver or operator. Any used items will be replaced immediately.

Fire extinguishers will be stored where they are well marked and readily accessible. Fire extinguishers will be protected from the damaging effects of environmental elements. The UXOSO/UXOQCS is responsible for ensuring that all fire extinguishers are visually inspected monthly 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.

C.3.14 EMERGENCY RESPONSE PLAN AND CONTINGENCY PROCEDURES

The Emergency Response Plan and contingency procedures address emergencies that could occur during site operations, and outlines the appropriate response actions. This information can be found in Section C.9.2, “Emergency Plans” under “Plans, Programs, and Procedures” (Section C.9) of the APP.

C.3.14.1 Pre-Emergency Planning

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/UXOQCS will verify all on-site emergency services information, to include procedures for requesting services. It will be the UXOSO/UXOQCS’s responsibility to post these procedures and contact information in accordance with the requirements of this SSHP and APP. Pre-emergency planning tasks include:

- Post emergency instructions and call numbers at accessible telephone locations.
- 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 hospital marked and highlighted, with copies of this map posted in all site vehicles (see Attachment provided at the end of this SSHP).
- 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 PWS affect the ERCP.
- Before normal activities are resumed, onsite personnel must be prepared and equipped to handle another emergency. These follow-up activities should be completed:
  - The CHSM will notify appropriate government agencies as required (Reminder: OSHA must be notified if there have been any fatalities, work-related hospitalizations, amputation or loss of an eye).
  - All equipment and supplies restocked, serviced and inspected.
  - 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, all personnel will review the points of contact list and where it is posted as well as location of the nearest hospital. A meeting place will be identified as the boat in case of emergency evacuation and the responsibilities of all persons on site. 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.

C.3.14.2 Personnel Roles, Lines of Authority, Training, and Communication

In the event of an emergency, the UXOSO/UXOQCS 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/UXOQCS will call in the first responders and the UXOSO/UXOQCS will determine if professional medical assistance (EMS) is required and will summon emergency response personnel if required.

C.3.14.2.1 Personnel and Lines of Authority for Emergency Situations

Specific responsibilities of the UXOSO/UXOQCS include, but are not limited to, the following:

- Notifying local Coast Guard, med-evac helicopter, ambulance and other off-site emergency units, as required
- Notifying the USACE Project Manager and providing updates as conditions change
- Directing offsite 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 Director of Safety and Quality and/or CHSM
- Ensuring that on-site emergency response personnel don the proper PPE if needed
- Assisting on-site emergency response personnel with treatment and transport of sick/injured
- Providing medical background information of the sick/injured and applicable site health and safety information to the off-site emergency medical responders
- Accompanying sick/injured personnel to hospital.

If the emergency involves employee injury, UXOSO/UXOQCS will complete the USA Accident Report. The CHSM will be responsible for notifying applicable Federal, state and local authorities/agencies. Once the emergency has been resolved, the UXOSO/UXOQCS, Project Manager, and CHSM 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/UXOQCS
- 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.

C.3.14.2.2 Training

USA personnel receive training in emergency procedures in response to potential incident scenarios of all kinds on the site as part of their mobilization training. Part of this training involves the clean-up of small spills of hazardous materials, as well as the use of emergency equipment such as fire extinguishers, etc.

C.3.14.2.3 Communications

USA maintains communication with the local authorities throughout the course of daily operations. In the event of an emergency, the local authorities will be contacted and made aware of the situation. The UXOSO/UXOQCS will contact emergency response organizations as required.

C.3.14.3 Emergency Recognition and Prevention

An emergency is an unplanned event that threatens the safety of any personnel. Compliance with this SSHP can assist in the prevention of anticipated site emergencies. These emergency situations can easily be recognized by visual observations, worker complaints, or monitoring instruments.

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
- Health emergencies.

Prevention of emergencies will be aided by the effective implementation of this SSHP and APP, 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/UXOQCS 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 on the boat
- Begin emergency procedures
- Notify off-site emergency response organizations.

After evacuation, the UXOSO/UXOQCS will account for all personnel, ascertain information about the emergency and advise responding onsite personnel. The UXOSO/UXOQCS will contact, advise, and coordinate with responding off-site emergency personnel if deemed necessary by the situation. In all situations that require evacuation, personnel will not re-enter the work area until:

- The conditions causing the emergency have been corrected
- The hazard has been reassessed
- The SSHP has been revised and reviewed with onsite personnel, if needed
- Instructions have been given for authorized re-entry by the UXOSO/UXOQCS.

C.3.14.4 Safe Distances and Places of Refuge

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

- 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.

The EZ of this project is the actual project footprint and an additional distance of the HFD of the MGFD for each area to provide for the protection of the public from MEC operations on this site. The quantity-distances in the approved ESS will be adhered to throughout the TCRA. In the case of encountering a CWM item, personnel would evacuate at least 450 ft upwind of the item. Because this location would change with the shifting winds, it cannot be specifically identified.

C.3.14.5 Site Security and Control

USA will maintain control of the site during operations. The site will be marked and visitors will be required to check in with the SUXOS and/or UXOSO/UXOQCS prior to leaving on the boat for the site, where they will receive a briefing on safety and emergency procedures of the site. Visitors to the site will also provide documentation to verify that they have current Hazardous Waste Operations and Emergency Response (HAZWOPER) Training and a HAZWOPER physical that will allow them to enter a hazardous waste operations site. Visitors meeting these requirements who have a need to access the site will be required to have a UXO-qualified escort for the duration of their visit to the site (normally the UXOSO/UXOQCS) and wear the PPE required for site operations. Unauthorized persons will not be admitted into the EZ of the site.

During an emergency situation, USA personnel will evacuate personnel from the area to the boat, which is the designated evacuation location. Emergency responders will be called to the site to assist as required. USA personnel will inform emergency responders of MEC or other known hazards at the site and required PPE for entering the site; they will also provide assistance to emergency responders if requested to do so.

C.3.14.6 Evacuation Routes and Procedures

The UXOSO/UXOQCS 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.

In the event of an emergency requiring evacuation, the evacuation signal will be given as an alarm or through verbal instructions. Personnel will evacuate to the boat while on Cayo del Agua. The UXOSO/UXOQCS will account for all personnel and will summon emergency response personnel, if required.

Potentially hazardous weather conditions will be closely monitored by the UXOSO/UXOQCS. The UXOSO/UXOQCS will determine if high wind or heavy rain conditions pose a hazard to site operations, in which case, personnel will evacuate to the pre-determined evacuation point and will wait for conditions to clear or for further instructions from the UXOSO/UXOQCS.

After the emergency situation has been controlled and eliminated, or has passed, the Project Manager, UXOSO/UXOQCS, and CHSM will review the way the emergency was handled and change procedures if necessary.

After allowing the appropriate wait time (24 hours in the case of a fire), the SUXOS and the UXOSO/UXOQCS will enter the site together and determine whether the site is safe for re-entry. If MEC is encountered that may have been subjected to extreme temperatures in a fire, it will be considered unacceptable to be moved and will be blown in place.

C.3.14.7 Decontamination

Because of the nature of work to be performed on this site, personnel are not expected to come into contact with leaking hazardous substances, so personnel decontamination stations are not required. Basic cleaning (washing face and hands) is all that will be required.

C.3.14.8 Emergency Medical Facilities

Because of the nature of work to be performed on this site, a significant hazardous substance spill is unlikely to occur. There will be a minimum of two personnel trained and certified in First Aid/CPR onsite who will respond to site emergencies and will provide First Aid care as necessary until medical authorities arrive and take over. They will have supplies and equipment on hand to decontaminate any chemical substance from the victim and to provide First Aid treatment. A map to the nearest hospital can be found on the last page of this SSHP. The list of emergency telephone numbers can be found in the APP at Section C.9.2.5.

C.3.14.9 Emergency Alerting and Response Procedures

The emergency alerting procedures for a hazardous substance spill is the same for other emergencies that could occur on this site. 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
- Begin emergency procedures
- Notify off-site emergency response organizations, as required.

C.3.14.10 Critique of Response and Follow-Up

Following any emergency drill or actual emergency, the PM, SUXOS, UXOSO/UXOQCS, and CHSM will review the incident or drill and evaluate the effectiveness of the emergency response. If there were areas of weakness in the emergency response action, the procedures will be adjusted accordingly in order to address problems prior to the next emergency.

C.3.14.11 PPE and Emergency Response Equipment

Because of the PWS for this project, special PPE will not be required for responding to an emergency. An approved emergency First Aid kit, blood-borne pathogen kit, CPR mask, stretcher, blankets, eyewash kits, trauma supplies, and basic emergency equipment will be kept on the boat and will be available for use. Each field team will have access to a First Aid kit, blood-borne pathogen kit, eyewash, and fire extinguishers. A minimum of two USA employees on the site will be First Aid/CPR certified and will serve as the first responders to any site emergency. The UXOSO/UXOQCS will be charged with providing regular inspections of the emergency supplies, replacing any items that are used, and maintaining readiness.

C.3.15 EMERGENCY RESPONSE TEAM

In the event of an on-site emergency the individual team leader or first person aware of the emergency will contact the UXOSO/UXOQCS. There will be at least two site personnel who are currently trained in First Aid/CPR. The UXOSO/UXOQCS will normally be responsible for contacting the first responders to render emergency First Aid treatment, and the UXOSO/UXOQCS will authorize site personnel to assist, where required. The UXOSO/UXOQCS will contact the med-evac helicopter or ambulance to transport the victim to the hospital, should that be needed. 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 UXOSO/UXOQCS will function as the On-Scene Incident Commander in emergency response actions. During any site emergency, the UXOSO/UXOQCS will direct other site workers to assist in such areas as using fire extinguishers to put out fires in their incipient stages, evacuation to the designation evacuation location, etc. The UXOSO/UXOQCS will be responsible for assessing the situation and for calling for assistance from local emergency response organizations, as required. The UXOSO/UXOQCS will interface directly with emergency response organizations when they arrive on the site and will direct USA workers to assist if requested to do so.

C.3.15.1 Personnel Training Requirements

Training in emergency procedures will be accomplished as part of the site mobilization training and by performing drills. After any drill or real emergency scenario, the PM, CHSM, SUXOS and UXOSO/UXOQCS will evaluate the situation and determine any potential areas for improvement in the procedures. Procedures will be updated accordingly, and all site personnel will be made aware of any such changes.

At least two personnel on the site will have current training in First Aid/CPR.

C.3.15.2 Emergency Response Team Responsibilities

The site Emergency Response Team (ERT) will respond in a defensive manner to all emergency situations that arise on the site. The ERT will be trained to respond to all types of emergencies that are expected to arise on this project site. Due to the PWS for this project, major hazardous substance releases are not expected to occur; however, site personnel will be trained and equipped to respond to small spills of chemical materials. All site personnel will be trained in the use of a fire extinguisher and the situations when a fire extinguisher should and should not be used. The personnel trained in First Aid/CPR will respond to all injury situations in order to provide First Aid assistance until professional medical assistance arrives.

C.3.16 LOGS, REPORTS, AND RECORD KEEPING

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.

C.3.16.1 Recordkeeping Procedures

Each person on the site will have an individual file folder, which contains a copy of the following:

- 40-hr HAZWOPER Certificate
- Current 8-hr HAZWOPER Annual Refresher Certificate
- 8-hr HAZWOPER Supervisor Certificate, if applicable
- Explosive Ordnance Disposal Training Certificate
- Any other applicable training certificates.

Personnel folders will be maintained by the UXOSO/UXOQCS for the duration of site activities. A Training/Tailgate Safety Record will be completed for all on-site daily training. The UXOSO/UXOQCS will maintain the file, which will be made available for the client as requested.

C.3.16.1.1 Training Logs

Training logs documenting all training received on the project site will be maintained by the UXOSO/UXOQCS. This will include mobilization training, daily safety briefings, as well as other training and safety meetings. APP/SSHP training will be documented with signature sheets, which will remain on site for the duration of project operations. Daily safety briefings will also be documented on forms and signed by all personnel in attendance with forms maintained in files on site. Formal training in PPE, or other specific training, will also be documented on USA Documentation of Training forms and will remain on file at the site for the duration of site operations.

C.3.16.1.2 Daily Safety Inspection Logs

The UXOSO/UXOQCS will perform and document daily and weekly safety inspections of all site operations on a scheduled and non-scheduled basis. The UXOSO/UXOQCS 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 C.3-4. When discrepancies are observed, follow-

up will be documented in the UXOSO/UXOQCS log until the corrective actions required have been completed.

Table C.3-4: Inspection Type and Frequency

Area	Frequency
Sanitation	Daily
Medical and First Aid	Daily
Temporary Facilities	Weekly
Personal Protective and Safety Equipment	Daily
Hazardous Substances, Agents, and Environments	Weekly
Lighting	Monthly
Accident Prevention Signs, Tags, Labels, and Signals and Piping System Identification	Monthly
Fire Prevention and Protection	Weekly
Hand and Power Tools	Daily, if applicable
Material Handling, Storage and Disposal	Weekly
Machinery and Mechanized Equipment	Daily, if applicable
Motor Vehicles	Daily
Safe Access and Fall Protection	Weekly, if applicable
HTRW	Daily, if applicable

C.3.17 EMPLOYEE/VISITOR REGISTERS

The Visitors Log will be maintained by the UXOSO/UXOQCS 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. The Visitors Log will be maintained on the site for the duration of site operations. Visitors who have been approved in writing by the USACE as "Authorized Visitors" may access the site per the authorization letter provided by the USACE. However, "Authorized Visitors" will still be required to sign the Visitors Log and attend a safety briefing as a minimum requirement.

Employees sign in each day on the daily safety briefing forms, which are maintained on site for the duration of site activities.

C.3.18 MEDICAL SURVEILLANCE RECORDS AND CERTIFICATIONS

A copy of the Physician's 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 personnel folder with the HAZWOPER certificates. The Physician's 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 USA Corporate Office in Oldsmar, FL, at the end of site operations.

C.3.19 SITE MONITORING RESULTS

All site monitoring results will be documented. This 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. At this site, heat exposure

monitoring is the only monitoring anticipated, and that is dependent upon the site temperature and wind speed. No air monitoring is anticipated at this site.

C.3.19.1 Personal Exposure Records

Due to the PWS on this project, chemical exposures are not expected to occur. If changes in the PWS occur to require personal monitoring, this SSHP will be updated accordingly.

C.3.19.2 Personal Exposure and Medical Monitoring Records

Personal exposure records are not expected to be required on this project site. Medical monitoring records will be maintained in the individual personnel files on site for the duration of site operations. At the end of the field work, these records will be transferred to the USA Corporate office in Oldsmar, Florida, for the duration of employment plus 30 years.

C.3.19.3 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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Attachment: Map and Directions to Hospital

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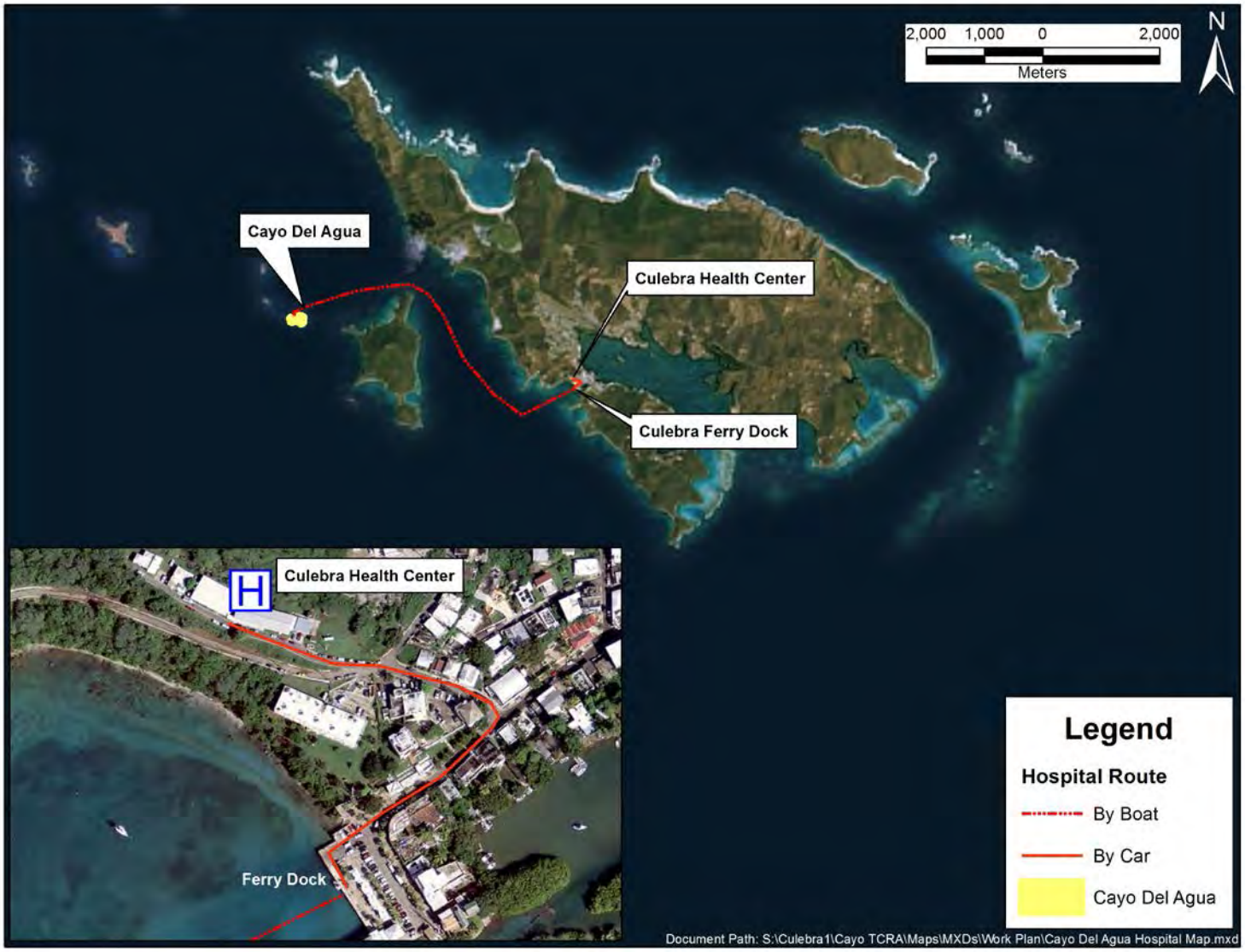
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APPENDIX C. ATTACHMENT 4: 2016 DRUG FREE WORK PLACE PROGRAM

This appendix contains a signed copy of the 2016 Drug Free Work Place Program.

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DRUG FREE WORK PLACE PROGRAM

January 01, 2016

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 - Quaaludes
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)

720 Brooker Creek Blvd., Suite 204, Oldsmar, FL 34677 Tel.: (813) 343-6336 Fax: (813) 343-6337

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 ENVIRONMENTAL, 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
Vice President of Human Resources
and Administration

APPENDIX C. ATTACHMENT 5: MATERIAL SAFETY DATA SHEETS / SAFETY DATA SHEETS

This appendix contains a copy of the following material safety data sheets (MSDs) / safety data sheets (SDSs):

- 2 Cycle oil
- 401-Kinepak Liquid
- 402-Kinepak Liquid
- 1122-NONEL
- 1124-NONEL Lead Line
- Fire Extinguisher
- Cast Boosters
- Bleach
- Detonating Cord, C1
- Insect Repellent
- Permethrin 1
- Primafuse
- RDX Nylon Detonating Cord
- Unleaded Gasoline.

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Material Safety Data Sheet

1. Chemical product and company identification

Product name	Castrol Multi-Mix 3 (TC-W3)
MSDS #	462507
Code	462507-US06
Product use	Engine oils For specific application advice see appropriate Technical Data Sheet or consult our company representative.
Manufacturer	BP Lubricants USA Inc. 1500 Valley Road Wayne, NJ 07470 Telephone: (973) 633-2200 Telecopier: (973) 633-7475
EMERGENCY HEALTH INFORMATION:	1 (800) 447-8735 Outside the US: +1 703-527-3887 (CHEMTREC)
EMERGENCY SPILL INFORMATION:	1 (800) 424-9300 CHEMTREC (USA)
OTHER PRODUCT INFORMATION	1 (866) 4 BP - MSDS (866-427-6737 Toll Free - North America) email: bpcares@bp.com

2. Composition/information on ingredients

Ingredient name	CAS #	%
Base oil - highly refined	64742-65-0	45 - 50
Straight run kerosine	64742-88-7	15 - 20
Base oil - highly refined	64742-01-4	15 - 20
Base oil - highly refined	64742-54-7	5 - 10

3. Hazards identification

Physical state Liquid.

Color Purple.

Emergency overview WARNING!

COMBUSTIBLE LIQUID AND VAPOR.
VAPOR MAY CAUSE FIRE.
MAY CAUSE EYE IRRITATION.
MAY CAUSE SKIN IRRITATION.
MAY CAUSE RESPIRATORY TRACT IRRITATION.

Avoid contact with eyes, skin and clothing. Avoid breathing vapor or mist. Keep away from heat, sparks and flame. Keep container closed. Use with adequate ventilation. Use only with adequate ventilation Wash thoroughly after handling. Prolonged or repeated contact can defat the skin and lead to irritation, cracking and/or dermatitis.

Routes of entry Dermal contact. Eye contact. Inhalation. Ingestion.

Potential health effects

Eyes May cause eye irritation.

Skin	May cause skin irritation. Prolonged or repeated contact can defat the skin and lead to irritation and/or dermatitis.
Inhalation	May cause respiratory tract irritation.
Ingestion	Ingestion may cause gastrointestinal irritation and diarrhea.
Medical conditions aggravated by over-exposure	None identified.

See toxicological Information (section 11).

4. First aid measures

Eye contact	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.
Skin contact	Immediately wash exposed skin with soap and water. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention if irritation develops.
Inhalation	If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion	Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention if symptoms appear. If large quantities of this material are swallowed, call a physician immediately.

5. Fire-fighting measures

Flammability of the product	Combustible.
Flash point	60 °C (Open cup) Cleveland.
Products of combustion	carbon oxides (CO, CO_2) (carbon monoxide, carbon dioxide)
Unusual fire/explosion hazards	Combustible liquid and vapor. Vapor may cause flash fire. Vapors may accumulate in low or confined areas, travel considerable distance to source of ignition and flash back. Runoff to sewer may create fire or explosion hazard. Non-explosive in the presence of the following materials or conditions: open flames, sparks and static discharge, heat and shocks and mechanical impacts.
Fire-fighting media and instructions	In case of fire, use water fog, foam, dry chemicals, or carbon dioxide. DO NOT FIGHT FIRE WHEN IT REACHES MATERIAL. Withdraw from fire and let it burn. Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. First move people out of line-of-sight of the scene and away from windows. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.
Protective clothing (fire)	Fire-fighters should wear positive pressure self-contained breathing apparatus (SCBA) and full turnout gear.

6. Accidental release measures

Personal precautions	Immediately contact emergency personnel. Eliminate all ignition sources. Keep unnecessary personnel away. Use suitable protective equipment (See Section: "Exposure controls/personal protection"). Follow all fire fighting procedures (See Section: "Fire-fighting measures"). Do not touch or walk through spilled material.
Environmental precautions and clean-up methods	If emergency personnel are unavailable, contain spilled material. For small spills add absorbent (soil may be used in the absence of other suitable materials) and use a non-sparking or explosion proof means to transfer material to a sealed, appropriate container for disposal. For large spills dike spilled material or otherwise contain material to ensure runoff does not reach a waterway. Place spilled material in an appropriate container for disposal. Avoid contact of spilled material with soil and prevent runoff entering surface waterways. See Section 13 for Waste Disposal Information.

Personal protection in case of a large spill

Chemical splash goggles. Chemical resistant protective suit. Boots. Chemical resistant gloves. Vapor respirator or a self-contained breathing apparatus. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

CAUTION: The protection provided by air-purifying respirators is limited. Use a positive pressure air-supplied respirator if there is any potential for an uncontrolled release, if exposure levels are not known, or if concentrations exceed the protection limits of air-purifying respirator.

7. Handling and storage

Handling

Avoid contact with skin and clothing. Avoid prolonged or repeated contact with skin. Avoid contact with eyes. Use only with adequate ventilation Avoid breathing vapor or mist. Keep away from heat, sparks and flame. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Wash thoroughly after handling.

Storage

Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

8. Exposure controls/personal protection

Occupational exposure limits

Ingredient name	Occupational exposure limits
Base oil - highly refined	**ACGIH (United States).** STEL: 10 mg/m^3 15 minute(s). Form: Oil mist, mineral TWA: 5 mg/m^3 8 hour(s). Form: Oil mist, mineral **OSHA (United States).** TWA: 5 mg/m^3 8 hour(s). Form: Oil mist, mineral
Straight run kerosine	None assigned.
Base oil - highly refined	**ACGIH (United States).** STEL: 10 mg/m^3 15 minute(s). Form: Oil mist, mineral TWA: 5 mg/m^3 8 hour(s). Form: Oil mist, mineral **OSHA (United States).** TWA: 5 mg/m^3 8 hour(s). Form: Oil mist, mineral
Base oil - highly refined	**ACGIH (United States).** TWA: 5 mg/m^3 8 hour(s). Form: Oil mist, mineral STEL: 10 mg/m^3 15 minute(s). Form: Oil mist, mineral **OSHA (United States).** TWA: 5 mg/m^3 8 hour(s). Form: Oil mist, mineral

Some states may enforce more stringent exposure limits.

Control Measures

Provide exhaust ventilation or other engineering controls to keep the relevant airborne concentrations below their respective occupational exposure limits. Ensure that eyewash stations and safety showers are close to the work-station location.

Hygiene measures

Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period.

Personal protection

Eyes Avoid contact with eyes. Chemical splash goggles.

Skin and body Avoid contact with skin and clothing. Wear suitable protective clothing.

Respiratory Use only with adequate ventilation Avoid breathing vapor or mist. In accordance with good industrial hygiene and safety work practices, airborne exposures should be controlled to the lowest extent practicable.

Hands Wear gloves that cannot be penetrated by chemicals or oil.
Recommended: Nitrile gloves.
The correct choice of protective gloves depends upon the chemicals being handled, the conditions of work and use, and the condition of the gloves (even the best chemically resistant glove will break down after repeated chemical exposures). Most gloves provide only a short time of protection before they must be discarded and replaced. Because specific work environments and material handling practices vary, safety procedures should be developed for each intended application. Gloves should therefore be chosen in consultation with the supplier/manufacturer and with a full assessment of the working conditions.

Consult your supervisor or S.O.P. for special handling directions

Consult local authorities for acceptable exposure limits.

9. Physical and chemical properties

Physical state	Liquid.
Odor	Hydrocarbon.
Color	Purple.
Heat of combustion	Not available.
Pour Point	-32 °C
Specific gravity	0.8686
Solubility	insoluble in water.
Viscosity	Kinematic: 6.97 mm^2/s (6.97 cSt) at 100°C

10. Stability and reactivity

Stability and reactivity	The product is stable.
Conditions to avoid	Keep away from heat, sparks and flame.
Incompatibility with various substances	Reactive or incompatible with the following materials: oxidizing materials.
Hazardous decomposition products	carbon oxides (CO, CO_2) (carbon monoxide, carbon dioxide)
Hazardous polymerization	Will not occur.

11. Toxicological information

Chronic toxicity

Carcinogenic effects No component of this product at levels greater than 0.1% is identified as a carcinogen by ACGIH or the International Agency for Research on Cancer (IARC). No component of this product present at levels greater than 0.1% is identified as a carcinogen by the U.S. National Toxicology Program (NTP) or the U.S. Occupational Safety and Health Act (OSHA).

Mutagenic effects No component of this product at levels greater than 0.1% is classified by established regulatory criteria as a mutagen.

Reproductive effects No component of this product at levels greater than or equal to 0.1% is classified by established regulatory criteria as a reproductive toxin.

Teratogenic effects No component of this product at levels greater than 0.1% is classified by established regulatory criteria as teratogenic or embryotoxic.

12. Ecological information

Ecotoxicity

No testing has been performed by the manufacturer.

13. Disposal considerations

Waste information

Avoid contact of spilled material and runoff with soil and surface waterways. Consult an environmental professional to determine if local, regional or national regulations would classify spilled or contaminated materials as hazardous waste. Use only approved transporters, recyclers, treatment, storage or disposal facilities. Dispose of in accordance with all applicable local and national regulations.

Consult your local or regional authorities.

14. Transport information

International transport regulations

Regulatory information	UN number	Proper shipping name	Class	Packing group	Label	Additional information
DOT Classification	NA1993	Combustible liquid, n.o.s. (Straight run kerosine)	Combustible liquid.	III	-----	**Remarks** Not regulated in containers less than 110 gallons.
TDG Classification	Not regulated.	Not regulated.	Not regulated.	Not regulated.	-----	Not regulated.
IMDG Classification	Not regulated.	Not regulated.	Not regulated.	Not regulated.	-----	Not regulated.
IATA/ICAO Classification	Not regulated.	Not regulated.	Not regulated.	Not regulated.	-----	Not regulated.

15. Regulatory information

U.S. Federal regulations

United States inventory (TSCA 8b): All components are listed or exempted.

TSCA 12(b) one-time export notification:: Naphthalene

This product is not regulated under Section 302 of SARA and 40 CFR Part 355.

SARA 311/312 MSDS distribution - chemical inventory - hazard identification: Castrol Multi-Mix 3 (TC-W3): Immediate (Acute) Health Hazard

SARA 313

Form R - Reporting requirements

This product does not contain any hazardous ingredients at or above regulated thresholds.

Supplier notification

This product does not contain any hazardous ingredients at or above regulated thresholds.

CERCLA Sections 102a/103 Hazardous Substances (40 CFR Part 302.4):: Naphthalene: 100 lbs. (45.36 kg);

State regulations

Massachusetts Substances

Massachusetts RTK: None of the components are listed.

New Jersey Hazardous Substances

New Jersey Hazardous Substances: None of the components are listed.

Pennsylvania RTK Hazardous Substances

Pennsylvania RTK: None of the components are listed.

WARNING: This product contains a chemical known to the State of California to cause cancer.
Naphthalene

Inventories

Canada inventory: All components are listed or exempted.

Europe inventory: All components are listed or exempted.

Australian Inventory Status: All components are listed or exempted.

China inventory (IECSC): All components are listed or exempted.

Japan inventory (ENCS): All components are listed or exempted.

Korea inventory (KECI): All components are listed or exempted.

Philippines inventory (PICCS): All components are listed or exempted.

16. Other information

Label requirements

WARNING!

COMBUSTIBLE LIQUID AND VAPOR.
VAPOR MAY CAUSE FIRE.
MAY CAUSE EYE IRRITATION.
MAY CAUSE SKIN IRRITATION.
MAY CAUSE RESPIRATORY TRACT IRRITATION.

HMIS® Rating :

Health	-	**1**
Flammability		**1**
Physical Hazard		**0**
Personal protection		**X**

National Fire Protection Association (U.S.A.)

History

Date of issue 04/05/2007.

Date of previous issue 03/23/2007.

Prepared by Product Stewardship

Notice to reader

NOTICE : This Material Safety Data Sheet is based upon data considered to be accurate at the time of its preparation. Despite our efforts, it may not be up to date or applicable to the circumstances of any particular case. We are not responsible for any damage or injury resulting from abnormal use, from any failure to follow appropriate practices or from hazards inherent in the nature of the product.

Material Safety Data Sheet

Preparation Date: 18-Feb-2008 **Revision Date:** 23-May-2011 **Revision Number:** 2

SECTION 1 – PRODUCT AND COMPANY IDENTIFICATION

Supplier(s):
Orica Canada Inc.
Maple Street
Brownsburg, QC
For MSDS Requests: 1-450-533-4201

Orica USA Inc.
33101 E. Quincy Avenue
Watkins, CO 80137-9406
For MSDS Requests: 1-303-268-5000

Manufacturer:
Hallowell Manufacturing LLC.
3600 NW 74th Street
Columbus, KS 66725-0348
1-620-597-2552

Product Name: **Kinepak™ (liquid)**
Product Code: 401
Alternate Name(s): K ⅓S, K ½WP, K1S, K1BB, K ½ FS, K1P, K2P, K4P, K ½ PS, K½S, K-1S/P
UN-No: UN1261
Recommended Use: Detonating agent.

24 EMERGENCY: CANADA: **1-877-561-3636 (Orica Transportation Emergency Response)**
USA: **1-800-424-9300 (CHEMTREC)**

FOR CHEMICAL EMERGENCIES (24 HOUR) INVOLVING TRANSPORTATION, SPILL, LEAK, RELEASE, FIRE OR ACCIDENTS: **IN CANADA CALL:** THE ORICA TRANSPORTATION EMERGENCY RESPONSE SYSTEM AT **1-877-561-3636. IN THE U.S. CALL: CHEMTREC 1-800-424-9300. IN THE U.S.:** FOR LOST, STOLEN, OR MISPLACED EXPLOSIVES CALL: BATF **1-800-800-3855.** FORM ATF F 5400.5 MUST BE COMPLETED AND LOCAL AUTHORITIES (STATE/MUNICIPAL POLICE, ETC.) MUST BE ADVISED.

SECTION 2 – HAZARD IDENTIFICATION

Emergency Overview:
Warning! Flammable liquid and vapor. Harmful if swallowed, inhaled or absorbed though skin. This product contains one or more substances, which are classified in the EU as carcinogenic, mutagenic and/ or reprotoxic. Causes irritations to skin, eyes and respiratory tract. Forms shock-sensitive mixtures with certain other materials. Affects central nervous system. Compounds formed with strong alkalis are explosive when dry.

Appearance:
Clear, oily liquid

Physical State:
Liquid

Odor:
Disagreeable and choking

SECTION 3 – COMPOSITION/ INFORMATION ON INGREDIENTS

Chemical Name	CAS-No	Weight %
Nitromethane	75-52-5	80 - 95
Nitroethane	79-24-3	5-20

SECTION 4 – FIRST AID MEASURES

General Advice: In case of accident or if you feel unwell, seek medical advice IMMEDIATELY (show the product label where possible).

Eye Contact: May cause irritation and corneal damage. Immediately flush with plenty of water. After initial flushing, remove any contact lenses and continue flushing for at least 15 minutes. Immediate medical attention is required.

Skin Contact: May cause irritation, redness, and pain. May be absorbed through skin with symptoms similar to those from inhalation. Wash off immediately with soap and plenty of water, removing all contaminated clothes and shoes. If skin irritation persists, call a physician.

Inhalation: Vapors may cause irritation to respiratory tract. A weak narcotic, higher concentrations may cause nausea, vomiting, diarrhea, and headaches. Move victim to fresh air. Give artificial respiration ONLY if breathing has stopped. Give cardiopulmonary resuscitation (CPR) if there is no breathing AND no pulse. Obtain medical advice IMMEDIATELY.

Ingestion: Vapors may cause irritation to respiratory tract. A weak narcotic, higher concentrations may cause nausea, vomiting, diarrhea, and headaches. Immediate medical attention is required. Do not induce vomiting. Clean mouth with water and afterwards drink plenty of water. If spontaneous vomiting occurs, have victim lean forward with head positioned to avoid breathing in of vomit, rinse mouth and administer more water. Never give anything by mouth to and unconscious person.

Notes to physician: Symptomatic. Administer oxygen if there are signs of cyanosis. If clinical condition deteriorates, administer 10cc Methylene Blue intravenously. It is unlikely for this to be required with methemoglobin level of less than 40%.

SECTION 5 – FIRE-FIGHTING MEASURES

Flammable properties: Flash point is 35°C/ 95°F.

Suitable extinguishing media: Evacuate surrounding areas. When controlling fire before involvement of explosives, fire-fighters should wear positive pressure self-containing breathing apparatus (SCBA) and full turnout gear. Carbon dioxide, alcohol foam, water spray. Water may be applied through fixed extinguishing system (sprinklers) as long as people need not be present for the system to operate.

Unsuitable extinguishing media: Attempts to smother a fire involving this product will be ineffective as it is its own oxygen source. Smother this product could lead to decomposition and explosion. This product is more sensitive to detonation if contaminated with organic or oxidisable material or if heated while confined. Unless the mass of product on fire is flooded with water, re-ignition is possible. Do not use dry chemical extinguishers. Do not use dry chemical fire extinguishers containing sodium or potassium bicarbonates on Nitromethane fires.

Specific hazards arising from the chemical: This product is a high explosive with mass detonation hazard. Immediately evacuate all personnel from the area to a safe distance. Guard against re-entry. Thermal decomposition can lead to release of irritating gases and vapors. Above the flash point, explosive vapor-air mixtures may be formed. Flammable vapors that are heavier than air may accumulate in low areas and/or spread along ground away from handling site. Flashback along vapor trail may occur. May be detonated if confined and heated, or by shock from high explosives. Becomes more sensitive to detonation by contamination with certain chemical compounds, such as amines and acids. Fire and explosion hazard when under pressure. Sensitive to mechanical impact. Sensitive to static discharge.

Protective equipment and precautions for firefighters: As in any fire, wear self-contained breathing apparatus pressure-demand, NIOSH approved (or equivalent) and full protective gear.

SECTION 6 – ACCIDENTAL RELEASE MEASURES

Methods for containment: Contain or absorb leaking liquid with sand or earth or other suitable substance.

Methods for cleaning up: Avoid breathing fumes. Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures.

Other information: No data available.

SECTION 7 – HANDLING AND STORAGE

Handling: Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Protect storage area from exposure to external fires. DO NOT distill Nitromethane. Protect from sources of adiabatic compression. Never wash empty containers with alkaline cleaning agents. After this container has been emptied, it may contain explosive vapors; observe all warnings and precautions listed for the product. Do not cut, or weld on or near this container.

Storage: Store under moderate temperatures recommended by a technical services representative. Protect storage area and processing vessels from high energy projectiles by a suitable barricade. Separate from flammables and sensitizers. Do not reuse or dispose of empty containers until they have been rinsed with water. Store under dry conditions in a well ventilated magazine that has been approved

for either detonator storage or explosive storage. Keep away from heat, spark and flames. Keep containers closed.

SECTION 8 – EXPOSURE CONTROLS/PERSONAL PROTECTION

Chemical Name	ACGIH TLV	OSHA PEL	NIOSH IDLH
Nitromethane	TWA 250 mg/ m³ 20 ppm	TWA 100ppm	
Nitroethane	TWA 310mg/ m³	TWA 310mg/ m³	

Other exposure guidelines: No information available.

Engineering Measures: No information available.

Personal Protective Equipment

Eye/Face Protection: Tightly fitting safety goggles.

Skin Protection: User should verify impermeability under normal conditions of use prior to general use. Impervious butyl rubber gloves are recommended.

Respiratory Protection: In case of insufficient ventilation wear suitable respiratory equipment. A NIOSH-approved respirator, if required.

Hygiene Measures: Handle in accordance with good industrial hygiene and safety practice. Recommendations listed in this section indicate the type of equipment, which will provide protection against over exposure to this product. Conditions of use, adequacy of engineering or other control measures, and actual exposures will dictate the need for specific protective devices at your workplace.

SECTION 9 – PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Clear, oily liquid
Physical State: Liquid
pH: 6 - 8
Autoignition Temperature: 77℃/ 170.6℉ (Nitroethane)
Melting Point/Range: -29℃/ -20.2℉ (Nitromethane)
Flammable Limits (Lower): No data available
Specific Gravity: 1.14 g/cc
Other Solubility: Partially soluble in Methanol, diethyl ether
Oxidizing Properties: No data available
Odor: Disagreeable and choking
Viscosity: No information available
Flash Point: 35℃/ 95℉
Boiling Point/Range: 100.8℃/ 213.4℉ (Nitromethane)
Flammable Limits (Upper): 63℃/ 145.4 ℉ (Nitroethane)
Explosion Power: No data available
Water Solubility: Slightly soluble
Vapor Pressure: 3.7 kPa @ 20℃ (Nitromethane)
Partition Coefficient (n-octanol/water): No data available

SECTION 10 – STABILITY AND REACTIVITY

Stability: Stable under normal conditions.

Conditions to avoid: Keep away from open flames, hot surfaces and sources of ignition. Not expected to be sensitive to static discharge. Not expected to be sensitive to mechanical impact.

Incompatible materials: May detonate if sensitized by amines, alkalies, strong acids, high temperatures or adiabatic compression. The dry alkali or amine salts are shock sensitive and sodium salt ignites on contact with water. Incompatible with amines, strong acids, strong bases, strong oxidizing agents, strong reducing agents, copper, copper alloys, lead, lead alloys. Flammable.

Reactivity: Forms explosive mixtures n air. May darken on storage. May explode by detonation, heat or shock.

Hazardous decomposition products: The following toxic decomposition products may be released. Nitrogen oxides (NOx). Carbon oxide. Hydrocarbons.

Hazardous Polymerization: None under normal processing. Hazardous polymerization does not occur

SECTION 11 – TOXICOLOGICAL INFORMATION

Acute Toxicity

Product Information: Irritating to eyes. May cause skin irritation. Harmful if swallowed.

Chemical name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Nitromethane	940 mg/ kg-¹ (Rat) 950 mg/ kg-¹ (Mouse)		
Nitroethane	310 mg/ m³ (Mouse)		

Chronic Toxicity: May cause methemoglobinemia.
Carcinogenicity: This table below indicates whether each agency has listed any ingredient as a carcinogen.

Chemical Name	ACGIH	IARC	NTP	OSHA
Nitromethane	A3	2B		

Legend: A3: Confirmed Animal Carcinogen. 2B: Some evidence of carcinogenity was noted in NTP tests. The effects were mammary tumors in female rats and benign gland tumors in mice.
Mutagenic effects: There is no evidence of mutagenic potential.
Irritation: Irritating to eyes. May cause irritation of respiratory tract. May cause skin irritation in susceptible persons.
Corrosivity: Highly corrosive in presence of copper. Non-corrosive in presence of glass.

Reproductive effects: No information is available and no adverse reproductive effects are anticipated.
Developmental effects: No information is available and no adverse developmental effects are anticipated.
Target Organ: Eyes, skin, respiratory system, blood, liver, urinary tract, gastrointestinal tract (GI), endocrine system, & immune system.

SECTION 12 – ECOLOGICAL INFORMATION

Ecotoxicity effects: When released into the soil, this material may leach into groundwater. When released into the soil, this material is expected to quickly evaporate. When released into water, this material is not expected to biodegrade. When released into water, this material may evaporate to a moderate extent. When released into water, this material is expected to have a half-life between 10 and 30 days. This material has an experimentally determined bioconcentration factor (BCF) of less than 100. This material has a log octanol-water partition coefficient of less than 3.0. This material is not expected to significantly bioaccumulate. When released into the air, this material is expected to be readily degraded by photolysis. When released into the air, this material is expected to have a half-life of less than 1 day.

Persistence/Degradability: Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Mobility in Environmental media: Dissolves slowly in water.

SECTION 13 – DISPOSAL CONSIDERATIONS

Waste Disposal Method: Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

EPA Hazardous Waste Number: D001, D003

SECTION 14 – TRANSPORT INFORMATION

DOT Proper Shipping Name: NITROMETHANE
Hazard Class: 3.0
UN-No: UN1261
Packing group: II
TDG Proper Shipping Name: NITROMETHANE
Hazard Class: 3.0
UN-No: UN1261
Packing group: II

Transportation Emergency Telephone Number: (Canada) 1-877-561-3636 or (USA) CHEMTREC: 1-800-424-9300

SECTION 15 – REGULATORY INFORMATION

CANADIAN CLASSIFICATION: This product has been classified in accordance with the hazard criteria of the CPR (Controlled Products Regulations) and this MSDS contains all the information required by the CPR.

WHMIS hazard class: Class B-2 Flammable liquid with a flash point lower than 37.8°C (100°F).
Class D-2A: Material causing other toxic effects (VERY TOXIC)

USA CLASSIFICATION:
SARA Regulations Sections 313 and 40 CFR 372: This product contains the following toxic chemical(s) subject to reporting requirements, Nitromethane (75-52-5) & Nitroethane (79-24-3).

SARA 311/312 Hazardous Categorization

Acute Heath Hazard:	Yes
Chronic Health Hazard:	Yes
Fire Hazard:	Yes
Reactive Hazard:	Yes
Sudden Release of Pressure Hazard:	No

Ozone Protection and 40 CFR 42: No reportable quantities of ozone depleting agents
Other Regulations/Legislations which apply to this product: New Jersey Right-to-Know, Pennsylvania Right-to-Know, Massachusetts Right-to-Know, Rhode Island Right-to-Know, Florida, New Jersey Special Health Hazard Substance List, Minnesota Hazardous Substance List, California Director's List of Hazardous Substances, California Proposition 65.

TSCA: Complies **DSL:** Complies **NDSL:** Does Not Comply

The components in the product are on the following international inventory lists:

Chemical Name	TSCA	DSL	NDSL	ENCS	EINECS	ELINCS	CHINA	KECL	PICCS	AICS
Nitromethane	X	X	-	-	X	X	-	X	X	X
Nitroethane	X	X	-	-	X	X	-	X	X	X

Legend: X – Listed

SECTION 16 – OTHER INFORMATION

Prepared by: **Safety Health & Environment**
303-268-5000

Preparation Date: 18-Feb-2008
Revision Date: 23-May-2011

The information contained herein is provided only as a guide for the handling of this specific material and has been prepared in good faith by technically knowledgeable personnel. This Material Safety Data Sheet is not all-inclusive. The circumstances of use and handling may involve additional considerations that have not been addressed by this Data Sheet. No warranty of any kind is provided or implied by this Data Sheet. Orica will not be liable for any damages, losses, injuries or indirect damages that may result from the use of, or reliance on, any information contained herein.

End of MSDS

Material Safety Data Sheet

Preparation Date: 18-Feb-2008 **Revision Date:** 17-May-2011 **Revision Number:** 2

SECTION 1 – PRODUCT AND COMPANY IDENTIFICATION

Supplier(s):
Orica Canada Inc.
Maple Street
Brownsburg, QC
For MSDS Requests: 1-450-533-4201

Orica USA Inc.
33101 E. Quincy Avenue
Watkins, CO 80137-9406
For MSDS Requests: 1-303-268-5000

Manufacturer:
Hallowell Manufacturing LLC.
3600 NW 74th Street
Columbus, KS 66725-0348
1-620-597-2552

Product Name: **Kinepak™ (solid)**
Product Code: 402
Alternate Name(s): K ⅓S, K1S, K1BB, K1P
UN-No: UN1942
Recommended Use: Detonating agent.

24 EMERGENCY: CANADA: **1-877-561-3636 (Orica Transportation Emergency Response)**
USA: **1-800-424-9300 (CHEMTREC)**

FOR CHEMICAL EMERGENCIES (24 HOUR) INVOLVING TRANSPORTATION, SPILL, LEAK, RELEASE, FIRE OR ACCIDENTS: **IN CANADA CALL:** THE ORICA TRANSPORTATION EMERGENCY RESPONSE SYSTEM AT **1-877-561-3636.** **IN THE U.S. CALL: CHEMTREC 1-800-424-9300. IN THE U.S.:** FOR LOST, STOLEN, OR MISPLACED EXPLOSIVES CALL: BATF **1-800-800-3855.** FORM ATF F 5400.5 MUST BE COMPLETED AND LOCAL AUTHORITIES (STATE/MUNICIPAL POLICE, ETC.) MUST BE ADVISED.

SECTION 2 – HAZARD IDENTIFICATION

Emergency Overview:
May cause skin irritation and/or dermatitis. Irritating to eyes. Harmful if swallowed. Oxidizing agent. May cause methemoglobinemia. May cause liver damage. May cause kidney damage.

Appearance: White granular
Physical State: Granular
Odor: Odorless

SECTION 3 – COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS-No	Weight %
Ammonium Nitrate	6484-52-2	98-100

SECTION 4 – FIRST AID MEASURES

General Advice: In case of accident or if you feel unwell, seek medical advice IMMEDIATELY (show the product label where possible).

Eye Contact: Immediately flush with plenty of water. After initial flushing, remove any contact lenses and continue flushing for at least 15 minutes. Immediate medical attention is required.

Skin Contact: Wash off immediately with soap and plenty of water, removing all contaminated clothes and shoes. If skin irritation persists, call a physician.

Inhalation: Move victim to fresh air. Give artificial respiration ONLY if breathing has stopped. Give cardiopulmonary resuscitation (CPR) if there is no breathing AND no pulse. Obtain medical advice IMMEDIATELY.

Ingestion: Immediate medical attention is required. Do no induce vomiting. Clean mouth with water and afterwards drink plenty of water. If spontaneous vomiting occurs, have victim lean forward with head positioned to avoid breathing in of vomitus, rinse mouth and administer more water. Never give anything by mouth to and unconscious person.

Notes to physician: Symptomatic. Administer oxygen if there are signs of cyanosis. If clinical condition deteriorates, administer 10cc Methylene Blue intravenously. It is unlikely for this to be required with methemoglobin level of less than 40%.

SECTION 5 – FIRE-FIGHTING MEASURES

Flammable properties: Not itself combustible but assists fire in burning materials. The product does not flash. Rate of burning: will accelerate burning. After fire has started, this product will continue to burn in the absence of air.

Suitable extinguishing media: Use Water only, in as much volume as possible to cool the burning mass quickly. Chemical extinguishers will not work. Fire-fighters should wear positive pressure self-containing breathing apparatus (SCBA) and full turnout gear. Water may be applied through fixed extinguishing system (sprinklers) as long as people need not be present for the system to operate.

Unsuitable extinguishing media: Chemical extinguishers will not work. Attempts to smother a fire involving this product will be ineffective as it is its own oxygen source. Smother this product could lead to decomposition and explosion. This product is more sensitive to detonation if contaminated with organic or oxidisable material or if heated while confined. Unless the mass of product on fire is flooded with water, re-ignition is possible.

Specific hazards arising from the chemical: Toxic gases and vapours will be released by the thermal decomposition of this material. At higher temperatures, decomposition may be explosive, especially if confined. Immediately evacuate all personnel from the area to a safe distance. Guard against re-entry.

Protective equipment and precautions for firefighters: As in any fire, wear self-contained breathing apparatus pressure-demand, NIOSH approved (or equivalent) and full protective gear.

SECTION 6 – ACCIDENTAL RELEASE MEASURES

Methods for containment: Avoid dust formation. Do not breathe dust. Prevent further leak if safe to do so.

Methods for cleaning up: Avoid the use of metal tools containing iron and/or copper. Collect product in suitable containers for recovery or disposal. Prevent product from entering drains. Notify applicable government authority if release is reportable or could adversely affect the environment.

SECTION 7 – HANDLING AND STORAGE

Handling: Avoid contact with eyes or skin. Wash thoroughly with soap and water after handling. Wash clothing before re-use. Locate safety shower and eyewash station closest to chemical handling area. The use of coveralls is recommended. Use good industrial hygiene and housekeeping practices. Keep away from open flames, hot surfaces and sources of ignition

Storage: Store in a cool, well-ventilated area. Keep away from heat, sparks, and flames. Keep storage containers closed. Store at 10-27℃ (50-80℉). Do not expose closed containers to temperatures above 40℃ (104℉). Product is mildly corrosive to concrete and steel. Stainless steel and aluminium are adequate. Avoid materials made of copper, iron, or bronze.

SECTION 8 – EXPOSURE CONTROLS/PERSONAL PROTECTION

Other exposure guidelines: Ammonium Nitrate: ORICA Guideline 5 mg/m^3 (internal TWA)

Engineering Measures: Where reasonably practicable this should be achieved by the use of local exhaust ventilation and good general extraction.

Personal Protective Equipment

Eye/Face Protection: Tightly fitting safety goggles.

Skin Protection: User should verify impermeability under normal conditions of use prior to general use. Impervious butyl rubber gloves are recommended

Respiratory Protection: In case of insufficient ventilation wear suitable respiratory equipment. A NIOSH-approved respirator, if required.

Hygiene Measures: Handle in accordance with good industrial hygiene and safety practice. Recommendations listed in this section indicate the type of equipment, which will provide protection against over exposure to this product. Conditions of use, adequacy of engineering or other control measures, and actual exposures will dictate the need for specific protective devices at your workplace.

SECTION 9 – PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	White granular	**Odor:**	Odorless
Physical State:	Granular	**Viscosity:**	No information available
pH:	5 - 6	**Flash Point:**	Not applicable
Autoignition Temperature:	Not applicable	**Boiling Point/Range:**	210℃/ 410℉
Melting Point/Range:	160–165℃/ 320-329℉	**Flammable Limits (Upper):**	Not applicable
Flammable Limits (Lower):	Not applicable	**Explosion Power:**	No data available
Specific Gravity:	Not available	**Water Solubility:**	79% @25
Other Solubility:	No data available	**Vapor Pressure:**	No data available
Oxidizing Properties:	Oxidizer	**Partition Coefficient (n-octanol/water):**	No data available

SECTION 10 – STABILITY AND REACTIVITY

Stability: Stable under normal conditions. Decomposition Temperature: Ammonium Nitrate will spontaneously decompose at 210℃ (410℉).

Conditions to avoid: Keep away from open flames, hot surfaces and sources of ignition. Not expected to be sensitive to static discharge. Not expected to be sensitive to mechanical impact.

Incompatible materials: Avoid oxidizable materials, metal powder, bronze & copper alloys, fuels (e.g. lubricants, machine oils), fluorocarbon lubricants, acids, corrosive liquids, chlorate, sulphur, sodium nitrite, charcoal, coke and other finely divided combustibles. Strong oxidizing and reducing agents.

Hazardous decomposition products: The following toxic decomposition products may be released. At temperatures above 210℃, decomposition may be explosive, especially if confined. Nitrogen oxides (NOx). Carbon oxide. Hydrocarbons.

Hazardous Polymerization: None under normal processing. Hazardous polymerization does not occur. Explosive material under shock conditions.

SECTION 11 – TOXICOLOGICAL INFORMATION

Acute Toxicity

Product Information: Irritating to eyes. May cause skin irritation. Harmful if swallowed.

Chemical name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Ammonium Nitrate	2217 mg/kg Rat	3000 mg/kg Rabbit	88.8 mg/L Rat 4 h

Subchronic Toxicity (28 Days): Ingestion may cause methemoglobinemia. Initial manifestation of methemoglobinemia is cyanosis, characterized by navy lips, tongue and mucous membranes, with skin color being slate grey. Further manifestation is characterized by headache, weakness, dyspnea, dizziness, stupor, respiratory distress and death due to anoxia. If ingested, nitrates may be reduced to nitrites by bacteria in the digestive tract. Signs and symptoms of nitrite poisoning include

methemoglobinemia, nausea, dizziness, increased heart rate, hypotension, fainting and, possibly shock.

Chronic Toxicity: May cause methemoglobinemia.
Carcinogenicity: The ingredients of this product are not classified as carcinogenic by ACGIH (American Conference of Governmental Industrial Hygienists) or IARC (International Agency for Research on Cancer), not regulated as carcinogens by OSHA (Occupational Safety and Health Administration), and not listed as carcinogens by T\NTP (National Toxicology Program).
Mutagenic effects: There is no evidence of mutagenic potential.
Irritation: Irritating to eyes. May cause irritation of respiratory tract. May cause skin irritation in susceptible persons.
Reproductive effects: No information is available and no adverse reproductive effects are anticipated.
Developmental effects: No information is available and no adverse developmental effects are anticipated.
Target Organ: Eyes, skin, respiratory system, blood, liver, urinary tract, gastrointestinal tract (GI), endocrine system, & immune system.

SECTION 12 – ECOLOGICAL INFORMATION

Ecotoxicity effects: Dissolves slowly in water. Harmful to aquatic life at low concentrations.
Environmental Effects: Can be dangerous if allowed to enter drinking water intakes. Do not contaminate domestic or irrigation water supplies, lakes, streams, ponds, or rivers.

Mobility in Environmental media: Dissolves slowly in water.

SECTION 13 – DISPOSAL CONSIDERATIONS

Waste Disposal Method: Dispose of in accordance with National, State and local regulations. Should not be released into the environment. Do not dispose of waste with normal garbage, or to sewer systems. Call upon the services of a SEC/ Hallowell Technical Representative.

SECTION 14 – TRANSPORT INFORMATION

DOT Proper Shipping Name: Ammonium Nitrate
Hazard Class: 5.1
UN-No: UN1942
Packing group: III
TDG Proper Shipping Name: Ammonium Nitrate
Hazard Class: 5.1
UN-No: UN1942
Packing group: III

Transportation Emergency Telephone Number: (Canada) 1-877-561-3636 or (USA) CHEMTREC: 1-800-424-9300

SECTION 15 – REGULATORY INFORMATION

CANADIAN CLASSIFICATION: This product has been classified in accordance with the hazard criteria of the CPR (Controlled Products Regulations) and this MSDS contains all the information required by the CPR

WHMIS hazard class: This product is an explosive and is not regulated by WHMIS.
USA CLASSIFICATION:
SARA Regulations Sections 313 and 40 CFR 372: This product contains the following toxic chemical(s) subject to reporting requirements, Ammonium Nitrate (6484-52-2).
SARA 311/312 Hazardous Categorization
Acute Heath Hazard: Yes
Chronic Health Hazard: Yes
Fire Hazard: Yes
Reactive Hazard: No

Sudden Release of Pressure Hazard: No
Ozone Protection and 40 CFR 42: No reportable quantities of ozone depleting agents
Other Regulations/Legislations which apply to this product: New Jersey Right-to-Know, Pennsylvania Right-to-Know, Massachusetts Right-to-Know, Rhode Island Right-to-Know, Florida, New Jersey Special Health Hazard Substance List, Minnesota Hazardous Substance List, California Director's List of Hazardous Substances, California Proposition 65.

TSCA: Complies **DSL:** Complies **NDSL:** Complies

The components in the product are on the following international inventory lists:

Chemical Name	TSCA	DSL	NDSL	ENCS	EINECS	ELINCS	CHINA	KECL	PICCS	AICS
Ammonium Nitrate	X	X	-	X	X	-	X	X	X	X

Legend: X – Listed

SECTION 16 – OTHER INFORMATION

Prepared by: **Safety Health & Environment**
303-268-5000

Preparation Date: 14-May-2004
Revision Date: 17-May-2011

The information contained herein is provided only as a guide for the handling of this specific material and has been prepared in good faith by technically knowledgeable personnel. This Material Safety Data Sheet is not all-inclusive. The circumstances of use and handling may involve additional considerations that have not been addressed by this Data Sheet. No warranty of any kind is provided or implied by this Data Sheet. Orica will not be liable for any damages, losses, injuries or indirect damages that may result from the use of, or reliance on, any information contained herein.

End of MSDS

Material Safety Data Sheet

Dyno Nobel Inc.
2795 East Cottonwood Parkway, Suite 500
Salt Lake City, Utah 84121
Phone: 801-364-4800 Fax: 801-321-6703
E-Mail: dnna.hse@am.dynonobel.com
FOR 24 HOUR EMERGENCY, CALL CHEMTREC (USA) 800-424-9300
CANUTEC (CANADA) 613-996-6666

MSDS # 1122
Date 12/20/12

Supercedes
MSDS # 1122 06/13/12

SECTION I - PRODUCT IDENTIFICATION

Trade Name(s):
NONEL® MS
NONEL® MS ARCTIC
NONEL® LP
NONEL® SL
NONEL® TD
NONEL® MS CONNECTOR
NONEL® TWINPLEX™
NONEL® STARTER
NONEL® EZ DET®
NONEL® EZTL™
NONEL® EZ DRIFTER ®
NONEL® SUPER

Product Class: NONEL® Non-electric Delay Detonators

Product Appearance & Odor: Aluminum cylindrical shell with varying length and diameter of attached colored plastic tubing. The detonator may be enclosed in a plastic housing, and an assembly may contain two detonators. Odorless.

DOT Hazard Shipping Description: UN0029 Detonators, non-electric 1.1B II
-or- UN0360 Detonator assemblies, non-electric 1.1B II
-or- UN0361 Detonator assemblies, non-electric 1.4B II

NFPA Hazard Classification: Not Applicable (See Section IV - Special Fire Fighting Procedures)

SECTION II - HAZARDOUS INGREDIENTS

Ingredients	CAS#	Occupational Exposure Limits OSHA PEL-TWA	ACGIH TLV-TWA
Pentaerythritol Tetranitrate (PETN)	78-11-5	None[1]	None[2]
Lead Azide	13424-46-9	0.05 mg (Pb)/m^3	0.05 mg (Pb)/m^3
Lead	7439-92-1	0.05 mg (Pb)/m^3	0.05 mg (Pb)/m^3
Silicon	7440-21-3	15 mg / m^3 (total dust) 5 mg / m^3 (respirable fraction)	10 mg / m^3
Selenium	7782-49-2	0.2 mg/m^3	0.2 mg/m^3
Red Lead (Lead tetroxide)	1314-41-6	0.05 mg (Pb)/m^3	0.05 mg (Pb)/m^3
Titanium dioxide	13463-67-7	15 mg/m^3	10 mg/m^3
Barium Chromate	10294-40-3	1 mg (CrO_3)/10m^3 (ceiling) 0.5 mg (Ba)/m^3	0.01 mg (Cr)/m^3 0.5 mg (Ba)/m^3
Lead Chromate	7758-97-6	0.05 mg (Pb)/m^3 1 mg (CrO_3)/10m^3 (ceiling)	0.15 mg (Pb)/m^3 0.012 mg (Cr)/m^3

Barium Sulfate	7727-43-7	0.5 mg (Ba)/m^3	10 mg/m^3
Potassium Perchlorate[3]	7778-74-7	None[1]	None[2]
Silica (crystalline)	61790-53-2	See Note Below	0.05 mg/m^3 (resp frac)
Molybdenum	7439-98-7	None[1]	None[2]
Tungsten	7440-33-7	None[1]	5 mg/m^3 (TWA) 10 mg/m^3 (STEL)
Aluminum	7429-90-5	15 mg/m^3 (total dust) 5 mg/m^3 (respirable fraction)	5 mg/m^3
Antimony	7440-36-0	0.5 mg/m^3	0.5 mg/m^3
Cyclotetramethylene Tetranitramine (HMX)	2691-41-0	None[1]	None[2]
Diazodinitrophenol	4682035	No value established	No value established

[1] Use limit for particulates not otherwise regulated (PNOR): Total dust, 15 mg/m^3 ; respirable fraction, 5 mg/m^3 .
[2] Use limit for particulates not otherwise classified (PNOC): Inhalable particulate, 10 mg/m^3 ; respirable part., 3 mg/m^3 .
Note: The OSHA PEL for crystalline silica is calculated as follows:
Quartz, respirable: 10 mg/m^3 [e] / % SiO_2 + 2 Quartz, total dust: 30 mg/m^3 / % SiO_2 + 2
[3] Not all delay periods contain perchlorate. Those that do contain between from about 4 to a maximum of about 60 mg perchlorate per detonator.

Ingredients, other than those mentioned above, as used in this product are not hazardous as defined under current Department of Labor regulations, or are present in deminimus concentrations (less than 0.1% for carcinogens, less than 1.0% for other hazardous materials).

SECTION III - PHYSICAL DATA

Boiling Point: Not Applicable
Vapor Density: Not Applicable
Percent Volatile by Volume: Not Applicable
Evaporation Rate (Butyl Acetate = 1): Not Applicable
Vapor Pressure: Not Applicable
Density: Not Applicable
Solubility in Water: Not Applicable

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point: Not Applicable **Flammable Limits:** Not Applicable
Extinguishing Media: (See Special Fire Fighting Procedures section.)
Special Fire Fighting Procedures: Do not attempt to fight fires involving explosive materials. Evacuate all personnel to a predetermined safe, distant location. Allow fire to burn unless it can be fought remotely or with fixed extinguishing systems (sprinklers).
Unusual Fire and Explosion Hazards: Can explode or detonate under fire conditions. Burning material may produce toxic vapors.

SECTION V - HEALTH HAZARD DATA

Effects of Overexposure

This is a packaged product that will not result in exposure to the explosive material under normal conditions of use. Exposure concerns are primarily with post-detonation reaction products, particularly heavy metal compounds.

Eyes: No exposure to chemical hazards anticipated with normal handling procedures. Particulates in the eye may cause irritation, redness, swelling, itching, pain and tearing.

Skin: No exposure to chemical hazards anticipated with normal handling procedures. Exposure to post-detonation reaction products may cause irritation.
Ingestion: No exposure to chemical hazards anticipated with normal handling procedures. Post-detonation reaction product residue is toxic by ingestion. Symptoms may include gastroenteritis with abdominal pain, nausea, vomiting and diarrhea. See systemic effects below.

Inhalation: Not a likely route of exposure. See systemic effects below.
Systemic or Other Effects: None anticipated with normal handling procedures. Repeated inhalation or ingestion of post-detonation reaction products may lead to systemic effects such as respiratory tract irritation, ringing of the ears, dizziness, elevated blood pressure, blurred vision and tremors. Heavy metal (lead) poisoning can occur.
Carcinogenicity: ACGIH classifies Lead as a "Suspected Human Carcinogen" and insoluble Chromium VI as "Confirmed Human Carcinogen". NTP, OSHA, and IARC consider components contained in this detonator carcinogenic.

Perchlorate: Perchlorate can potentially inhibit iodide uptake by the thyroid and result in a decrease in thyroid hormone. The National Academy of Sciences (NAS) has reviewed the toxicity of perchlorate and has concluded that even the most sensitive populations could ingest up to 0.7 microgram perchlorate per kilogram of body weight per day without adversely affecting health. The USEPA must establish a maximum contaminant level (MCL) for perchlorate in drinking water by 2007, and this study by NAS may result in a recommendation of about 20 ppb for the MCL.

Emergency and First Aid Procedures

Eyes: Irrigate with running water for at least fifteen minutes. If irritation persists, seek medical attention.
Skin: Wash with soap and water.
Ingestion: Seek medical attention.
Inhalation: Not applicable.
Special Considerations: None

SECTION VI - REACTIVITY DATA

Stability: Stable under normal conditions, may explode when subjected to fire, supersonic shock or high-energy projectile impact.
Conditions to Avoid: Keep away from heat, flame, ignition sources, impact, friction, electrostatic discharge and strong shock. Do not attempt to disassemble.
Materials to Avoid (Incompatibility): Corrosives (acids and bases or alkalis).
Hazardous Decomposition Products: Carbon Monoxide (CO), Nitrous Oxides (NO_X), Sulfides, Chromates, Lead (Pb), Antimony (Sb) and various oxides and complex oxides of metals.
Hazardous Polymerization: Will not occur.

SECTION VII - SPILL OR LEAK PROCEDURES

Steps to be taken in Case Material is Released or Spilled: Protect from all ignition sources. In case of fire evacuate all personnel to a safe distant area and allow to burn or fight fire remotely. Notify authorities in accordance with emergency response procedures. Only personnel trained in emergency response should respond. If no fire danger is present, and product is undamaged and/or uncontaminated, repackage product in original packaging or other clean DOT approved container. Ensure that a complete account of product has been made and is verified. If loose explosive powder is spilled, such as from a broken detonator, only properly qualified and authorized personnel should be involved with handling and clean-up activities. Spilled explosive powder is extremely sensitive to initiation and may detonate. Follow applicable Federal, State, and local spill reporting requirements.

Waste Disposal Method: Disposal must comply with Federal, State and local regulations. If product becomes a waste, it is potentially regulated as a hazardous waste as defined under the Resource Conservation and Recovery

Act (RCRA) 40 CFR, part 261. Review disposal requirements with a person knowledgeable with applicable environmental law (RCRA) before disposing of any explosive material.

SECTION VIII - SPECIAL PROTECTION INFORMATION

Ventilation: None required for normal handling. Provide enhanced ventilation after use if in underground mines or other enclosed areas.

Respiratory Protection: None required for normal handling.

Protective Clothing: Cotton gloves are recommended.

Eye Protection: Safety glasses are recommended.

Other Precautions Required: None.

SECTION IX - SPECIAL PRECAUTIONS

Precautions to be taken in handling and storage: Store in cool, dry, well-ventilated location. Store in compliance with Federal, State, and local regulations. Only properly qualified and authorized personnel should handle and use explosives. Keep away from heat, flame, ignition sources, impact, friction, electrostatic discharge and strong shock.

Precautions to be taken during use: Use accepted safe industry practices when using explosive materials. Unintended detonation of explosives or explosive devices can cause serious injury or death. Avoid breathing the fumes or gases from detonation of explosives. Detonation in confined or unventilated areas may result in exposure to hazardous fumes or oxygen deficiency.

Other Precautions: It is recommended that users of explosive materials be familiar with the Institute of Makers of Explosives Safety Library Publications.

Material Safety Data Sheet

ECTION X - SPECIAL INFORMATION

These products contain the following substances that are subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

Chemical Name	CAS Number	Max. lbs/1000 units
Lead	7439-92-1	39.4
	(Use Toxic Chemical Category Code)	
Lead Compounds	N420	2.0
Barium Compounds	N040	1.8
Chromium Compounds	N090	1.9

Range* of Section 313 Chemicals in each product

Product	lb Pb per 1000 detonators	lb Pb compounds per 1000 detonators	lb Ba compounds per 1000 detonators	lb Cr compounds per 1000 detonators
NONEL® MS	**0 - 27**	**0.3 – 1.5**	**0 – 0.9**	**0 – 0.9**
NONEL® LP	**0 - 30**	**0.3 – 2.0**	**0 - 1.8**	**0 - 1.9**
NONEL® SL	**7 - 27**	**0.3 – 1.5**	**0**	**0**
NONEL® TD	**0 - 18**	**0.3 – 0.7**	**0**	**0**
NONEL® MS Connector	**5 - 16**	**0.3 – 0.4**	**0**	**0**
NONEL® TWINPLEX™	**5 - 15**	**0.3 – 0.7**	**0**	**0**
NONEL® STARTER	**0**	**0.3**	**0**	**0**
NONEL® EZ DET®	**22 - 36**	**2.0**	**0**	**0**
NONEL® EZTL™	**5 - 15**	**0.5 – 0.7**	**0**	**0**
NONEL® EZ DRIFTER	**39.4**	**1.3**	**1.2**	**1.3**
NONEL® SUPER	**019**	**0.35**	**1.1**	**1.4**

*** The exact quantity and weight percent of Section 313 Chemicals in each delay period and tubing length for each product is available upon request.**

Disclaimer

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Material Safety Data Sheet

Dyno Nobel Inc.
2795 East Cottonwood Parkway, Suite 500
Salt Lake City, Utah 84121
Phone: 801-364-4800 Fax: 801-321-6703
E-Mail: dnna.hse@am.dynonobel.com
FOR 24 HOUR EMERGENCY, CALL CHEMTREC (USA) 800-424-9300
CANUTEC (CANADA) 613-996-6666

MSDS # 1124
Date 12/20/12

Supercedes
MSDS # 1124 12/15/11

SECTION I - PRODUCT IDENTIFICATION

Trade Name(s): NONEL® LEAD LINE

Product Class: Shock Tube

Product Appearance & Odor: Hollow plastic tubing (normally yellow) with dusty inner coating of HMX and aluminum. No detectable odor.

DOT Hazard Shipping Description: **UN0349** Articles, explosive, n.o.s. (HMX) 1.4S II.
For 10,000 ft spools with Wire Lock Terminations only: Not regulated as an explosive, 0000

NFPA Hazard Classification: Not Applicable (See Section IV - Special Fire Fighting Procedures)

SECTION II - HAZARDOUS INGREDIENTS

Ingredients:	CAS#	% (Range)	Occupational Exposure Limits OSHA PEL-TWA	ACGIH TLV-TWA
Cyclotetramethylene Tetranitramine (HMX)	2691-41-0	0.35	None[1]	None[2]
Aluminum (dust)	7429-90-5	0.04	15 mg/m^3 (total) 5 mg/m^3 (respirable)	10 mg/m^3

[1] Use limit for particulates not otherwise regulated (PNOR): Total dust, 15 mg/m^3 ; respirable fraction, 5 mg/m^3.
[2] Use limit for particulates not otherwise classified (PNOC): Inhalable particulate, 10 mg/m^3 ; respirable part., 3 mg/m^3.
Note: The above hazardous dust mixture is present at approximately 15 mg per meter of tubing.

Ingredients, other than those mentioned above, as used in this product are not hazardous as defined under current Department of Labor regulations, or are present in deminimus concentrations (less than 0.1% for carcinogens, less than 1.0% for other hazardous materials).

SECTION III - PHYSICAL DATA

Boiling Point: Not Applicable
Vapor Density: Not Applicable
Melting Point: HMX decomposes violently at melting pt., about 278°C
Evaporation Rate (Butyl Acetate = 1): Not Applicable
Vapor Pressure: Not Applicable
Density: Not Applicable
Solubility in Water: Not Soluble
Percent Volatile by Volume: Not Applicable

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point: Not Applicable
Flammable Limits: Not Applicable
Extinguishing Media: Water, inert powder, CO_2
Special Fire Fighting Procedures: For shock tube only, consider initial isolation of at least 15 meters (50 feet) in all directions. Fight fire with normal precautions and methods used for plastic fires from a reasonable distance. IF DETONATORS OR OTHER EXPLOSIVES ARE PRESENT, DO NOT FIGHT FIRE.
Unusual Fire and Explosion Hazards: May burn vigorously with localized detonations and projection of fragments, with effects usually confined to the immediate vicinity of packages. Toxic smoke from combustion of the plastic material may be emitted. If product functions, high heat and pressure are released from the end of the tube if not covered or enclosed, typically by a metal device.

SECTION V - HEALTH HAZARD DATA

Effects of Overexposure

This is a packaged product that will not result in exposure to hazardous ingredients (inner coating materials) under normal conditions of use.
Eyes: Not a likely route of exposure. Dust particles may be irritating.
Skin: Not a likely route of exposure. Dust particles may cause skin irritation.
Ingestion: Not a likely route of exposure. Ingestion of large amounts of the reactive powder (HMX) is poisonous and may cause cardiovascular collapse.
Inhalation: Not a likely route of exposure. Breathing dust can cause respiratory irritation. During manufacture and at processing temperatures, irritating fumes may evolve.
Systemic or Other Effects: None known.
Carcinogenicity: No constituents are listed by NTP, IARC or OSHA.

Emergency and First Aid Procedures

Eyes: Irrigate with running water for at least fifteen minutes. If irritation persists, seek medical attention.
Skin: Wash with soap and water.
Ingestion: Not Applicable
Inhalation: Not Applicable
Special Considerations: None.

SECTION VI - REACTIVITY DATA

Stability: Stable
Conditions to Avoid: Keep away from heat, flame, impact, friction, ignition sources and strong shocks. Also avoid stretching to failure.
Materials to Avoid (Incompatibility): Incompatible with strong oxidizers and acids.
Hazardous Decomposition or Combustion Products: Hazardous carbon monoxide (CO), nitrogen oxide (NO_X) gases and products of plastic decomposition produced.
Hazardous Polymerization: Will not occur.

SECTION VII - SPILL OR LEAK PROCEDURES

Steps to be taken in Case Material is Released or Spilled: Protect from all ignition sources. In case of fire evacuate area not less than 50 feet in all directions. Notify authorities in accordance with emergency response procedures. Only personnel trained in emergency response should respond. If no fire danger is present, repackage undamaged devices in original packaging, accounting for every device. If the ends or tube wall have been opened such that powder may have

been released from the tube, isolate the spill area. Contamination of the HMX/Aluminum powder with sand, grit or dirt will render the material more sensitive to detonation. Carefully wet down and clean "loose" powder spills using a damp sponge or rag, avoid applying friction or pressure to the explosive, and place in a (Velostat) electrically conductive bag. Follow applicable Federal, State, and local spill reporting requirements.
Waste Disposal Method: Disposal must comply with Federal, State and local regulations. If product becomes a waste, it is potentially regulated as a hazardous waste as defined under the Resource Conservation and Recovery Act (RCRA) 40 CFR, part 261. Review disposal requirements with a person knowledgeable with applicable environmental law (RCRA) before disposing of any explosive material.

SECTION VIII - SPECIAL PROTECTION INFORMATION

Ventilation: None normally required. Provide enhanced ventilation if used in underground mines, indoors or other enclosed areas.
Respiratory Protection: None normally required. Extended testing of the product indoors or in enclosed areas may necessitate respiratory protection.
Protective Clothing: None normally required. Wear chemical-resistant gloves during post-detonation cleanup or spill cleanup operations.
Eye Protection: Safety glasses or goggles are recommended for handling, testing or cleanup.
Other Precautions Required: None

SECTION IX - SPECIAL PRECAUTIONS

Precautions to be taken in handling and storage: Store in cool, dry, well-ventilated location. Store in compliance with Federal, State, and local regulations. Keep away from heat, flame, ignition sources and strong shock. Only properly qualified and authorized personnel should handle and use Shock Tube.
Precautions to be taken during use: Use accepted safe industry practices when using explosive materials. Unintended detonation of explosives or explosive devices can cause serious injury or death. Avoid breathing the fumes or gases from detonation of explosives. Detonation in confined or unventilated areas may result in exposure to hazardous fumes or oxygen deficiency.
Other Precautions: It is recommended that users of explosive materials be familiar with the Institute of Makers of Explosives Safety Library Publications.

SECTION X - SPECIAL INFORMATION

This product contains the following substances that are subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

Chemical Name	CAS Number	% By Weight
None		

Disclaimer

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MATERIAL SAFETY DATA SHEET

Commercial ABC Dry Chemical (Fire Extinguishing Agent)

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATIONS AND OF THE COMPANY UNDERTAKING

Product Name	Commercial ABC Dry Chemical (Fire Extinguishing Agent)
Other Trade Names	Multi-Purpose, Ammonium Phosphate, Monoammonium Phosphate
Product Description	Fire Extinguishing Agent
Manufacturer/Supplier	Badger Fire Protection
Address	944 Glenwood Station Lane, Suite 303 Charlottesville, VA 22901 USA
Phone Number	(434)-964-3200
Chemtrec Number (for emergencies only)	(800) 424-9300 (703) 527-3887 (International)
Revision Date:	March 4, 2010
MSDS Date:	February 9, 2009

Safety Data Sheet according to EC directive 2001/59/EC and OSHA's Hazcom Standard (29 CFR 1910.1200)

2. HAZARDS IDENTIFICATION

EU Main Hazards
Non Hazardous Powder

Routes of Entry
- Eye contact - Inhalation - Skin contact

Carcinogenic Status
See Section 11 - Toxicity

Target Organs
- Respiratory System - Skin - Eye

Health Effects - Eyes
Contact for short periods of time may cause irritation.

Health Effects - Skin
Contact may cause mild irritation.

Health Effects - Ingestion
Ingestion is not an expected route of exposure.

Health Effects - Inhalation
May irritate the respiratory tract. May cause transient cough and shortness of breath.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	CAS#/Codes	Concentration	R Phrases	EU Classification
Monoammonium Phosphate	7722-76-1 EC#2317645	55 - 65%	None	None
Ammonium Sulfate	7783-20-2 EC#2319841	30 - 40%	None	None
Mica	12001-26-2	1 - 4%	None	None

3. COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	CAS#/Codes	Concentration	R Phrases	EU Classification
Clay	8031-18-3	<2%	None	None
Amorphous Silica	7631-86-9 EC#2315454	<2%	None	None
Dye	NA	<0.1%	None	None

4. FIRST AID MEASURES

Eyes
Immediately flood the eye with plenty of water for at least 15 minutes, holding the eye open. Obtain medical attention if soreness or redness persists.

Skin
Wash affected area with soap and water. Obtain medical attention if irritation persists.

Ingestion
Dilute by drinking large quantities of water and obtain medical attention.

Inhalation
Move victim to fresh air. Obtain medical attention immediately for any breathing difficulty.

Advice to Physicians
Treat symptomatically.

5. FIRE - FIGHTING MEASURES

Extinguishing Media
This preparation is used as an extinguishing agent and therefore is not a problem when trying to control a blaze. Use extinguishing agent appropriate to other materials involved. Keep pressurized extinguishers and surroundings cool with water spray as they may rupture or burst in the heat of a fire.

Unusual Fire and Explosion Hazards
Pressurized containers may explode in heat of fire.

Protective Equipment for Fire-Fighting
Wear full protective clothing and self-contained breathing apparatus as appropriate for specific fire conditions.

6. ACCIDENTAL RELEASE MEASURES

Sweep up or vacuum. Prevent skin and eye contact. Wear appropriate protective equipment.

7. HANDLING AND STORAGE

Pressurized extinguishers should be properly stored and secured to prevent falling or being knocked over. Do not drag, slide or roll extinguishers. Do not drop extinguishers or permit them to strike against each other. Never apply flame or localized heat directly to any part of the extinguisher or plastic container. Store pressurized extinguishers and plastic containers away from high heat sources. Storage area should be: - cool - dry - well ventilated - under cover - out of direct sunlight

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Occupational Exposure Standards
Occupational exposure limits are listed below, if they exist.
Mica
ACGIH TLV: 3 mg/m^3 TWA, measured as respirable fraction of the aerosol.
OSHA PEL: 20 mppcf, <1% crystalline silica
Nuisance Dust Limit
OSHA PEL: 50 mppcf or 15 mg/m^3 TWA, total dust
15 mppcf or 5 mg/m^3 TWA, respirable fraction

Engineering Control Measures
Use with adequate ventilation. There should be local procedures for the selection, training, inspection and maintenance of this equipment. When used in large volumes, use local exhaust ventilation.

Respiratory Protection
Not normally required. Use dust mask where dustiness is prevalent, or TLV is exceeded.

Hand Protection
Not normally needed when used as a portable fire extinguisher. Use gloves if irritation occurs.

Eye Protection
Chemical goggles or safety glasses with side shields.

Body Protection
Normal work wear.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State	Powder
Color	Pale Yellow
Odor	Odorless
Specific Gravity	Not available
Boiling Range/Point (°C/F)	Not applicable
Flash Point (PMCC) (°C/F)	Not Flammable
Solubility in Water	Not applicable
Vapor Density (Air = 1)	Heavier than air.
Vapor Pressure	Not applicable
Evaporation Rate	Not applicable

10. STABILITY AND REACTIVITY

Stability
Stable under normal conditions.

Conditions to Avoid
- Heat - High temperatures - Exposure to direct sunlight

Materials to Avoid
- Strong oxidizing agents - strong acids - sodium hypochlorite

Hazardous Polymerization
Will not occur.

10. STABILITY AND REACTIVITY

Hazardous Decomposition Products
- oxides of carbon - ammonia – oxides of phosphorus – nitrogen oxides

11. TOXICOLOGICAL INFORMATION

Acute Toxicity
Low order of acute toxicity.

Chronic Toxicity/Carcinogenicity
This product is not expected to cause long term adverse health effects.

Mica and clay may contain small quantities of quartz (crystalline silica) as an impurity. Prolonged exposure to respirable crystalline silica dust at concentrations exceeding the occupational exposure limits may increase the risk of developing a disabling lung disease known as silicosis. IARC found limited evidence for pulmonary carcinogenicity of crystalline silica in humans.

Genotoxicity
This product is not expected to cause any mutagenic effects.

Reproductive/Developmental Toxicity
This product is not expected to cause adverse reproductive effects.

12. ECOLOGICAL INFORMATION

Mobility
No relevant studies identified.

Persistence/Degradability
No relevant studies identified.

Bio-accumulation
No relevant studies identified.

Ecotoxicity
No relevant studies identified.

13. DISPOSAL CONSIDERATIONS

Dispose of container in accordance with all applicable local and national regulations. Do not cut, puncture or weld on or near to the container. No harm to the environment is expected from this preparation.

14. TRANSPORT INFORMATION

DOT CFR 172.101 Data	Not regulated
UN Proper Shipping Name	Not regulated
UN Class	None
UN Number	None
UN Packaging Group	None

15. REGULATORY INFORMATION

EU Label Information

Classification and labelling have been performed according to EU directives 67/548/EEC and 99/45/EC including amendments(2001/60/EC and 2006/8/EC)

EU Hazard Symbol and Indication of Danger.

This preparation is not classified as dangerous.

R phrases

None

S phrases

None.

US REGULATIONS (Federal, State) and INTERNATIONAL CHEMICAL REGISTRATION LAWS

TSCA Listing

This product contains ingredients that are listed on or exempt from listing on the EPA Toxic Substance Control Act Chemical Substance Inventory.

EINECS Listing

All ingredients in this product have not been verified for listing on the European Inventory of Existing Commercial Chemical Substances (EINECS) or the European List of New Chemical Substances (ELINCS).

DSL/NDSL (Canadian) Listing

All ingredients in this product are listed on the Domestic Substance List (DSL) or the Non-Domestic Substance List (NDSL) or are exempt from listing.

WHMIS Classification

D2B

This product was classified in accordance with the hazard criteria of the Canadian Controlled Products Regulations and the MSDS contains all the information required by these regulations.

MA Right To Know Law

All components have been checked for inclusion on the Massachusetts Substance List (MSL). Those components present at or above the de minimis concentration include: - Mica (12001-26-2) 1-4% - Amorphous Silica (7631-86-9) <2% - Ammonium Sulfate (7783-20-2) 30 - 40%

PA Right To Know Law

This product contains the following chemicals found on the Pennsylvania Hazardous Substance List: - Mica (12001-26-2) 1-4% - Amorphous Silica (7631-86-9) <2% - Ammonium Sulfate (7783-20-2)

30 - 40%

NJ Right To Know Law

This product contains the following chemicals found on the NJ Right To Know Hazardous Substance List: - Mica (12001-26-2) 1-4% - Amorphous Silica (7631-86-9) <2%

California Proposition 65

This product does not contain materials which the State of California has found to cause cancer, birth defects or other reproductive harm.

SARA Title III Sect. 302 (EHS)

This product does not contain any chemicals subject to SARA Title III Section 302.

SARA Title III Sect. 304

This product does not contain any chemicals subject to SARA Title III Section 304.

15. REGULATORY INFORMATION

SARA Title III Sect. 311/312 Categorization
- Immediate (Acute) Health Hazard

SARA Title III Sect. 313
This product does not contain any chemicals that are listed in Section 313 at or above de minimis concentrations.

16. OTHER INFORMATION

NFPA Ratings
NFPA Code for Health - 1
NFPA Code for Flammability - 0
NFPA Code for Reactivity - 0
NFPA Code for Special Hazards - None

HMIS Ratings
HMIS Code for Health - 1
HMIS Code for Flammability - 0
HMIS Code for Reactivity - 0
HMIS Code for Personal Protection - See Section 8

Abbreviations
N/A: Denotes no applicable information found or available
CAS#: Chemical Abstracts Service Number
ACGIH: American Conference of Governmental Industrial Hygienists
OSHA: Occupational Safety and Health Administration
TLV: Threshold Limit Value
PEL: Permissible Exposure Limit
STEL: Short Term Exposure Limit
NTP: National Toxicology Program
IARC: International Agency for Research on Cancer
R: Risk
S: Safety

Prepared By: EnviroNet LLC.

The information contained herein is based on data believed to be accurate. However, no representation, warranty, or guarantee is made to its accuracy, reliability or completeness. It is the user's responsibility to satisfy himself as to the suitability and completeness of such information for its own particular use. Badger Fire Protection assumes no responsibility for personal injury or property damage resulting from use, handling or from contact with this product.

MATERIAL SAFETY DATA SHEET

CAST BOOSTERS

DATE MAY 2011 **MSDS NO. P-1 PAGE 1 OF 2**

SECTION I

Issued by the Safety and Compliance Dept.

Austin Powder Company
25800 Science Park Drive
Cleveland, Ohio 44122

CHEMTREC (24HR Emergency Telephone), call 1-800-424-9300- United States, Canada, Puerto Rico (U.S. Commonwealth) and the Virgin Islands (U.S. Territory).
International callers, dial the U.S. access number followed by 1-703-527-3887 (Mexico access number 00).
U.S. Maritime callers dial- 1-703-527-3887.

For non-emergency assistance, call
216-464-2400

TRADE NAME AND SYNONYMS
ACP Boosters: Orange Cap, Orange Cap DC, Orange Cap R, Red Cap, Black Cap, Black Cap DC, Brown Cap, Green Cap, Purple Cap, White Cap, White Cap DC, Gray Cap, etc.
NDS Boosters, ADP Boosters, Gold Nugget, Silver Nugget, Diamond Nugget, DES Series, DES Pentolite Charges, Rock Crushers, 60 Gram, 90 Gram, 110 Gram, DES Shaped Charges, Prime Gel*, Renforcatuers, HDP 150, HDP 400, HDP 400LP, HDP 450, Snow Launcher Series, Avalanche Guard, Hornet Series, Enviroprime Series, Electro Star Series, E-Star Series, Seisprime Series and Oil Well Special Series.

SECTION II HAZARDOUS INGREDIENTS

Formulated with TNT and an explosive sensitizer such as PETN, RDX and/or HMX.

TNT, Trinitrotoluene, $C_7H_5N_3O_6$,	CAS No. 118-96-7 30% to 80% TNT
PETN, Pentaerythritol tetranitrate, $C_5H_8N_4O_{12}$,	CAS No. 78-11-5 20% to 70% PETN, RDX, and/or HMX.
HMX, Cyclotetramethylene tetranitramine, Octogen, $C_4H_8N_8O_8$,	CAS No. 261-41-0
RDX, Cyclotrimethylene trinitramine, Cyclonite, $C_3H_6N_6O_6$,	CAS No. 121-82-4
Aluminum, AL	CAS No. 7429-90-5 0% to 20% Aluminum
Pentolite is a 50/50 mixture of PETN and TNT.	CAS No. 8066-33-9

Orange Cap R and Electro Star boosters contain a brass sleeve.

SECTION III PHYSICAL DATA

BOILING POINT	Decomposes	VAPOR PRESSURE (mm Hg)	Negligible at 20°C
SPECIFIC GRAVITY (H_2O = 1)	1.65	VAPOR DENSITY (Air = 1)	N/A
PERCENT VOLATILE BY VOL. (%)	N/A	EVAPORATION RATE:	N/A
SOLUBILITY IN WATER:	0.15%		

APPEARANCE AND ODOR: Solid yellow-buff cast crystalline material. No odor.

SECTION IV FIRE AND EXPLOSION DATA

FLASH POINT:	N/A
FLAMMABLE LIMITS:	N/A
EXTINGUISHING MEDIA:	See below
SPECIAL FIRE FIGHTING PROCEDURES:	Do not fight fires. Withdraw personnel immediately. Allow fire to burn itself out. Avoid toxic fumes from fire.
UNUSUAL FIRE AND EXPLOSION HAZARDS:	May explode when subjected to fire or shock.

SECTION V HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: ACGIH: TNT-Skin, 0.1 MG/M³ PETN-None RDX-Skin, 1.5 MG/M³ AL-10MG/M³
OSHA : TNT-Skin, 1.5 MG/M³ PETN-None RDX-None AL-15MG/M³
EFFECTS OF OVEREXPOSURE: TNT ingestion may cause headache, weakness, anemia, or liver damage. Excessive skin contact may cause dermatitis and sensitization. PETN is a vasodilator. Ingestion of RDX may cause nervous system disorders or epiliptiform seizures.
EMERGENCY AND FIRST AID PROCEDURES:
FUMES: Remove to fresh air.
IF INGESTED: Obtain medical attention immediately.

MATERIAL SAFETY DATA SHEET

USED IN 1833 AUSTIN & EVER SINCE

CAST BOOSTERS

SECTION VI REACTIVITY DATA **Issued by the Safety and Compliance Dept.**

STABILITY: Stable under normal conditions. May explode when subjected to fire shock or friction.
INCOMPATIBILITY (MATERIALS TO AVOID): Avoid contact with strong acids or alkalies.
Do not exceed 150°F (66°C).
HAZARDOUS DECOMPOSITION PRODUCTS: Gaseous nitrogen oxides and carbon oxides: Toxic decomposition products including carbon monoxide (CO) may migrate to off blast-site areas.
HAZARDOUS POLYMERIZATION WILL NOT OCCUR.

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Sweep up and dispose of all spilled material immediately. Do not permit smoking or open flames near spill site.

WASTE DISPOSAL METHOD: Dispose of under direct supervision of a qualified person according to local, state and federal regulations. Call Austin Powder for recommendations and assistance. This material may become a hazardous waste under certain conditions and must be collected, labeled and disposed of per state and federal hazardous waste regulations.

TRANSPORTATION EMERGENCIES involving spills, leaks, fires or exposures in the United States, Canada, Puerto Rico (U.S. Commonwealth) and the Virgin Islands (U.S. Territory): **CALL CHEMTREC** for emergencies only: 1-800-424-9300.
International callers, dial the U.S. access number followed by 1-703-527-3887 (Mexico access number 00).
U.S. Maritime callers dial- 1-703-527-3887. All calls are recorded.

SECTION VIII SPECIAL PROTECTION INFORMATION:

RESPIRATORY PROTECTION:	Avoid breathing fumes from detonation.
VENTILATION:	Not required under normal conditions.
PROTECTIVE GLOVES:	Not required for normal handling of boosters.
EYE PROTECTION:	Not required under normal conditions.

SECTION IX SPECIAL PRECAUTIONS

COMPLY WITH THE SAFETY LIBRARY PUBLICATION NO. 4 "WARNINGS AND INSTRUCTIONS" AS ADOPTED BY THE INSTITUTE OF MAKERS OF EXPLOSIVES.
TRANSPORTATION, STORAGE AND USE MUST COMPLY WITH OSHA SAFETY AND HEALTH STANDARDS 29CFR1910.109, APPLICABLE MSHA REGULATIONS, THE DOT AND HAZARDOUS MATERIALS REGULATIONS, BATF REQUIREMENTS AND STATE AND LOCAL TRANSPORTATION, STORAGE AND USE REGULATIONS AND ORDINANCES.

DOT or IMDG proper shipping description: Boosters, Without Detonator, 1.1D, UN 0042, PG II
None of the components are listed in the 1987 IARC Monographs, Group 1, 2A, or 2B as a known, probable or possible carcinogen, nor are they listed in the NTP annual report on carcinogens.
The Enviroprime Series contains 4 to 7 % of a bioremediation inoculant consisting of natural food products and a trace of a naturally occurring non-pathogenic bacterium.
*Prime Gel contains both a Cast Booster and Hydromite. Also see the Hydromite MSDS.

The Clorox Company
1221 Broadway
Oakland, CA 94612
Tel. (510) 271-7000

Material Safety Data Sheet

I Product:	CLOROX REGULAR-BLEACH
Description:	CLEAR, LIGHT YELLOW LIQUID WITH A CHARACTERISTIC CHLORINE ODOR

Other Designations	Distributor	Emergency Telephone Nos.
Clorox Bleach EPA Reg. No. 5813-50	Clorox Sales Company 1221 Broadway Oakland, CA 94612	For Medical Emergencies call: (800) 446-1014 For Transportation Emergencies Chemtrec (800) 424-9300

II Health Hazard Data

DANGER: CORROSIVE. May cause severe irritation or damage to eyes and skin. Vapor or mist may irritate. Harmful if swallowed. Keep out of reach of children.

Some clinical reports suggest a low potential for sensitization upon exaggerated exposure to sodium hypochlorite if skin damage (e.g., irritation) occurs during exposure. Under normal consumer use conditions the likelihood of any adverse health effects are low.

Medical conditions that may be aggravated by exposure to high concentrations of vapor or mist: heart conditions or chronic respiratory problems such as asthma, emphysema, chronic bronchitis or obstructive lung disease.

FIRST AID:

Eye Contact: Hold eye open and rinse with water for 15-20 minutes. Remove contact lenses, after first 5 minutes. Continue rinsing eye. Call a physician.

Skin Contact: Wash skin with water for 15-20 minutes. If irritation develops, call a physician.

Ingestion: Do not induce vomiting. Drink a glassful of water. If irritation develops, call a physician. Do not give anything by mouth to an unconscious person.

Inhalation: Remove to fresh air. If breathing is affected, call a physician.

III Hazardous Ingredients

Ingredient	Concentration	Exposure Limit
Sodium hypochlorite CAS# 7681-52-9	5 - 10%	Not established
Sodium hydroxide CAS# 1310-73-2	<1%	2 mg/m[1] 2 mg/m[2]

[1]ACGIH Threshold Limit Value (TLV) - Ceiling

[2]OHSA Permissible Exposure Limit (PEL) – Time Weighted Average (TWA)

None of the ingredients in this product are on the IARC, NTP or OSHA carcinogen lists.

IV Special Protection and Precautions

No special protection or precautions have been identified for using this product under directed consumer use conditions. The following recommendations are given for production facilities and for other conditions and situations where there is increased potential for accidental, large-scale or prolonged exposure.

Hygienic Practices: Avoid contact with eyes, skin and clothing. Wash hands after direct contact. Do not wear product-contaminated clothing for prolonged periods.

Engineering Controls: Use general ventilation to minimize exposure to vapor or mist.

Personal Protective Equipment: Wear safety goggles. Use rubber or nitrile gloves if in contact liquid, especially for prolonged periods.

KEEP OUT OF REACH OF CHILDREN

V Transportation and Regulatory Data

DOT/IMDG/IATA - Not restricted.

EPA - SARA TITLE III/CERCLA: Bottled product is not reportable under Sections 311/312 and contains no chemicals reportable under Section 313. This product does contain chemicals (sodium hydroxide <0.2% and sodium hypochlorite <7.35%) that are regulated under Section 304/CERCLA.

TSCA/DSL STATUS: All components of this product are on the U.S. TSCA Inventory and Canadian DSL.

VI Spill Procedures/Waste Disposal

Spill Procedures: Control spill. Containerize liquid and use absorbents on residual liquid; dispose appropriately. Wash area and let dry. For spills of multiple products, responders should evaluate the MSDS's of the products for incompatibility with sodium hypochlorite. Breathing protection should be worn in enclosed, and/or poorly ventilated areas until hazard assessment is complete.

Waste Disposal: Dispose of in accordance with all applicable federal, state, and local regulations.

VII Reactivity Data

Stable under normal use and storage conditions. Strong oxidizing agent. Reacts with other household chemicals such as toilet bowl cleaners, rust removers, vinegar, acids or ammonia containing products to produce hazardous gases, such as chlorine and other chlorinated species. Prolonged contact with metal may cause pitting or discoloration.

VIII Fire and Explosion Data

Flash Point: None

Special Firefighting Procedures: None

Unusual Fire/Explosion Hazards: None. Not flammable or explosive. Product does not ignite when exposed to open flame.

IX Physical Data

Boiling point.....approx. 212°F/100°C
Specific Gravity (H_2O=1) ..... ~ 1.1 at 70°F
Solubility in Water ..... complete
pH .....~11.9

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DATA SUPPLIED IS FOR USE ONLY IN CONNECTION WITH OCCUPATIONAL SAFETY AND HEALTH DATE PREPARED 08/09

MATERIAL SAFETY DATA SHEET

DETONATING CORD

DATE MARCH 2011 **MSDS NO. C-1** **PAGE 1 of 2**

SECTION I **Issued by the Safety and Compliance Dept.**

Austin Powder Company
25800 Science Park Drive
Cleveland, Ohio 44122

CHEMTREC (24HR Emergency Telephone), call
1-800-424-9300- United States, Canada, Puerto Rico (U.S. Commonwealth) and the Virgin Islands (U.S. Territory).
International callers, dial the U.S. access number followed by 1-703-527-3887 (Mexico access number 00).
U.S. Maritime callers dial- 1-703-527-3887.

For non-emergency assistance, call
216-464-2400

TRADE NAME AND SYNONYMS
Lite Line, Scotch Cord, A-Cord, No. 40, No. 50
No. 60, No.80 etc. Seismic Detonating Cord, Slide Line Series, Heavy Duty Series, Cordeau Detonant Fuse, Cord, Detonating, Flexible, Special 18, 25, 30,40 and 50.Detonating Cord C3

SECTION II HAZARDOUS INGREDIENTS

PETN, Pentaerythritol tetranitrate, $C_5H_8N_4O_{12}$, CAS No. 78-11-5

SECTION III PHYSICAL DATA

BOILING POINT	N/A	VAPOR PRESSURE (mm Hg)	Negligible at 20^0C
SPECIFIC GRAVITY (H_2O = 1)	1.76	VAPOR DENSITY (Air = 1)	N/A
PERCENT VOLATILE BY VOL. (%)	N/A	EVAPORATION RATE:	N/A
SOLUBILITY IN WATER:	Negligible		

APPEARANCE AND ODOR: Flexible cord with an explosive core of PETN protected within a textile casing covered by a seamless polyethylene jacket. PETN is a white crystalline solid. No odor.

SECTION IV FIRE AND EXPLOSION DATA

FLASH POINT:	N/A
FLAMMABLE LIMITS:	N/A
EXTINGUISHING MEDIA:	See below
SPECIAL FIREFIGHTING PROCEDURES:	Do not fight fire. Withdraw personnel immediately. Allow fire to burn itself out.
UNUSUAL FIRE AND EXPLOSION HAZARDS:	May explode when subjected to fire or shock. Avoid toxic fumes from fire.

SECTION V HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: ACGIH: PETN-None
OSHA : PETN-None

EFFECTS OF OVEREXPOSURE: Ingestion of PETN may cause headache and nausea. PETN is a vasodilator and produces dilation of blood vessels.

EMERGENCY AND FIRST AID PROCEDURES:
FUMES: Remove to fresh air.
IF INGESTED: Obtain medical attention immediately.

MATERIAL SAFETY DATA SHEET

DETONATING CORD

SECTION VI REACTIVITY DATA **Issued by the Safety and Compliance Dept.**

STABILITY: Stable under normal conditions. May explode when subjected to fire or shock.
INCOMPATIBILITY (MATERIALS TO AVOID): Avoid contact with strong acids or alkalies.
HAZARDOUS DECOMPOSITION PRODUCTS: Gaseous nitrogen oxides and carbon oxides: Toxic decomposition products including carbon monoxide (CO) may migrate to off blast-site areas.
HAZARDOUS POLYMERIZATON WILL NOT OCCUR.

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Sweep up and dispose of all spilled material immediately. Do not permit smoking or open flames near spill site.

WASTE DISPOSAL METHOD: Dispose of under direct supervision of a qualified person according to local, state and federal regulations. Call Austin Powder for recommendations and assistance. This material may become a hazardous waste under certain conditions and must be collected, labeled and disposed of per state and federal hazardous waste regulations.

TRANSPORTATION EMERGENCIES involving spills, leaks, fires or exposures in the United States, Canada, Puerto Rico (U.S. Commonwealth) and the Virgin Islands (U.S. Territory): **CALL CHEMTREC** for emergencies only: 1-800-424-9300.
International callers, dial the U.S. access number followed by 1-703-527-3887 (Mexico access number 00).
U.S. Maritime callers dial- 1-703-527-3887. All calls are recorded.

SECTION VIII SPECIAL PROTECTION INFORMATION:

RESPIRATORY PROTECTION:	Not required under normal conditions.
VENTILATION:	Not required under normal conditions.
PROTECTIVE GLOVES:	Not required except to prevent abrasive injuries.
EYE PROTECTION:	Not required under normal conditions.

SECTION IX SPECIAL PRECAUTIONS

COMPLY WITH THE SAFETY LIBRARY PUBLICATION NO. 4 "WARNINGS AND INSTRUCTIONS" AS ADOPTED BY THE INSTITUTE OF MAKERS OF EXPLOSIVES.
TRANSPORTATION, STORAGE AND USE MUST COMPLY WITH OSHA SAFETY AND HEALTH STANDARDS 29CFR1910.109, APPLICABLE MSHA REGULATIONS, THE DOT AND HAZARDOUS MATERIALS REGULATIONS, BATF REQUIREMENTS AND STATE AND LOCAL TRANSPORTATION, STORAGE AND USE REGULATIONS AND ORDINANCES.

DOT or IMDG proper shipping description: Cord, Detonating, Flexible, 1.1D, UN0065, PG II
May be offered for transportation domestically and transported as Cord, Detonating (UN 0289), Division 1.4 compatibility group D (1.4D) Explosives, if the explosive content does not exceed 100 grains per linear foot (21.3 grams per meter) and the gross weight of all packages of detonating cord does not exceed (45 KG) 99 pounds per vehicle. See 49 CFR 173.63

The maximum recommended temperature for detonating cord is 160°F (71°C). None of the components are listed in the 1987 IARC Monographs, Group 1, 2A or 2B as known, probable, or possible carcinogens, nor are they listed in the NTP annual report on carcinogens.

Material Safety Data Sheet

according to ANSI Z400.1- 2004 and 29 CFR 1910.1200

OFF!™ DEEP WOODS® INSECT REPELLENT VII

Version 3.0

Revision Date 08/22/2012

Print Date 08/31/2012

MSDS Number 350000012887
SITE_FORM Number
30000000000000003296.005

1. PRODUCT AND COMPANY IDENTIFICATION

Product information

Trade name	:	OFF!™ DEEP WOODS® INSECT REPELLENT VII
Use of the Substance/Mixture	:	Insect Repellent
Company	:	S.C. Johnson & Son, Inc. 1525 Howe Street Racine WI 53403-2236
Emergency telephone number	:	24 Hour Medical Emergency Phone: (866)231-5406 24 Hour International Emergency Phone: (703)527-3887 24 Hour Transport Emergency Phone: (800)424-9300

2. HAZARDS IDENTIFICATION

Emergency Overview

Appearance / Odor	:	clear / liquid / pleasant
Immediate Concerns	:	Warning FLAMMABLE: CAUSES EYE IRRITATION. Keep away from heat, sparks and flame. Harmful if swallowed. Avoid contact with eyes and lips.

Potential Health Effects

Exposure routes	:	Eye, Skin, Inhalation, Ingestion.
Eyes	:	Causes: Moderate eye irritation
Skin	:	May cause skin reactions in rare cases. Prolonged or repeated contact may dry skin and cause irritation.
Inhalation	:	May cause nose, throat, and lung irritation. Inhalation may cause central nervous system effects.
Ingestion	:	May cause irritation to mouth, throat and stomach. May cause abdominal discomfort. Causes headache, drowsiness or other effects to the central nervous system. Harmful if swallowed.

Aggravated Medical Condition	:	Do not apply to cuts or irritated skin. Persons with pre-existing skin disorders may be more susceptible to irritating effects. Individuals with chronic respiratory disorders such as asthma, chronic bronchitis, emphysema, etc. may be more susceptible to irritating effects

3. COMPOSITION/INFORMATION ON INGREDIENTS

Hazardous chemicals present at or above reportable levels as defined by OSHA 29 CFR 1910.1200 or the Canadian Controlled Products Regulations are listed in this table:

Chemical Name	CAS-No.	Weight percent
Ethyl alcohol	64-17-5	30.00 - 60.00
N,N-Diethyl-m-toluamide	134-62-3	10.00 - 30.00

For additional information on product ingredients, see www.whatsinsidescjohnson.com.

4. FIRST AID MEASURES

Eye contact	:	Remove contact lenses. Flush immediately with plenty of water for at least 15 to 20 minutes. Get medical attention if irritation develops and persists.
Skin contact	:	Wash off immediately with plenty of water. Rinse with plenty of water. Get medical attention if irritation develops and persists. If you suspect a reaction to this product, discontinue use and remove contaminated clothing.
Inhalation	:	Remove to fresh air.
Ingestion	:	If swallowed, DO NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
Specific hazards during firefighting	:	Flammable liquid. Vapors are heavier than air and may travel to a source of ignition and flash back. Liquid run-off to sewers may create fire/explosion hazard. Container may melt and leak

in heat of fire. Do not allow run-off from fire fighting to enter drains or water courses. Burns with colourless flame.

Further information : Fight fire from maximum distance or protected area. Cool and use caution when approaching or handling fire-exposed containers. For large quantities of flammable liquids, consider containment to prevent the spread of fire. Wear full protective clothing and positive pressure self-contained breathing apparatus. In case of fire and/or explosion do not breathe fumes.

Flash point : 29 °C
84.2 °F
Method: Tag Closed Cup (TCC)

Lower explosion limit : Note: no data available

Upper explosion limit : Note: no data available

6. ACCIDENTAL RELEASE MEASURES

Personal precautions : Remove all sources of ignition.
Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.
Wear personal protective equipment.

Environmental precautions : Do not flush into surface water or sanitary sewer system.
Use appropriate containment to avoid environmental contamination.
Outside of normal use, avoid release to the environment.

Methods for cleaning up : Contain spillage, soak up with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and transfer to a container for disposal according to local / national regulations (see section 13).
Use only non-sparking equipment.
Dike large spills.
Clean residue from spill site.

7. HANDLING AND STORAGE

Handling

Advice on safe handling : Avoid contact with eyes and lips.
Avoid breathing vapors, mist or gas.
For personal protection see section 8.
Use only as directed.

KEEP OUT OF REACH OF CHILDREN AND PETS.
Smoking, eating and drinking should be prohibited in the application area.

Advice on protection against fire and explosion : Keep away from heat and sources of ignition.
Take measures to prevent the build up of electrostatic charge.

Storage

Requirements for storage areas and containers : Keep away from food, drink and animal feedingstuffs.
Keep container closed when not in use.
Keep in a dry, cool and well-ventilated place.

Other data : Stable under normal conditions.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Occupational Exposure Limits

Components	CAS-No.	mg/m3	ppm	Non-standard units	Basis
Ethyl alcohol	64-17-5	1,900 mg/m3	1,000 ppm	-	OSHA TWA
Ethyl alcohol	64-17-5	-	1,000 ppm	-	ACGIH STEL

Personal protective equipment

Respiratory protection Use only with adequate ventilation.
Do not spray in enclosed areas.

Hand protection : No special requirements.

Eye protection Safety glasses with side-shields

Skin and body protection : No special requirements.

Hygiene measures : Handle in accordance with good industrial hygiene and safety practice. Wash thoroughly after handling. Smoking, eating and drinking should be prohibited in the application area.

9. PHYSICAL AND CHEMICAL PROPERTIES

Form	:	liquid
Color	:	clear
Odor	:	pleasant
pH	:	5.3
Boiling point	:	no data available
Freezing point	:	no data available
Flash point	:	29 °C 84.2 °F Method: Tag Closed Cup (TCC)
Evaporation rate	:	no data available
Flammability (solid, gas)	:	no data available
Lower explosion limit	:	no data available
Upper explosion limit	:	no data available
Vapour pressure	:	no data available
Density	:	0.93 g/cm3
Water solubility	:	soluble
Partition coefficient: n-octanol/water	:	no data available
Viscosity, dynamic	:	no data available
Viscosity, kinematic	:	not applicable
Volatile Organic Compounds Total VOC (wt. %)*	:	34.7 % - additional exemptions may apply *as defined by US Federal and State Consumer Product Regulations

10. STABILITY AND REACTIVITY

Conditions to avoid	:	Heat, flames and sparks.

Materials to avoid	:	Strong oxidizing agents
Hazardous decomposition products	:	Thermal decomposition can lead to release of irritating gases and vapours.
Hazardous reactions	:	Stable under recommended storage conditions.

11. TOXICOLOGICAL INFORMATION

Acute oral toxicity	:	LD50 4,103 mg/kg
Acute inhalation toxicity	:	LC50 > 2.07 mg/l
Acute dermal toxicity	:	LD50 > 5,000 mg/kg

Chronic effects

Carcinogenicity	:	no data available
Mutagenicity	:	None Anticipated
Reproductive effects	:	no data available
Teratogenicity	:	no data available
Sensitisation	:	Not known to be a sensitizer.

12. ECOLOGICAL INFORMATION

Ecotoxicity effects	:	no data available

13. DISPOSAL CONSIDERATIONS

PESTICIDAL WASTE:
Observe all applicable Federal, Provincial and State regulations and Local/Municipal ordinances regarding disposal.
Consumer may discard empty container in trash, or recycle where facilities exist.

RCRA waste class : D001 (Ignitable Waste)

14. TRANSPORT INFORMATION

Land transport

- **U.S. DOT and Canadian TDG Surface Transportation:**

Proper shipping name	UN 1993 FLAMMABLE LIQUID N.O.S. (ethanol), 3, III
Class:	3
UN number	1993
Packaging group:	III
Note:	Limited quantities derogation may be applicable to this product, please check transport documents.

Sea transport

- *IMDG:*

Proper shipping name	UN 1993 FLAMMABLE LIQUID N.O.S. (ethanol), 3, III
Class:	3
UN number:	1993
Packaging group:	III
EmS:	F-E, S-E
Note:	Limited quantities derogation may be applicable to this product, please check transport documents.

Air transport

- *ICAO/IATA:*

Proper shipping name	UN 1993 FLAMMABLE LIQUID N.O.S. (ethanol), 3, III
Class:	3
UN/ID No.:	UN 1993
Packaging group:	III
Note:	SC Johnson typically does not ship products via air. Refer to IATA/ICAO Dangerous Goods Regulations for detailed instructions when shipping this item by air.

15. REGULATORY INFORMATION

Notification status	:	All ingredients of this product are listed or are excluded from listing on the U.S. Toxic Substances Control Act (TSCA) Chemical Substance Inventory.
Notification status	:	All ingredients of this product comply with the New Substances Notification requirements under the Canadian Environmental Protection Act (CEPA).
California Prop. 65	:	This product is not subject to the reporting requirements under California's Proposition 65.
Canada Regulations	:	This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

Registration # / Agency
4822-399/US/EPA
29931/PMRA

16. OTHER INFORMATION

HMIS Ratings

Health	2
Flammability	3
Reactivity	0

NFPA Ratings

Health	2
Fire	3
Reactivity	0
Special	-

Further information
This document has been prepared using data from sources considered to be technically reliable. It does not constitute a warranty, expressed or implied, as to the accuracy of the information contained herein. Actual conditions of use are beyond the seller's control. User is responsible to evaluate all available information when using product for any particular use and to comply with all Federal, State, Provincial and Local laws and regulations.

OFF!™ DEEP WOODS® INSECT REPELLENT VII

Version 3.0

Revision Date 08/22/2012

Print Date 08/31/2012

MSDS Number 350000012887
SITE_FORM Number
30000000000000003296.005

Prepared by:	SC Johnson Global Safety Assessment & Regulatory Affairs (GSARA)

FOR CHEMICAL EMERGENCY, SPILL, LEAK, FIRE, EXPOSURE OR ACCIDENT, CALL CHEMTREC - DAY OR NIGHT 1-800-424-9300

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

FORMULATED FOR:

LOVELAND PRODUCTS, INC.
P.O. Box 1286 • Greeley, CO 80632-1286

24-Hour Emergency Phone: 1-800-424-9300
Medical Emergencies: 1-866-944-8565
U.S. Coast Guard National Response Center: 1-800-424-8802

PRODUCT NAME: PERMETHRIN
CHEMICAL NAME: Permethrin: (3-Phenoxyphenyl) methyl (±) cis-trans-3- (2,2-dichloroethenyl)-2,2-dimethylcyclopropanecarboxylate*
CHEMICAL FAMILY: Pyrethroid Insecticide
EPA REG. NO.: 34704-873
MSDS Number: 000873-09-LPI **MSDS Revisions:** Sections 1, 4, 8, 13 **Date of Issue:** 03/24/09 **Supersedes:** 10/15/08

2. HAZARDS IDENTIFICATION SUMMARY

KEEP OUT OF REACH OF CHILDREN – CAUTION - AVISO – Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detaile (If you do not understand the label, find someone to explain it to you in detail.) Harmful if swallowed or absorbed through skin. Causes moderate eye irritation. Avoid contact with eyes, skin or clothing. Avoid breathing vapor or spray mist. Wash thoroughly with soap and water after handling.

This product is amber liquid with an aromatic solvent odor.

3. COMPOSITION, INFORMATION ON INGREDIENTS

Chemical Ingredients:	Percentage by Weight:	CAS No.	TLV (Units)
Permethrin	38.40	52645-53-1	not listed
Inert ingredients, including:	61.60		
Aromatic Hydrocarbons		64742-95-6	not listed

4. FIRST AID MEASURES

If inhaled: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably by mouth-to-mouth, if possible. Call a poison control center or doctor for further treatment advice.

If on skin or clothing: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15 - 20 minutes. Call a poison control center or doctor for treatment advice.

If in eyes: Hold eye open and rinse slowly and gently with water for 15 - 20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.

If swallowed: Call a poison control center or doctor immediately for treatment advice. Do not give any liquid to the person. Do not induce vomiting unless told to do so by the poison control center or doctor. Do not give anything by mouth to an unconscious person.

NOTE TO PHYSICIAN: Vomiting should be supervised by a physician or the professional staff because of the possible pulmonary damages by aspiration of the solvent.

FOR A MEDICAL EMERGENCY INVOLVING THIS PRODUCT CALL: 1-866-944-8565. Have the product label or container with you when calling a poison control center or doctor, or going for treatment.

5. FIRE FIGHTING MEASURES

FLASH POINT (°F/Test Method): 108°F / 42.2°C (CC)
FLAMMABLE LIMITS (LFL & UFL): None established
EXTINGUISHING MEDIA: Foam, CO_2, or dry chemical. Soft stream water fog only if necessary.
HAZARDOUS COMBUSTION PRODUCTS: Carbon monoxide and/or carbon dioxide. Chlorine and hydrogen chloride may be formed.
SPECIAL FIRE FIGHTING PROCEDURES: Wear self-contained breathing apparatus with full protective clothing. Fight fire from upwind and keep all non-essential personnel downwind and out of area.
UNUSUAL FIRE AND EXPLOSION HAZARDS: If water is used to fight fire and cool the containers, contain run-off by diking to prevent contamination of water supplies. Containers in fire may burst or explode from excessive heat. Vapors may travel a considerable distance to source of ignition and flash back along vapor trail.

6. ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:

For small spills, absorb with an absorbent material such as pet litter. Sweep up and transfer to containers for possible land application according to label use or for proper disposal. Wash the spill with water containing a strong detergent, absorb with pet litter or other absorbent material, sweep up and place in a chemical container and handle in an approved manner. Check local, state and federal regulations for proper disposal. Flush the area with water to remove any residue. For large spills: contain liquid by diking the area, keep product out of water supplies. Large spills that soak into ground should be dug up to a depth of 1 to 2 inches, placed in drums and disposed of in accordance with instructions provide under DISPOSAL, section 13 of this MSDS. Any recovered spilled liquid should be similarly collected and disposed of.

CAUTION: Keep spills and cleaning runoff out of municipal sewers and open bodies of water.

7. HANDLING AND STORAGE

HANDLING: Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet. Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing. Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

STORAGE: Do not store below 10°F / -12.2°C. Do not use or store near heat, open flame, or hot surfaces. Keep out of reach of children and animals. Store in original containers only. Store in a cool dry place and avoid excess heat. Carefully open containers. After partial use, replace lids and close tightly. Do not put concentrate or dilute material into food or drink containers. Do not contaminate other pesticides, fertilizers, water, food or feed by storage or disposal.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

ENGINEERING CONTROLS: Pilots must use an enclosed cockpit that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240(d)(6)].

RESPIRATORY PROTECTION: Not normally required; if vapors or mists become excessive, wear a NIOSH approved pesticide respirator with cartridges for pesticide vapors.

EYE PROTECTION: Chemical goggles or shielded safety glasses.

SKIN PROTECTION: Wear protective clothing: long-sleeved shirts and pants, shoes plus socks. Wear rubber or chemical-resistant gloves.

	OSHA PEL 8 hr TWA	ACGIH TLV-TWA
Xylene (mixed isomers)	435 mg/m^3	434 mg/m^3
Ethyl benzene	435 mg/m^3	434 mg/m^3
Trimethylbenzene	not listed	123 mg/m^3
Cumene	245 mg/m^3 (Skin)	246 mg/m^3

Personal Protective Equipment (PPE): All mixers, loaders, applicators and other handlers must wear: long sleeved shirt and long pants, shoes plus socks, chemical-resistant gloves for all handlers except for applicators using motorized ground equipment, pilots, and flaggers. Chemical-resistant apron for mixers/loaders, persons cleaning equipment, and persons exposed to the concentrate. Follow manufacturer's instructions for cleaning and maintaining PPE. If no instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry. Discard clothing and other absorbent materials that have been drenched (except as required by directions for use) or heavily contaminated with this product's concentrate. Do not reuse them.

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE AND ODOR: Amber liquid with an aromatic solvent odor.
SOLUBILITY: Emulsifiable
SPECIFIC GRAVITY (Water = 1): 1.002 g/ml
BULK DENSITY: 8.36 lbs/gal.
pH: 5.0 - 5.6 (1% solution)
VAPOR PRESSURE: Not applicable
BOILING POINT: Not established
PERCENT VOLATILE (by volume): Not applicable
EVAPORATION RATE: Not applicable

Note: These physical data are typical values based on material tested but may vary from sample to sample. Typical values should not be construed as a guaranteed analysis of any specific lot or as specification items.

10. STABILITY AND REACTIVITY

STABILITY: Stable
CONDITIONS TO AVOID: Excessive heat and fire.
INCOMPATIBILITY: Not established.
HAZARDOUS DECOMPOSITION PRODUCTS: Carbon monoxide and/or carbon dioxide, chlorine and hydrogen chloride may be formed in a fire situation.
HAZARDOUS POLYMERIZATION: Will not occur.

11. TOXICOLOGICAL INFORMATION

Acute Oral LD_{50} (rat): 1,030 mg/kg
Acute Dermal LD_{50} (rabbit): >2000 mg/kg
Eye Irritation (rabbit): Moderate eye irritant
Skin Irritation (rabbit): Not established
Inhalation LC_{50} (rat): 25.7 mg/L (4 hr).
Skin Sensitization (guinea pig): Not established.
Carcinogenic Potential: Ethyl benzene is listed as a Class 2B carcinogen (limited evidence for carcinogenicity in humans) by the International Agency for Research on Cancer (IARC). Ethyl benzene was found to be possibly carcinogenic to humans by NTP. Not listed by OSHA or ACGIH.

12. ECOLOGICAL INFORMATION

This pesticide is extremely toxic to fish and aquatic invertebrates. For terrestrial uses, do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark. Do not apply when weather conditions favor drift from target areas. Do not contaminate water by cleaning equipment or disposal of wastes. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops if bees are visiting the treatment area.

13. DISPOSAL CONSIDERATIONS

PESTICIDE DISPOSAL: Pesticide wastes are toxic. Improper disposal of excess pesticide, spray mixture, or rinsate is a violation of Federal law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste representative of the nearest EPA Regional Office for guidance. **CONTAINER DISPOSAL: Nonrefillable container.** Do not reuse this container to hold materials other than pesticides or dilute pesticides (rinsate). After emptying and cleaning, it may be allowable to temporarily hold rinsate or other pesticide-related materials in the container. Contact your state regulatory agency to determine allowable practices in your state. Once cleaned, some agricultural plastic pesticide containers can be taken to a container collection site or picked up for recycling. To find the nearest site, contact your chemical dealer or manufacturer, or contact The Agricultural Container Recycling Council (ACRC) at www.acrecycle.org. Triple rinse or pressure rinse container (or equivalent) promptly after emptying. **Triple rinse as follows:** Empty the remaining contents into application equipment or a mix tank and drain for 10 seconds after the flow begins to drip. Fill the container ¼ full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times. **Pressure rinse as follows:** Empty the remaining contents into application equipment or a mix tank and continue to drain for 10 seconds after the flow begins to drip. Hold container upside down over application equipment or mix tank or collect rinsate for later use or disposal. Insert pressure rinsing nozzle in the side of the container, and rinse at about 40 PSI for at least 30 seconds. Drain for 10 seconds after the flow begins to drip.

14. TRANSPORT INFORMATION

DOT Shipping Description: LESS THAN 119 GALLONS NOT REGULATED BY USDOT FOR SURFACE (GROUND) TRANSPORTATION.
U.S. Surface Freight Classification: INSECTICIDES OR FUNGICIDES, INSECT OR ANIMAL REPELLENTS, NOI, OTHER THAN POISON (NMFC 102120; CLASS: 60)

Consult appropriate ICAO/IATA and IMDG regulations for shipment requirements in the Air and Maritime shipping modes. Packaging and classification for these modes of transportation are more stringent.

15. REGULATORY INFORMATION

NFPA & HMIS Hazard Ratings:

NFPA		HMIS
2 Health	0 Least	2 Health
2 Flammability	1 Slight	2 Flammability
1 Instability	2 Moderate	1 Reactivity
	3 High	H PPE
	4 Severe	

SARA Hazard Notification/Reporting
SARA Title III Hazard Category:

Immediate	Y	Fire	Y	Sudden Release of Pressure	N
Delayed	Y	Reactive	N		

Reportable Quantity (RQ) under U.S. CERCLA: Xylene (mixed isomers) (CAS: 1330-20-7) 100 pounds; Cumene (CAS: 98-82-8) 5000 pounds; Ethylbenzene (CAS: 100-41-1) 1000 pounds
SARA, Title III, Section 313: Permethrin (CAS: 52645-53-1) 38.40%; 1,2-4 Trimethylbenzene (CAS: 95-63-6): <17.0%; Xylene (mixed isomers) (CAS: 1330-20-7) < 2.0%; Cumene (CAS: 98-82-8) < 1.0%; Ethylbenzene (CAS: 100-41-1) <1.0%
RCRA Waste Code: Not listed.
CA Proposition 65: Not listed.

16. OTHER INFORMATION

MSDS STATUS: Sections 1, 4, 8, and 13 revised

PREPARED BY: Registrations and Regulatory Affairs **REVIEWED BY:** Environmental/ Regulatory Services

This product is a Restricted Use Pesticide (Toxic to Fish and Aquatic Organisms)

U.S. Patent No. 4,024,163

**cis/trans ratio: Max. 55% (±) cis and min. 45% trans*

Disclaimer and Limitation of Liability: This data sheet was developed from information on the constituent materials identified herein and does not relate to the use of such materials in combination with any other material or process. No warranty is expressed or implied with respect to the completeness or ongoing accuracy of the information contained in this data sheet, and LOVELAND PRODUCTS, INC. disclaims all liability for reliance on such information. This data sheet is not a guarantee of safety. Users are responsible for ensuring that they have all current information necessary to safely use the product described by this data sheet for their specific purpose.

Material Safety Data Sheet

Preparation Date: 20-Sep 2007 **Revision Date:** 22-Oct-2008 **Revision Number:** 1

SECTION 1 – PRODUCT AND COMPANY INFORMATION

Supplier(s):

Orica Canada Inc.	Orica USA Inc
Maple Street	33101 E Quincy Ave
Brownsburg, QC	Watkins, CO 80137-9406
For MSDS Requests: 1-450-533-4201	For MSDS Requests: 1-303-268-5000

Product Name:	**Primafuse™**
Product Code:	20085
Alternate Name(s):	Not available
UN-No:	UN0360 or UN0361 (Depending on packaging)
Recommended Use:	Non Electric Detonator assemblies for blasting.

Emergency Telephone Number: FOR CHEMICAL EMERGENCIES (24 HOUR) INVOLVING TRANSPORTATION, SPILL, LEAK, RELEASE, FIRE OR ACCIDENTS: **IN CANADA CALL:** ORICA CANANDA TRANSPORTATION EMERGENCY RESPONSE SYSTEM AT **1-877-561-3636**. IN US CALL: CHEMTREC **1-800-424-9300**. **IN THE U.S**. FOR LOST, STOLEN OR MISPLACED EXPLOSIVES CALL: BATF **1-800-800-3855.** FORM ATF F5400.0 MUST BE COMPLETED AND LOCAL AUTHORITIES (STATE/MUNICIPAL POLICE, ETC.) MUST BE ADVISED.

SECTION 2 – HAZARD IDENTIFICATION

Emergency Overview:
This product is an article. No exposure to hazardous chemicals is expected to occur during intended product use. Misuse of the product may result in exposure to hazardous chemicals. The following information is the potential hazards associated with the ingredient(s) in this product. It is our belief that, under conditions of normal occupational exposure, this product should pose no such hazards to the user. Main risk is that of explosion by shock, friction, fire or other sources of ignition. Read the entire MSDS for a more thorough evaluation of the hazards. Suspect cancer hazard – risk of cancer depends on duration and level of exposure. Irritating to respiratory system. Vapors may be irritating to eyes, nose, throat, and lungs.

Appearance:	**Physical State:**	**Odor:**
Yellow flexible cord	Solid	Slight

SECTION 3 – COMPOSITION/ INFORMATION ON INGREDIENTS

Chemical Name	**CAS-No**	**Weight %**
Pentaerythritol Tetranitrate	78-11-5	5-10
Calcium Estearate	1305-78-8	1-5
Charcoal	1333-86-4	1-5
Titanium Dioxide	13463-67-7	1-5
Dinitrotoluene (mixed isomers)	25321-14-6	1-5
Lead Styphnate	63918-97-8	1-5
Lead	7439-92-1	1-5
Zinc	7440-66-6	1-5
Amorphous Silica	7631-86-9	1-5
Sulfur	7704-34-9	1-5
Potassium Nitrate	7757-79-1	1-5
Dibutyl Phthalate	84-74-2	1-5

SECTION 4- FIRST AID MEASURES

General Advice: In case of accident or if you feel unwell, seek medical advice IMMEDIATELY (show the product label where possible).

Eye Contact: Immediately flush with plenty of water. After initial flushing, remove any contact lenses and continue flushing for at least 15 minutes. Immediate medical attention is required.

Skin Contact: Wash off immediately with soap and plenty of water, removing all contaminated clothes and shoes. If skin irritation persists, call a physician.

Inhalation: Move victim to fresh air. Give artificial respiration ONLY if breathing has stopped. Give cardiopulmonary resuscitation (CPR) if there is not breathing AND no pulse. Obtain medical advice IMMEDIATELY.

Ingestion: Immediate medical attention is required. Do no induce vomiting. Clean mouth with water and afterwards drink plenty of water. Never give anything by mouth to an unconscious person. If spontaneous vomiting occurs, have victim lean forward with head positioned to avoid breathing in of vomitus, rinse mouth and administer more water.

Notes to Physician: Symptomatic. Administer oxygen if there are signs of cyanosis. If clinical condition deteriorates, administer 10cc Methylene Blue intravenously. It is unlikely for this to be required with methemoglobin level of less than 40%. Do not give vasopressor drugs (i.e., epinephrine, adrenaline, ephedrine, etc.) as there may be danger of producing cardiac arrhythmia. Medical conditions that may be aggravated by exposure to this product include hypotension and skin disorders.

SECTION 5 – FIRE-FIGHTING MEASURES

Flammable properties: High explosive with mass detonation hazard. Expected to be sensitive to mechanical impact. Not expected to be sensitive to static discharge.

Suitable extinguishing media: DO NOT FIGHT FIRES INVOLVING EXPLOSIVES. Evacuate surrounding areas. When controlling fire before involvement of explosives, fire-fighters should wear positive pressure self-contained breathing apparatus (SCBA) and full turnout gear. Water may be applied through fixed extinguishing system (sprinklers) as long as people need not be present for the system to operate. Water may be used on small fires.

Unsuitable extinguishing media: DO NOT FIGHT FIRES INVOLVING EXPLOSIVES.

Specific hazards arising from the Chemical: DO NOT FIGHT FIRES INVOLVING EXPLOSIVE MATERIALS. Immediately evacuate all personnel from the area to a safe distance. Guard against re-entry. This product is a high explosive with a mass detonation hazard. Thermal decomposition can lead to release of irritating gases and vapors.

Protective equipment and precautions for fire fighters: As in any fire, wear self-contained breathing apparatus pressure-demand, NIOSH approved (or equivalent) and full protective gear.

SECTION 6 – ACCIDENTAL RELEASE MEASURES

Methods for containment: No information available.

Methods for cleaning up: Not required. If detonators are damaged, contact an Orica Canada Inc. or Orica USA Inc. technical representative.

SECTION 7 - HANDLING AND STORAGE

Handling: This product is an explosive and should only be used under the supervision of trained personnel. Protect containers from physical damage. Keep away from incompatible materials, heat, sparks, flames and other ignition sources. Avoid rough handling.

Storage: Keep container tightly closer in a dry and well-ventilated place.

SECTION 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering Measures: Where reasonably practicable this should be achieved by the use of local exhaust ventilation and good general extraction.

Personal Protective Equipment

- **Eye/Face Protection:** Tightly fitting safety goggles.
- **Skin Protection:** Not required for normal use.
- **Respiratory protection:** Use a NIOSH-approved respirator, if required.

Hygiene Measures: Handle in accordance with good industrial hygiene and safety practice.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Polyolefin tube with unspecified color

Physical State: Solid
pH: No data available
Flammable Limits (upper): No data available
Explosion Power: No data available
Water Solubility: Negligible
Vapor Pressure: Not available
Partition Coefficient (n-octanol/water): No data available

Odor: None
Viscosity: No Information Available
Melting Point/Range: PETN melts at 140℃ / 284℉

Flammable Limits (lower): No data available
Specific Gravity: Not available
Other Solubility: No information available
Oxidizing Properties: No information available

SECTION 10 - STABILITY AND REACTIVITY

Stability: Explosive. Stable under recommended storage conditions
Conditions to avoid: Keep away from heat, sparks, flame, impact and friction.
Incompatible materials: Strong oxidizing agents, Acids.
Hazardous decomposition products: Thermal decomposition products are toxic and may include hydrocarbons, oxides of carbon and nitrogen.
Hazardous polymerization: Hazardous polymerization does not occur.

SECTION 11 - TOXICOLOGICAL INFORMATION

Acute Toxicity

Product Information: This product has not been tested for toxicity. Information provided is based on the components.

Carcinogenicity: The table below indicates weather each agency has listed any ingredient as a carcinogen.

Chemical Name	ACGIH	IARC	NTP	OSHA
Charcoal		Group 2B		X
Dinitrotoluene (Mixed isomers)	A3			
Lead Styphnate	A3	Group 2B		X
Lead	A3	Group 2A Group 2B		X

Legend: A3 is listed as a known animal carcinogen. Group 2A is probably carcinogenic to humans Group 2B is possibly carcinogenic to humans. X is listed as the OSHA acknowledges these chemicals as carcinogens.
Mutagenicity: There is no evidence of mutagenic potential
Sensitization: None.
Reproductive effects: An ingredient in the product may cause reproductive effects
Developmental effects: A study in animals has shown that high exposures produce teratogenic effects in the absence of maternal toxicity
Target Organ: Blood, Liver, Respiratory system, Eye, Reproductive System, Central Vascular System (CVS), Gastrointestinal tract (GI)

SECTION 12 - ECOLOGICAL INFORMATION

Ecotoxicity effects: Environmental Effects: Can be dangerous if allowed to enter drinking water intakes. Do not contaminate domestic or irrigation water supplies, lakes, streams, ponds, or rivers.

SECTION 13 - DISPOSAL CONSIDERATIONS

Waste Disposal Method: Burn under supervision of an expert at and explosive burning ground or destroy by detonation in boreholes, in accordance with applicable local, provincial and federal regulations. Call upon the services of an Orica Technical Representative.

SECTION 14 - TRANSPORT INFORMATION

DOT Proper Shipping Name:	Detonators Assemblies Non Electric
Hazard Class:	1.4B or 1.1B (depending on packaging)
UN-No:	UN0361 or UN0360 (depending on packaging)
Packing Group:	II
TDG Proper Shipping Name:	Detonators Assemblies Non Electric
Hazard Class:	1.4B or 1.1B (depending on packaging)
UN-No:	UN0361 or UN0360 (depending on packaging)
Packing Group:	II

SECTION 15 - REGULATORY INFORMATION

CANADIAN CLASSIFICATION: This product has been classified in accordance with the hazard criteria of the CPR (Controlled Products Regulations) and this MSDS contains all the information required by the CPR

WHMIS hazard class: This product is an explosive and is not regulated by WHMIS.

USA CLASSIFICATION:

SARA Regulations Sections 313 and 40 CFR 372: No reportable components present

SARA 311/312 Hazardous Categorization

Acute Health Hazard:	Yes
Chronic Health Hazard:	Yes
Fire Hazard:	No
Sudden Release of Pressure Hazard:	Yes

Ozone Protection and 40 CFR 42: No reportable quantities of ozone depleting agents

Other Regulations/Legislations which apply to this product: California Proposition 65, Pennsylvania Right-to-Know, Massachusetts Right-to-Know, Rhode Island Right-to-Know, New Jersey Right-to-Know.

TSCA: Complies **DSL:** Complies **NDSL:** Complies

SECTION 16 - OTHER INFORMATION

Prepared By: **Safety, Health & Environment**
303-268-5000

Preparation Date: 20-Sep-2007
Revision Date: 22-Oct-2008

The information contained herein is offered as a guide to the handling of this specific material and has been prepared in good faith by technically knowledgeable personnel. It is not intended to be all-inclusive and the manner and conditions of use and handling may involve other and additional considerations. No warranty of any kind is given or implied and Orica will not be liable for any damages, losses, injuries or consequential damages which may result from the use of or reliance on any information contained herein.

End of MSDS

DETOTEC NORTH AMERICA, INC.

MATERIAL SAFETY DATA SHEET

RDX/NYLON PERFACORD® DETONATING CORD

ISSUE DATE: AUGUST 2001
REVISION DATE: OCTOBER 2011 **MSDS D-1 Rev 4**

SECTION I — Issued by the Safety and Compliance Dept.

DETOTEC NORTH AMERICA, INC.
363 EKONK HILL ROAD
STERLING, CT 06377
EMERGENCY PHONE
DAY 1-800-255-3924
NIGHT 1-800-255-3924

TRADE NAME AND SYNONYMS:

40 RDX LS Detonating Cord	Detotec 40 RDX LS
40 RDX LS Ribbon Detonating Cord	Detotec 40 RDX LS Ribbon
80 RDX Detonating Cord	Detotec 80 RDX
80 RDX LS Detonating Cord	Detotec 80 RDX LS
80 RDX LS XHV Detonating Cord	Detotec 80 RDX LS XHV
Pipebuster Special RDX	Detotec 70 RDX LS

SECTION II - HAZARDOUS INGREDIENTS

Material or Component	CAS No.	TLV	PEL
RDX (Cyclotrimethylene Trinitramine)	121-82-4	1.5 mg/m^3	1.5mg/m^3

SECTION III - PHYSICAL DATA

BOILING POINT:	Not Applicable	VAPOR PRESSURE (mm Hg):	Negligible
SOLUBILITY IN WATER:	Insoluble	VAPOR DENSITY (Air = 1):	Not Applicable
EVAPORATION RATE:	Not Applicable		

APPEARANCE AND ODOR: Flexible cord with an explosive core of RDX protected within a textile braid covered by a seamless nylon jacket. RDX is a white crystalline solid. No odor.

SECTION IV - REACTIVITY DATA — Issued by the Safety and Compliance Dept.

STABILITY: Stable under normal conditions. May explode when subjected to fire, shock, or high-energy projectile impact.

INCOMPATIBILITY (MATERIALS TO AVOID): Avoid contact with strong acids or alkalies.

HAZARDOUS DECOMPOSITION PRODUCTS: Gaseous Nitrogen Oxides and Carbon Oxides.

HAZARDOUS POLYMERIZATION WILL NOT OCCUR.

DETOTEC NORTH AMERICA, INC.

MATERIAL SAFETY DATA SHEET

RDX/NYLON PERFACORD® DETONATING CORD

ISSUE DATE: AUGUST 2001
REVISION DATE: OCTOBER 2011 **MSDS D-1 Rev 4**

SECTION V - FIRE AND EXPLOSION DATA

FLASH POINT:	Not Applicable
FLAMMABLE LIMITS:	Not Applicable
EXTINGUISHING MEDIA:	See below
SPECIAL FIREFIGHTING PROCEDURES:	ALL EXPLOSIVES: DO NOT FIGHT EXPLOSIVES FIRES. Try to keep fire from reaching explosives. Isolate Area. Guard against intruders. Withdraw personnel immediately. Allow fire to burn itself out. Division 1.1 Explosives: Evacuate the area for 5000 feet (1 mile). Consult the 2008 Emergency Response Guidebook, Guide 112 for further details. Division 1.4 Explosives: Evacuate the area for 1500 feet (1/3 mile). Consult the 2008 Emergency Response Guidebook, Guide 114 for further details.
UNUSUAL FIRE AND EXPLOSION HAZARDS:	May explode when subjected to fire or shock. Avoid toxic fumes from fire.

SECTION VI - HEALTH HAZARD DATA

GENERAL: Detonating cords do not present health hazards in normal handling and use; however, the products are Division 1.1 or 1.4 explosives, and detonation may cause severe physical injury, including death. All explosives are dangerous and must be handled carefully and used following approved safety procedures under the direction of competent, experienced persons in accordance with all applicable federal, state and local laws, regulations, and ordinances.

THRESHOLD LIMIT VALUE: ACGIH: RDX – Skin TWA 1.5 mg/M^3
OSHA: RDX – Skin TWA 1.5 mg/M^3

EFFECTS OF OVEREXPOSURE: Ingestion of RDX may cause disorders or epiliptiform seizures.

EMERGENCY AND FIRST AID PROCEDURES:
FUMES: Remove to fresh air.
IF INGESTED: Obtain medical attention immediately.

CARCIONOGENICITY: None of the components of detonating cords are listed as a carcinogen by NTP, IARC, or OSHA.

DETOTEC NORTH AMERICA, INC.

MATERIAL SAFETY DATA SHEET

RDX/NYLON PERFACORD® DETONATING CORD

ISSUE DATE: AUGUST 2001
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SECTION VII - FIRST AID

Inhalation	Not a likely route of exposure. If inhaled, remove to fresh air. If not breathing, give artificial respiration, preferably by mouth-to-mouth. If breathing is difficult, give oxygen. Seek prompt medical attention.
Eye and skin contact	Not a likely route of exposure.
Ingestion	Not a likely route of exposure.
Injury from detonation	Seek prompt medical attention.

SECTION VIII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Protect from all ignition sources. Sweep up and dispose of all spilled material immediately. Only competent, experienced persons should be involved in cleanup procedures. Do not permit smoking or open flames near spill site.

WASTE DISPOSAL METHOD: Dispose of under direct supervision of a qualified person according to local, state and federal regulations. This material may become a hazardous waste as defined under the Resource Conservation and Recovery Act (RCRA) 40 CFR, parts 260-271, and must be collected, labeled and disposed of per state and federal hazardous waste regulations.

TRANSPORTATION EMERGENCIES INVOLVING SPILLS, LEAKS, FIRES, OR EXPOSURES CALL CHEMTEL: 1-800-255-3924.

SECTION IX – SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION:	Not required under normal conditions.
VENTILATION:	Not required under normal conditions.
PROTECTIVE GLOVES:	Not required except to prevent abrasive injuries.
EYE PROTECTION:	Not required under normal conditions.

SECTION X - SPECIAL PRECAUTIONS

COMPLY WITH "ALWAYS AND NEVER" AS ADOPTED BY THE INSTITUTE OF MAKERS OF EXPLOSIVES. TRANSPORTATION, STORAGE AND USE MUST COMPLY WITH OSHA SAFETY AND HEALTH STANDARDS 29 CFR1910.109, APPLICABLE MSHA REGULATIONS, THE DOT AND HAZARDOUS MATERIALS REGULATIONS, BATF REQUIREMENTS AND STATE AND LOCAL TRANSPORTATION, STORAGE AND USE REGULATIONS AND ORDINANCES.

The maximum recommended temperature for RDX/Nylon detonating cord is 325° F (163°C)

None of the components are listed in the 1987 IARC Monographs, Group 1, 2A or 2B as known, probable, or possible carcinogens, nor are they listed in the NTP annual report on carcinogens.

DETOTEC NORTH AMERICA, INC.

MATERIAL SAFETY DATA SHEET

RDX/NYLON PERFACORD® DETONATING CORD

ISSUE DATE: AUGUST 2001
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SECTION XI – STORAGE CONDITIONS

Store in accordance with the requirements of Subpart K, ATF: Explosives Law and Regulations (27 CFR 55.201-55.219). Store in a cool, dry, well-ventilated location.

SECTION XII – SHIPPING INFORMATION

Proper Shipping Name	Cord, detonating		Components, explosive train, n.o.s.
Hazard Class	1.1D*	1.4D	1.4S
UN Number	UN 0065	UN 0289	UN 0384
DOT Label & Placard	EXPLOSIVE 1.1D	EXPLOSIVE 1.4D	EXPLOSIVE 1.4S

*May be offered for transportation domestically within the United States and transported as Cord, Detonating (UN 0289), Division 1.4 compatibility group D (1.4D) Explosives, provided the explosive content does not exceed 100 grains per linear foot and the gross weight of all packages of detonating cord does not exceed (45 KG) 99 pounds per vehicle. See 49 CFR 173.63.

DISCLAIMER

The information in this Material Safety Data Sheet is based upon available data and believed to be correct; however as such has been obtained from various sources, including the manufacturer and independent laboratories, it is given without warranty or representation that it is complete, accurate, and can be relied upon. Detotec North America, Inc., and its subsidiaries disclaim any warranties with respect to this product, the safety or suitability thereof, or the information contained herein, including without limitation any implied fitness for a particular purpose and/or other warranty. The information contained herein is provided for reference purposes only and is intended only for persons having relevant technical skills. Any other use of this information is expressly prohibited. Because conditions and manner of use are outside of our control, the user is responsible for determining the conditions of safe use of the product. Buyers and users assume all risk, responsibility and liability whatsoever from any and all injuries (including death), losses, or damage to persons or property arising from the use of this product or information.

Material Safety Data Sheet

1. Product and company identification

Product name	ARCO Unleaded Gasoline
MSDS #	APPC306
Code	APPC306
Product use	USE AS MOTOR FUEL ONLY.
Synonyms	ARCO Unleaded Regular, Midgrade and Premium gasolines; ARCO EC Unleaded Regular, Midgrade and Premium gasolines, CARB Gasoline
Supplier	BP Products North America Inc. 150 West Warrenville Road Naperville, Illinois 60563-8460 USA
EMERGENCY HEALTH INFORMATION:	1 (800) 447-8735 Outside the US: +1 703-527-3887 (CHEMTREC)
EMERGENCY SPILL INFORMATION:	1 (800) 424-9300 CHEMTREC (USA)
OTHER PRODUCT INFORMATION	1 (866) 4 BP - MSDS (866-427-6737 Toll Free - North America) email: bpcares@bp.com

2. Hazards identification

Physical state	Liquid.
Color	Clear
Emergency overview	DANGER ! EXTREMELY FLAMMABLE. VAPOR MAY CAUSE FLASH FIRE. INHALATION OF VAPOR/AEROSOL CONCENTRATIONS ABOVE THE RECOMMENDED EXPOSURE LIMITS CAUSES HEADACHES, DIZZINESS, DROWSINESS, AND NAUSEA, AND MAY LEAD TO UNCONSCIOUSNESS OR DEATH. HARMFUL IF SWALLOWED. HARMFUL OR FATAL IF LIQUID IS ASPIRATED INTO LUNGS. CAUSES EYE AND SKIN IRRITATION. PROLONGED OR REPEATED CONTACT MAY DRY SKIN AND CAUSE IRRITATION. LONG-TERM EXPOSURE TO VAPORS HAS CAUSED CANCER IN LABORATORY ANIMALS. Extremely flammable liquid. Do not ingest. If ingested, do not induce vomiting. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Keep away from heat, sparks and flame. Keep container tightly closed and sealed until ready for use. Use only with adequate ventilation. Wash thoroughly after handling. Contains material which can cause cancer. Risk of cancer depends on duration and level of exposure.
Routes of entry	Dermal contact. Eye contact. Inhalation. Ingestion.
Potential health effects	
Eyes	Causes eye irritation.
Skin	Causes skin irritation. Prolonged or repeated contact can defat the skin and lead to irritation and/or dermatitis. See toxicological information (Section 11)
Inhalation	Inhalation of vapor/aerosol concentrations above the recommended exposure limits causes headaches, drowsiness and nausea and may lead to unconsciousness or death. See toxicological information (Section 11)
Ingestion	Aspiration hazard if swallowed. Can enter lungs and cause damage. See toxicological information (Section 11)

See toxicological information (Section 11)

3. Composition/information on ingredients

Ingredient name	CAS #	%
Gasoline	Mixture	90 - 100
Ethanol	64-17-5	0 - 10
Contains:		
Benzene	71-43-2	0 - 3
n-hexane	110-54-3	1 - 2
Cyclohexane	110-82-7	0 - 1
Ethylbenzene	100-41-4	0 - 2
Toluene	108-88-3	4 - 11
1,2,4-Trimethylbenzene	95-63-6	0 - 3
xylene	1330-20-7	4 - 11
Naphthalene	91-20-3	0 - 0.5

4. First aid measures

Eye contact In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.

Skin contact Immediately wash exposed skin with soap and water. Remove contaminated clothing and shoes. Clean shoes thoroughly before reuse. Wash contaminated clothing before reuse. Get medical attention.

Inhalation If inhaled, remove to fresh air. If not breathing, give artificial respiration. Get medical attention immediately.

Ingestion Aspiration hazard if swallowed. Can enter lungs and cause damage. Do not induce vomiting. Never give anything by mouth to an unconscious person. Get medical attention immediately.

5. Fire-fighting measures

Flammability of the product Extremely flammable liquid.

Flash point Closed cup: -42.778°C (-45°F)

Explosion limits Lower: 1.3%
Upper: 7.6%
(Estimated.)

Fire/explosion hazards Extremely flammable liquid and vapor. Vapor may cause flash fire. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back. Runoff to sewer may create fire or explosion hazard. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.

Unusual fire/explosion hazards Extremely explosive in the presence of the following materials or conditions: open flames, sparks and static discharge and heat.

Extinguishing media

Suitable Use dry chemical, CO_2, water spray (fog) or foam.

Not suitable Do not use water jet.

Fire-fighting procedures Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Hazardous combustion products Combustion products may include the following:
carbon oxides (CO, CO_2) (carbon monoxide, carbon dioxide)

Protective clothing (fire) Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Special remarks on fire hazards Do not use water jet.

6. Accidental release measures

Environmental precautions

Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Personal protection in case of a large spill

Chemical splash goggles. Chemical-resistant protective suit. Boots. Chemical-resistant gloves. Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product. Suggested protective clothing might not be adequate. Consult a specialist before handling this product.

Methods for cleaning up

Large spill

Stop leak if without risk. Eliminate all ignition sources. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Small spill

Stop leak if without risk. Eliminate all ignition sources. Move containers from spill area. Dilute with water and mop up if water-soluble or absorb with an inert dry material and place in an appropriate waste disposal container. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

7. Handling and storage

Handling

Put on appropriate personal protective equipment (see Section 8). Workers should wash hands and face before eating, drinking and smoking. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material.

Never siphon by mouth.
For use as a motor fuel only. Do not use as a cleaning solvent, thinner or for other non-motor fuel uses. Do not use as a portable heater or appliance fuel.
Warning! Customers should not re-enter vehicle during the re-fueling process as this can generate static electricity and cause a spark and flash fire hazard if sufficient vapors are present. The flow of gasoline through a pump nozzle can produce static electricity, which may cause a fire if gasoline is pumped into an ungrounded container. To avoid static spark hazard when filling portable containers:
- Fill only containers approved to hold gasoline
- Place container on the ground while dispensing fuel.
- Do not fill container in or on a vehicle or on a truck or trailer bed.
- Keep nozzle in contact with container while filling.

"Empty" containers retain liquid and vapor residues and can be dangerous. Do not pressurize, cut, weld, drill, grind or expose to heat, flame, sparks, static electricity, or other sources of ignition, containers with ANY residue; they may explode and cause injury or death.

Storage

Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

Other information

Do not enter storage tanks without breathing apparatus unless the tank has been well ventilated and the tank atmosphere has been shown to contain hydrocarbon vapor concentrations of less than 1% of the lower flammability limit and an oxygen concentration of at least 20% volume.

Light hydrocarbon vapors can build up in the headspace of tanks. These can cause flammability/ explosion hazards even at temperatures below the normal flash point (note: flash point must not be regarded as a reliable indicator of the potential flammability of vapor in tank headspaces).

Tank headspaces should always be regarded as potentially flammable and care should be taken to avoid static electrical discharge and all ignition sources during filling, ullaging and sampling from storage tanks. When the product is pumped (e.g. during filling, discharge or ullaging) and when sampling, there is a risk of static discharge. Ensure equipment used is properly earthed or bonded to the tank structure. Electrical equipment should not be used unless it is intrinsically safe (i.e. will not produce sparks).

8. Exposure controls/personal protection

Occupational exposure limits

Ingredient name	Occupational exposure limits
Gasoline	**ACGIH TLV (United States).** TWA: 300 ppm 8 hour(s). Issued/Revised: 5/1996 TWA: 890 mg/m³ 8 hour(s). Issued/Revised: 5/1996 STEL: 500 ppm 15 minute(s). Issued/Revised: 5/1996 STEL: 1480 mg/m³ 15 minute(s). Issued/Revised: 5/1996
Ethanol	**ACGIH TLV (United States).** STEL: 1000 ppm 15 minute(s). Issued/Revised: 11/2008 **OSHA PEL (United States).** TWA: 1900 mg/m³ 8 hour(s). Issued/Revised: 6/1993 TWA: 1000 ppm 8 hour(s). Issued/Revised: 6/1993
Benzene	**ACGIH TLV (United States). Absorbed through skin.** STEL: 8 mg/m³ 15 minute(s). Issued/Revised: 5/1997 STEL: 2.5 ppm 15 minute(s). Issued/Revised: 5/1997 TWA: 1.6 mg/m³ 8 hour(s). Issued/Revised: 5/1997 TWA: 0.5 ppm 8 hour(s). Issued/Revised: 5/1997 **OSHA PEL (United States).** STEL: 5 ppm 15 minute(s). Issued/Revised: 6/1993 TWA: 1 ppm 8 hour(s). Issued/Revised: 6/1993 **OSHA PEL Z2 (United States).** AMP: 50 ppm 10 minute(s). Issued/Revised: 6/1993 CEIL: 25 ppm Issued/Revised: 6/1993 TWA: 10 ppm 8 hour(s). Issued/Revised: 6/1993
n-hexane	**OSHA PEL (United States). Absorbed through skin.** TWA (States of California & Washington): 50 ppm 8 hour(s). Form: Vapor TWA: 1800 mg/m³ 8 hour(s). Issued/Revised: 6/1993 TWA: 500 ppm 8 hour(s). Issued/Revised: 6/1993 STEL (State of Washington): 75 ppm 15 minute(s). **ACGIH TLV (United States). Absorbed through skin.** TWA: 50 ppm 8 hour(s). Issued/Revised: 9/1998
Cyclohexane	**ACGIH TLV (United States).** TWA: 100 ppm 8 hour(s). Issued/Revised: 1/2002 **OSHA PEL (United States).** TWA: 1050 mg/m³ 8 hour(s). Issued/Revised: 6/1993 TWA: 300 ppm 8 hour(s). Issued/Revised: 6/1993
Ethylbenzene	**ACGIH TLV (United States).** TWA: 20 ppm 8 hour(s). Issued/Revised: 12/2010 **OSHA PEL (United States).** TWA: 435 mg/m³ 8 hour(s). Issued/Revised: 6/1993 TWA: 100 ppm 8 hour(s). Issued/Revised: 6/1993
Toluene	**OSHA PEL Z2 (United States).** AMP: 500 ppm 10 minute(s). Issued/Revised: 6/1993 CEIL: 300 ppm Issued/Revised: 6/1993 TWA: 200 ppm 8 hour(s). Issued/Revised: 6/1993 **ACGIH TLV (United States).** TWA: 20 ppm 8 hour(s). Issued/Revised: 11/2006
1,2,4-Trimethylbenzene	**ACGIH TLV (United States).** TWA: 123 mg/m³ 8 hour(s). Issued/Revised: 9/1994 TWA: 25 ppm 8 hour(s). Issued/Revised: 9/1994
xylene	**ACGIH TLV (United States).** STEL: 651 mg/m³ 15 minute(s). Issued/Revised: 5/1996 STEL: 150 ppm 15 minute(s). Issued/Revised: 5/1996 TWA: 434 mg/m³ 8 hour(s). Issued/Revised: 5/1996 TWA: 100 ppm 8 hour(s). Issued/Revised: 5/1996 **OSHA PEL (United States).** TWA: 435 mg/m³ 8 hour(s). Issued/Revised: 6/1993 TWA: 100 ppm 8 hour(s). Issued/Revised: 6/1993

Naphthalene	**ACGIH TLV (United States). Absorbed through skin.** STEL: 79 mg/m³ 15 minutes. Issued/Revised: 5/1996 STEL: 15 ppm 15 minutes. Issued/Revised: 5/1996 TWA: 52 mg/m³ 8 hours. Issued/Revised: 5/1996 TWA: 10 ppm 8 hours. Issued/Revised: 5/1996 **OSHA PEL (United States).** TWA: 50 mg/m³ 8 hours. Issued/Revised: 6/1993 TWA: 10 ppm 8 hours. Issued/Revised: 6/1993

While specific OELs for certain components may be shown in this section, other components may be present in any mist, vapor or dust produced. Therefore, the specific OELs may not be applicable to the product as a whole and are provided for guidance only.

Some states may enforce more stringent exposure limits.

Control Measures Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Hygiene measures Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing.

Personal protection

Eyes Avoid contact with eyes. Safety glasses with side shields or chemical goggles.

Skin and body Do not get on skin or clothing. Wear clothing and footwear that cannot be penetrated by chemicals or oil.

Respiratory Use only with adequate ventilation. Avoid breathing vapor or mist. If ventilation is inadequate, use a NIOSH certified respirator with an organic vapor cartridge and P95 particulate filter.

CAUTION: The protection provided by air-purifying respirators is limited. Use a positive pressure air-supplied respirator if there is any potential for an uncontrolled release, if exposure levels are not known, or if concentrations exceed the protection limits of air-purifying respirator.

Hands Wear gloves that cannot be penetrated by chemicals or oil.

The correct choice of protective gloves depends upon the chemicals being handled, the conditions of work and use, and the condition of the gloves (even the best chemically resistant glove will break down after repeated chemical exposures). Most gloves provide only a short time of protection before they must be discarded and replaced. Because specific work environments and material handling practices vary, safety procedures should be developed for each intended application. Gloves should therefore be chosen in consultation with the supplier/manufacturer and with a full assessment of the working conditions.

Consult your supervisor or Standard Operating Procedure (S.O.P) for special handling instructions.

9. Physical and chemical properties

Physical state Liquid.

Color Clear

Odor Hydrocarbon.

Flash point Closed cup: -42.778°C (-45°F)

Explosion limits Lower: 1.3%
Upper: 7.6%
(Estimated.)

Density 750 kg/m³ (0.75 g/cm³)

Boiling point / Range 26.67 to 221°C (80 to 430°F)

Vapor pressure 48.134 to 103.146 kPa (361.97 to 775.66 mm Hg)

Volatility 100% (v/v)

Solubility Very slightly soluble in water

10. Stability and reactivity

Stability and reactivity The product is stable.

Possibility of hazardous reactions Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid Keep away from heat, sparks and flame. Avoid all possible sources of ignition (spark or flame).

Incompatibility with various substances Reactive or incompatible with the following materials: oxidizing materials.
Chlorine and Fluorine

Hazardous decomposition products carbon oxides (CO, CO_2) (carbon monoxide, carbon dioxide)

Hazardous polymerization Will not occur.

11. Toxicological information

Classification

Product/ingredient name	IARC	NTP	OSHA
xylene	3	-	-
Toluene	3	-	-
Benzene	1	Proven.	+
Ethylbenzene	2B	-	-
Naphthalene	2B	Possible	-

IARC :
1 - Carcinogenic to human.
2B - Possible carcinogen to human.
3 - Not classifiable as a human carcinogen.

NTP :
Proven - Known to be human carcinogens.
Possible - Reasonably anticipated to be human carcinogens.

OSHA :
+ Potential occupational carcinogen

Other information

Aspiration of this product into the lungs can cause chemical pneumonia and can be fatal. Aspiration into the lungs can occur while vomiting after ingestion of this product. Do not siphon by mouth.

Excess exposure to vapors may produce headaches, dizziness, nausea, drowsiness, irritation of eyes, nose and throat and central nervous system depression. Aspiration of this material into the lungs can cause chemical pneumonia and can be fatal. Aspiration into the lungs can occur while vomiting after ingestion of this product. Inhalation of unleaded gasoline vapors did not produce birth defects in laboratory animals. Ingestion of this material can cause gastrointestinal irritation and diarrhea.

In a long-term inhalation study of whole unleaded gasoline vapors, exposure-related kidney damage and kidney tumors were observed in male rats. Similar kidney effects were not seen in female rats or in mice. At the highest exposure level (2056 ppm), female mice had an increased incidence of liver tumors. Results from subsequent scientific studies have shown that a broad variety of chemicals cause these kidney effects only in the male rat. Further studies have discovered the means by which the physiology of the male rat uniquely predispose it to these effects. Consequently, the Risk Assessment Forum of the Environmental Protection Agency has recognized that these responses are not predictive of a human health hazard. The liver tumors that were increased in the high-dose female mice are likewise of questionable significance because of their high spontaneous occurrence even without chemical exposure and because the rate of their occurrence is accelerated by a broad spectrum of chemicals not commonly considered to be carcinogens (e.g., phenobarbital). Thus, the significance of the mouse liver tumor response in terms of human health is questionable.

Gasoline is a complex mixture of hydrocarbons and contains benzene (typically no more than 2 volume%), toluene, and xylene. Chronic exposure to high levels of benzene has been shown to cause cancer (leukemia) in humans and other adverse blood effects (anemia). Benzene is considered a human carcinogen by IARC, NTP and OSHA. Over exposure to xylene and toluene

can cause irritation to the upper respiratory tract, headache and narcosis. Some liver damage and lung inflammation were seen in chronic studies on xylene in guinea pigs but not in rats.

Solvent "sniffing" (abuse) or intentional overexposure to vapors can produce serious central nervous system effects, including unconsciousness, and possibly death.

Exposure to vapor at high concentrations may have the following effects: heart beat irregularity (arrhythmia)

Gasoline as a mixture is classified as a 2B (possible human) carcinogen by IARC.

Gasoline engine exhaust is classified as possibly carcinogenic to humans by IARC (2B). This classification is based primarily on animal and in vitro studies of gasoline engine exhaust condensates/extracts. Studies of the gaseous exhaust stream in animals did not provide sufficient evidence for classification as a carcinogen.

Gasoline: Additional toxicity information on components.

This product contains n-hexane. Overexposure to n-hexane may cause progressive and potentially irreversible damage to the peripheral nervous system, particularly in the arms and legs. Animal studies have also shown that n-hexane overexposure may cause testicular injury. However, animal studies conducted with commercial hexane, containing 53% n-hexane, showed neither peripheral nervous system damage nor testicular injury at inhalation exposures up to 9000 ppm.

Ethanol:
Irritancy - Skin: A single 4h semi-occlusive application to intact rabbit skin produced minimal signs of irritation (mean scores for erythema or oedema less than 2).

Irritancy - Eye. The eye irritancy has been investigated by OECD Test method 405. Single application to the rabbit eye produced conjunctival irritation and transient corneal damage. The effect was insufficient to warrant classification as an eye irritant.

Sensitization: The material is not sensitizing in standard animal tests. In rare cases non -irritant contact dermatitis has been identified in humans after skin exposure to this material. Such cases have been identified as delayed hypersensitivity or as urticarial reactions. In reactive individuals such reactions may also be elicited by drinking alcoholic drinks or by cross reaction to certain other alcohols.

Sub-acute/Subchronic Toxicity: It has been shown in many animal experiments that the repeated oral consumption of large doses of ethanol can lead to damage in practically all organ systems. The main manifestations of the toxic effects are shown by the liver.

Chronic toxicity/carcinogenicity: No convincing evidence of carcinogenic effects in animal studies.

Genotoxicity : The product has been tested in a number of bacterial and mammalian systems. The product did not exhibit mutagenic activity in the following systems (with and without metabolic activation): Drosophila. Salmonella typhimurium. Human lymphocytes in vitro. Most in vitro tests and all in vivo tests for chromosome abberations report negative results. The product did not induce micronuclei in standard bone marrow tests in vivo. There is some evidence that ethanol both induces SCE in vivo and can also act as an aneugen at high doses. Overall, there is no robust evidence that ethanol is a genotoxic hazard according to the criteria normally applied for the purpose of classification and labelling of industrial chemicals.

Reproductive/Developmental Toxicity: Adverse effects on the male reproductive system have been reported in laboratory animals following repeated exposure to high concentrations. Developmental effects have been observed in laboratory animals following large oral exposures.

Human data: In humans excessive consumption of alcoholic beverages during pregnancy is associated with the induction of Fetal Alcohol Syndrome in the offspring. Reduced birth weight and physical and mental defects occur. There is no evidence that such effects might be caused by exposures other than direct ingestion of alcoholic drinks. In humans high lifetime consumption of alcoholic beverages can be associated with certain cancers and effects on the liver. There is no evidence that these can be caused by exposure other than direct ingestion of alcoholic drinks (IARC 1988).

Potential chronic health effects

Carcinogenicity Contains material which can cause cancer. Risk of cancer depends on duration and level of exposure.

12. Ecological information

Ecotoxicity

No testing has been performed by the manufacturer.

Persistence/degradability Inherently biodegradable

Mobility Spillages may penetrate the soil causing ground water contamination.

Bioaccumulative potential This product is not expected to bioaccumulate through food chains in the environment.

Other ecological information Spills may form a film on water surfaces causing physical damage to organisms. Oxygen transfer could also be impaired.

13. Disposal considerations

Waste information The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

NOTE: The generator of waste has the responsibility for proper waste identification (based on characteristic(s) or listing), transportation and disposal

14. Transport information

International transport regulations

Regulatory information	UN number	Proper shipping name	Class	Packing group	Additional information
DOT Classification	UN1203	Gasoline	3	II	-
TDG Classification	UN1203	GASOLINE	3	II	-
IMDG Classification	UN1203	GASOLINE. Marine pollutant	3	II	**Emergency schedules (EmS)** F-E, S-E
IATA/ICAO Classification	-----	Proper classification to be determined at the time of shipment	-----	-----	-

15. Regulatory information

U.S. Federal Regulations

United States inventory (TSCA 8b) All components are listed or exempted.

SARA 302/304: No products were found.
SARA 311/312 Hazards identification: Fire hazard, Immediate (acute) health hazard, Delayed (chronic) health hazard

SARA 313

Product name	CAS number	Concentration

Form R - Reporting requirements	Toluene	108-88-3	4 - 11
	xylene	1330-20-7	4 - 11
	Benzene	71-43-2	0 - 3
	1,2,4-Trimethylbenzene	95-63-6	0 - 3
	n-hexane	110-54-3	1 - 2
	Ethylbenzene	100-41-4	0 - 2
	Cyclohexane	110-82-7	0 - 1
	Naphthalene	91-20-3	0 - 0.5
Supplier notification	Toluene	108-88-3	4 - 11
	xylene	1330-20-7	4 - 11
	Benzene	71-43-2	0 - 3
	1,2,4-Trimethylbenzene	95-63-6	0 - 3
	n-hexane	110-54-3	1 - 2
	Ethylbenzene	100-41-4	0 - 2
	Cyclohexane	110-82-7	0 - 1
	Naphthalene	91-20-3	0 - 0.5

CERCLA Sections 102a/103 Hazardous Substances (40 CFR Part 302.4): CERCLA: Hazardous substances.: Benzene: 10 lbs. (4.54 kg); n-hexane: 5000 lbs. (2270 kg); Cyclohexane: 1000 lbs. (454 kg); Ethylbenzene: 1000 lbs. (454 kg); Toluene: 1000 lbs. (454 kg); xylene: 100 lbs. (45.4 kg); Naphthalene: 100 lbs. (45.4 kg);

State regulations

Massachusetts Substances The following components are listed: XYLENE; TOLUENE; ETHYL ALCOHOL; BENZENE; PSEUDOCUMENE; HEXANE; ETHYL BENZENE; CYCLOHEXANE

New Jersey Hazardous Substances The following components are listed: XYLENES; BENZENE, DIMETHYL-; TOLUENE; BENZENE, METHYL-; ETHYL ALCOHOL; ALCOHOL; BENZENE; PSEUDOCUMENE; 1,2,4-TRIMETHYL BENZENE; n-HEXANE; HEXANE; ETHYL BENZENE; BENZENE, ETHYL-; CYCLOHEXANE; NAPHTHALENE; MOTH FLAKES

Pennsylvania RTK Hazardous Substances The following components are listed: GASOLINE; BENZENE, DIMETHYL-; BENZENE, METHYL-; DENATURED ALCOHOL; BENZENE; PSEUDOCUMENE; HEXANE; BENZENE, ETHYL-; CYCLOHEXANE; NAPHTHALENE

California Prop. 65 **WARNING:** This product contains a chemical known to the State of California to cause cancer.
Ethylbenzene; Naphthalene

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.
Toluene

WARNING: This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.
Benzene

Other Prop 65 chemicals will result under certain conditions from the use of this material. For example, burning fuels produces combustion products including carbon monoxide, a Prop 65 reproductive toxin.

Other regulations

Canada inventory All components are listed or exempted.

REACH Status For the REACH status of this product please consult your company contact, as identified in Section 1.

Australia inventory (AICS) At least one component is not listed.

China inventory (IECSC) At least one component is not listed.

Japan inventory (ENCS) All components are listed or exempted.

Korea inventory (KECI) All components are listed or exempted.

Philippines inventory (PICCS) All components are listed or exempted.

16. Other information

Label requirements

DANGER !

EXTREMELY FLAMMABLE.
VAPOR MAY CAUSE FLASH FIRE.
INHALATION OF VAPOR/AEROSOL CONCENTRATIONS ABOVE THE RECOMMENDED EXPOSURE LIMITS CAUSES HEADACHES, DIZZINESS, DROWSINESS, AND NAUSEA, AND MAY LEAD TO UNCONSCIOUSNESS OR DEATH.
HARMFUL IF SWALLOWED.
HARMFUL OR FATAL IF LIQUID IS ASPIRATED INTO LUNGS.
CAUSES EYE AND SKIN IRRITATION.
PROLONGED OR REPEATED CONTACT MAY DRY SKIN AND CAUSE IRRITATION.
LONG-TERM EXPOSURE TO VAPORS HAS CAUSED CANCER IN LABORATORY ANIMALS.

HMIS® Rating :

Health	*	**1**
Flammability		**3**
Physical Hazard		**0**
Personal protection		**X**

National Fire Protection Association (U.S.A.)

History

Date of issue 12/31/2012.

Date of previous issue 03/01/2012.

Prepared by Product Stewardship

Indicates information that has changed from previously issued version.

Notice to reader

All reasonably practicable steps have been taken to ensure this data sheet and the health, safety and environmental information contained in it is accurate as of the date specified below. No warranty or representation, express or implied is made as to the accuracy or completeness of the data and information in this data sheet.

The data and advice given apply when the product is sold for the stated application or applications. You should not use the product other than for the stated application or applications without seeking advice from BP Group.

It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations. The BP Group shall not be responsible for any damage or injury resulting from use, other than the stated product use of the material, from any failure to adhere to recommendations, or from any hazards inherent in the nature of the material. Purchasers of the product for supply to a third party for use at work, have a duty to take all necessary steps to ensure that any person handling or using the product is provided with the information in this sheet. Employers have a duty to tell employees and others who may be affected of any hazards described in this sheet and of any precautions that should be taken. You can contact the BP Group to ensure that this document is the most current available. Alteration of this document is strictly prohibited.

APPENDIX D. FORMS

This appendix contains the following project forms:

- Accident Investigation Report (ENG Form 3394)
- Accident/Illness/Near Miss Report
- Chain of Custody Form (APPL)
- AHA Blank Template
- Daily Observer Log sheet (for Biologist)
- Daily Quality Control Report
- QC Surveillance DGM Anomaly Reacquisition
- QC Surveillance DGM Grid Survey
- QC Surveillance MEC Avoidance
- QC Surveillance MEC Management and Disposal
- QC Surveillance MPPEH Management
- QC Surveillance Site Preparation Transect and Grid Layout
- QC Surveillance Subsurface Removal
- QC Surveillance Surface Removal
- Explosive Usage Record
- Explosive Vehicle On-Site Inspection
- DD Form 1348-1A
- DD Form DoD 626
- Heat Stress Alert-Field Monitoring and Alert Checklist
- Heat Stress Monitoring Log
- MDAS Accumulation Form
- MEC Accountability Log
- Tailgate Safety Briefing
- Safety Inspection Form
- Site Visitor Log
- Operator and Geophysical Instrument Checkout Form for MEC Operations
- Daily Site Report
- Field Change Request Form
- Weekly QC Report
- Root Cause Analysis
- Grid/Area Completion Form
- QC Grid/Area Inspection Form
- Explosive Demolition Operations Record

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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	h. EMPLOYMENT STATUS AT TIME OF ACCIDENT
	☐ ON DUTY ☐ TDY ☐ OFF DUTY	☐ ARMY ACTIVE ☐ ARMY RESERVE ☐ VOLUNTEER ☐ PERMANENT ☐ FOREIGN NATIONAL ☐ SEASONAL ☐ TEMPORARY ☐ STUDENT ☐ OTHER *(Specify)*

3. GENERAL INFORMATION

a. DATE OF ACCIDENT *(month/day/year)*	b. TIME OF ACCIDENT *(Military time)* hrs	c. EXACT LOCATION OF ACCIDENT	d. CONTRACTOR'S NAME (1) PRIME: (2) SUBCONTRACTOR:

e. CONTRACT NUMBER	f. TYPE OF CONTRACT	g. HAZARDOUS/TOXIC WASTE ACTIVITY
☐ CIVIL WORKS ☐ MILITARY ☐ OTHER *(Specify)*	☐ CONSTRUCTION ☐ SERVICE ☐ A/E ☐ DREDGE ☐ OTHER *(Specify)*	☐ SUPERFUND ☐ DERP ☐ IRP ☐ OTHER *(Specify)*

4. CONSTRUCTION ACTIVITIES ONLY *(Fill in line and corresponding code number in box from list - see help menu)*

a. CONSTRUCTION ACTIVITY	(CODE) #	b. TYPE OF CONSTRUCTION EQUIPMENT	(CODE) #

5. INJURY/ILLNESS INFORMATION *(Include name on line and corresponding code number in box for items e, f & g - see help menu)*

a. SEVERITY OF ILLNESS/INJURY	(CODE) #	b. ESTIMATED DAYS LOST	c. ESTIMATED DAYS HOSPITALIZED	d. ESTIMATED DAYS RESTRICTED DUTY

e. BODY PART AFFECTED	(CODE)	g. TYPE AND SOURCE OF INJURY/ILLNESS	(CODE)
PRIMARY	#	TYPE	#
SECONDARY	#	SOURCE	#
f. NATURE OF ILLNESS/INJURY	#		

6. PUBLIC FATALITY *(Fill in line and correspondence code number in box - see help menu)*

a. ACTIVITY AT TIME OF ACCIDENT	(CODE) #	b. PERSONAL FLOATATION DEVICE USED? ☐ YES ☐ NO ☐ N/A

7. MOTOR VEHICLE ACCIDENT

a. TYPE OF VEHICLE	b. TYPE OF COLLISION	c. SEAT BELTS	USED	NOT USED	NOT AVAILABLE
☐ PICKUP/VAN ☐ AUTOMOBILE ☐ TRUCK ☐ OTHER *(Specify)*	☐ SIDE SWIPE ☐ HEAD ON ☐ REAR END ☐ BROADSIDE ☐ ROLL OVER ☐ BACKING ☐ OTHER *(Specify)*	(1) FRONT SEAT			
		(2) REAR SEAT			

8. PROPERTY/MATERIAL INVOLVED

a. NAME OF ITEM	b. OWNERSHIP	c. $ AMOUNT OF DAMAGE
(1)		
(2)		
(3)		

9. VESSEL/FLOATING PLANT ACCIDENT *(Fill in line and correspondence code number in box from list - see help menu)*

a. TYPE OF VESSEL/FLOATING PLANT	(CODE) #	b. TYPE OF COLLISION/MISHAP	(CODE) #

10. ACCIDENT DESCRIPTION *(Use additional paper, if necessary)*

11. **CAUSAL FACTOR(S)** *(Read Instruction Before Completing)*

a. (Explain YES answers in item 13)	YES	NO
DESIGN: Was design of facility, workplace or equipment a factor?	☐	☐
INSPECTION/MAINTENANCE: Were inspection & maintenance procedures a factor?	☐	☐
PERSON'S PHYSICAL CONDITION: In your opinion, was the physical condition of the person a factor?	☐	☐
OPERATING PROCEDURES: Were operating procedures a factor?	☐	☐
JOB PRACTICES: Were any job safety/health practices not followed when the accident occurred?	☐	☐
HUMAN FACTORS: Did any human factors such as, size or strength of person, etc., contribute to accident?	☐	☐
ENVIRONMENTAL FACTORS: Did heat, cold, dust, sun, glare, etc., contribute to the accident?	☐	☐

a. *(CONTINUED)*	YES	NO
CHEMICAL AND PHYSICAL AGENT FACTORS: Did exposure to chemical agents, such as dust, fumes, mists, vapors or physical agents, such as, noise, radiation, etc., contribute to accident?	☐	☐
OFFICE FACTORS: Did office setting such as, lifting office furniture, carrying, stooping, etc., contribute to the accident?	☐	☐
SUPPORT FACTORS: Were inappropriate tools/resources provided to properly perform the activity/task?	☐	☐
PERSONAL PROTECTIVE EQUIPMENT: Did the improper selection, use or maintenance of personal protective equipment contribute to the accident?	☐	☐
DRUGS/ALCOHOL: In your opinion, was drugs or alcohol a factor to the accident	☐	☐

b. WAS A WRITTEN JOB/ACTIVITY HAZARD ANALYSIS COMPLETED FOR TASK BEING PERFORMED AT TIME OF ACCIDENT?

☐ YES *(If yes, attach a copy.)* ☐ NO

12. **TRAINING**

a. WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK?	b. TYPE OF TRAINING.	c. DATE OF MOST RECENT FORMAL TRAINING.
☐ YES ☐ NO	☐ CLASSROOM ☐ ON JOB	(Month) (Day) (Year)

13. **FULLY EXPLAIN WHAT ALLOWED OR CAUSED THE ACCIDENT; INCLUDE DIRECT AND INDIRECT CAUSES** *(See instruction for definition of direct and indirect causes.) (Use additional paper, if necessary)*

a. DIRECT CAUSE

b. INDIRECT CAUSE(S)

14. **ACTION(S) TAKEN, ANTICIPATED OR RECOMMENDED TO ELIMINATE CAUSE(S).**

DESCRIBE FULLY:

15. **DATES FOR ACTIONS IDENTIFIED IN BLOCK 14.**

a. BEGINNING (Month/Day/Year)	b. ANTICIPATED COMPLETION (Month/Day/Year)

c. SIGNATURE AND TITLE OF SUPERVISOR COMPLETING REPORT	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 descretion 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 16 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: O-6; E-7; WG-8; 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 separately. 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. This 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	
	D9	DISABILITY, OTHER	0510
SKIN DISEASE OR CONDITION	SB	BIOLOGICAL	0520
	SC	CHEMICAL	
	S9	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
	STRUCK
0110	STRUCK BY
0111	STRUCK BY FALLING OBJECT
0120	STRUCK AGAINST

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)	
STRESSED BY (REPEATED ACTION)	
EXPOSED	
INHALED	
INGESTED	
ABSORBED	
EXPOSED TO	
TRAVELING IN	

SOURCE OF INJURY NAME	CODE
BUILDING OR WORKING AREA	0100
WALKING/WORKING SURFACE (FLOOR, STREET, SIDEWALKS, ETC.)	0110
STAIRS, STEPS	0120
LADDER	0130
FURNITURE, FURNISHINGS, OFFICE EQUIPMENT	0140
BOILER, PRESSURE VESSEL	0150
EQUIPMENT LAYOUT (ERGONOMIC)	0160
WINDOWS, DOORS	0170
ELECTRICITY	0180
ENVIRONMENTAL CONDITION	0200
TEMPERATURE EXTREME (INDOOR)	0210
WEATHER (ICE, RAIN, HEAT, ETC.)	0220
FIRE, FLAME, SMOKE (NOT TOBACCO)	0230
NOISE	0240
RADIATION	0250
LIGHT	0260
VENTILATION	0270
TOBACCO SMOKE	0271
STRESS (EMOTIONAL)	0280
CONFINED SPACE	0290
MACHINE OR TOOL	0300
HAND TOOL (POWERED; SAW, GRINDER, ETC.)	0310
HAND TOOL (NONPOWERED)	0320
MECHANICAL POWER TRANSMISSION APPARATUS	0330
GUARD, SHIELD (FIXED, MOVEABLE, INTERLOCK)	0340

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
0714	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	INAMINATE 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)
0980	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 6 - 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 mangement 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):

CHAIN OF CUSTODY RECORD

APPL Labs
908 North Temperance Ave.
Clovis, CA 93611

Phone: (559) 275-2175

Fax: (559) 275-4422

C.O.C. _____

Report to: PLEASE PRINT		Invoice to: PLEASE PRINT	
Company Name:	Phone:	Company Name:	Phone:
Address:	Fax:	Address:	Fax:
Attn:		Attn:	

Project Name/Number	Sampler (Print)	Analysis Requested/Method Number	Date Shipped:
			Carrier:
Purchase Order Number	Sampler (Signature)		Waybill No.:
			Comments:

Sample Identification	Location	Date Collected	Time Collected	Matrix	Number of Containers												

Shuttle Temperature:	Turnaround Requested: MUST CHECK ONE ☐ Standard (2-3 week) ☐ One week ☐ 24-48 hour	Sample Disposal: ☐ Return to client ☐ Disposal by Lab (30-day retention)

Relinquished by sampler:	Date	Time	Received by:	Relinquished by:	Date	Time	Received by:
Relinquished by:	Date	Time	Received by:	Relinquished by:	Date	Time	Received at lab by:

White: Return to client with report Yellow: Laboratory Copy Pink: Sampler

Activity Hazard Analysis (AHA)

Activity/Work Task:	Overall Risk Assessment Code (RAC) (Use highest code)
Project Location:	Risk Assessment Code (RAC) Matrix
Contract Number:	
Date Prepared:	
Prepared by (Name/Title):	
Reviewed by (Name/Title):	
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
1.	1.1	1.1.1	
	1.2	1.2.1	
	1.3	1.3.1	
	1.4	1.4.1	

Job Steps	Hazards	Controls	RAC
	1.5	1.5.1	
	1.6	1.6.1	
	1.7	1.7.1	
2.	2.1	2.1.1	
	2.2	2.2.1	
	2.3	2.3.1	
	2.4	2.4.1	
	2.5	2.5.1	
	2.6	2.6.1	
	2.7	2.7.1 .	
3.	3.1	3.1.1 .	

Job Steps	Hazards	Controls	RAC
	3.2	3.2.1	
	3.3	3.3.1	
	3.4	3.4.1	

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
•	•	•

Class Title: _____ Given by: _____ Date: _____

Printed Name	Signature	Date

DAILY OBSERVER LOG SHEET
DERP-FUDS PROPERTY NO. I02PR0068
CULEBRA, PUERTO RICO

PROJECT INFORMATION	
Contractor:	Munition Response Site#:
USACE Contract#:	Project Location:
Observer Name (and Company):	Observer Location:
Date: Time:	Shift Start: Shift End:
Sunrise: Sunset:	Crew:

Weather and Visibility Information

Location	Time	Glare	Water Clarity	Seas (wave height)	Visibility	Wind Speed and Direction	Conditions on Land	Estimated % Cloud Cover

Sighting Log

Time	Location Coordinates	Species	Total Number	Adults	Juveniles	Closest Distance to Vessel	Activity or Behavoir and Direct of Movement	Time Last Seen

Daily Summary

Species	Total Number	Total Number Outside 50 feet	Total Number Inside 50 feet	Action Taken

Remarks:
_____
_____

Observer Signature: _____

DAILY FIELD REPORT
TIME CRITICAL REMOVAL ACTION (TCRA)

CONTRACT NO.	**W912DY-10-D-0026, TO 0027**	**DELIVERY ORDER NO.**	**27**
JOB NO:		**DATE/DAY:**	
SITE NAME:	**Cayo Botella/Cayo del Agua TCRA**	**REPORT NO:**	
USACE DISTRICT:	**CEHNC/CESAJ**	**SHEET:**	
WEATHER:	Wet, cloudy and stormy, ~80°F		

WORK IN PROGRESS OR COMPLETED:

1. Mobilization/Demobilization

		CUMULATIVE
	Miles Driven	
	Number of Flights/Miles Flown	
	Number of Personnel	

2. Reconnaissance Details

	Linear Feet:	

3. MC Sampling Details

	Soil Samples	
	Sediment Samples	
	Ground Water Samples	
	Sampling Notes: See Attached DQCR	

4. QC Activities

	Soil Samples	
	Sediment Samples	

5. QA Activities

	Soil Samples	
	Sampling Notes:	

6. Safety Activities

A safety briefing on the hazards of vegetation clearance and drilling activities were performed in the morning.

USA Environmental SITE VISIT TEAM (SVT)		On-site Yes/No	Tailgate Brief Yes/No
Field Team Leader -	Cell Phone:		
Technician/SSHO -	Cell Phone:		
USA UXO Tech -	Cell Phone:		
VISITORS			

EQUIPMENT LIST:

Standard Field Kit Items:

Water Sampling Equipment:

ADDITIONAL INFORMATION:

ACTIVITIES SCHEDULED FOR NEXT WORK DAY:

REQUEST FOR PROJECT ACTION:

None

ACCIDENTS REPORTED TODAY:

ACCIDENTS TO DATE:

PREPARED BY FTL:

DAILY CONTRACTOR QUALITY CONTROL REPORT

Contract Number: W912DY-10-D-0026
Delivery Order Number: Task Order 0027
Project Name: TCRA
Project Number:
Site Location:
Date:

DAILY FIELD TCRA ACTIVITIES CONDUCTED

List all field and quality control samples collected (list or provide attachment):

Sample ID	Media	Time	Analysis	Shipment Date	Lab	Comments

Departures from approved QAQC and SAP:

Instructions given by government personnel:

Check all attachments:

_____ Field sampling forms (in separate submittal)
_____ Field-generated analytical results
_____ Chain-of-custody forms (in separate submittal)

Signed by:

Name
Date:
Phone
Copies sent to:

DAILY FIELD REPORT
TIME CRITICAL REMOVAL ACTION (TCRA)

CONTRACT NO.	W912DY-10-D-0026, TO 0027		0022
JOB NO:		DATE/DAY:	41624
SITE NAME:	TCRA for Cayo Botella and Cayo del Agua	REPORT NO:	2
USACE DISTRICT:	CEHNC/CESAJ	SHEET:	1
WEATHER:			

WORK IN PROGRESS OR COMPLETED:

DAILY CONTRACTOR QUALITY CONTROL REPORT

Contract Number: W912DY-10-D-0026
Delivery Order Number: Task Order 0027
Project Name: TCRA for Cayo Botella and Cayo del Agua
Project Number:
Site Location: Cayo Botella and Cayo del Agua
Date:

DAILY FIELD TCRA ACTIVITIES CONDUCTED

(Describe what sampling was conducted, and by what method, if samples are put on ice, where they are shipped, what carrier used to ship)

TOMORROW'S OPERATIONS PLAN

(If applicable, describe what will be done next day here, or note work is complete.)

Field Instrument Measurements (list or provide attachment):

Sample ID:	Temp. (ºC)		Cond. (µS/cm)	Turbidity (NTU)	DO (mV)	pH (s.u.)

Comments: No Field Instrument Measurements, section is not applicable, no water sampling was conducted.

List all field and quality control samples collected (list or provide attachment):

Sample ID	Media	Time	Time Zone	Analysis	Shipment Date	Lab	Comments
	Soil			Explosives, Ammonia Picrate,		APPL	

Departures from approved QAPP:
None

Instructions given by government personnel:
None

Check all attachments:
X Field sampling forms (in separate submittal)
Field-generated analytical results
X Chain-of-custody forms (in separate submittal)

Signed by:

Name
Position Sampling FTL
Date:

Phone Mobile: Office#:
Copies sent to:

Wilberto Cubero-Colon	Wilberto.Cubero-Deltoro@usace.army.mil
Rebecca Terry (USAESCH)	Rebecca.K.Terry@usace.army.mil
Kelly Longberg	Kelly.D.Longberg@usace.army.mil
Michael D'Auben	Michael.J.D'Auben@usace.army.mil
Tom Bourque (USAE PM)	tbourque@usatampa.com

PREPARATORY, INITIAL, FOLLOW-UP QC SURVEILLANCE FORM - 4

CONTRACT/TO: Contract No. W912DY-10-D-0026; Task Order No. 0027

DFW: DGM Anomaly Reacquisition

TEAM INFORMATION		
Team:	**Location:**	**Date:**
Team Leader:		
Personnel Present:		
Phase of Inspection (check one): ***Preparatory*** ☐ ***Initial*** ☐ ***Follow-Up*** ☐		

CHECKLIST

Item	Ref.	Inspection Point	Yes	No	N/A	Comments
1	MEC QAPP WS#12	Operator records RTK DGPS coordinates at a known point or monument; Recorded positions should be within 10 cm of known position				
2	MEC QAPP WS#12	Operator checks their analog instrument (e.g., Minelab E-TRAC) over the IVS. Team leader records 100% IVS seed item detection in their logbook; Daily detection of 100% IVS seed items				
3	MEC QAPP WS#12	Team Leader reviews reacquisition location to confirm they are consistent with selected anomaly; Anomalies have reacquisition response and extent similar to selected anomaly.				

FINDINGS

Item	Comments

Conducted By: _____ **Reviewed By:** _____

PREPARATORY, INITIAL, FOLLOW-UP QC SURVEILLANCE FORM - 3

CONTRACT/TO: Contract No. W912DY-10-D-0026; Task Order No. 0027

DFW: DGM Grid Surveys

TEAM INFORMATION		
Team:	**Location:**	**Date:**
Team Leader:		
Personnel Present:		
Phase of Inspection (check one): ***Preparatory*** ☐ ***Initial*** ☐ ***Follow-Up*** ☐		

CHECKLIST

Item	Ref.	Inspection Point	Yes	No	N/A	Comments
1	MEC QAPP WS #12	Team setting Line and Fiducial positioned grid corners measures each point with RTK DGPS or PLS; Grid corner measurements are consistent within 0.3 m of planned locations				
3	MEC QAPP WS #12	UXOQCS or designee places blind seeds in DGM or Analog and Dig grids; blind seeds will be small ISOs buried within 10 cm bgs at a frequency such that 1 seed should be mapped/detected per grid; all coverage seeds detected in IAW the reference. . Note: there is only one operator in an analog 50x50-ft grid/lot.				
4	MEC QAPP WS #12	Handheld DGPS- Operator records coordinates at a known point or monument; Recorded positions should be within 5 m of known position				
5	MEC QAPP WS #12	RTK DGPS- Operator records coordinates at a known point or monument; Recorded positions should be within 10 cm of known position				
6	MEC QAPP WS #12	DGM operator collects static test data over a small ISO at least once daily and compares measured response with expected response; Daily response is within ±10% of the value measured at project startup.				

CHECKLIST						
Item	**Ref.**	**Inspection Point**	**Yes**	**No**	**N/A**	**Comments**
7	MEC QAPP WS #12	DGM operator collects data over IVS and background noise line; Measured IVS seed item responses are ± 25% of the expected response and location accuracies are ≤25 cm				
8	MEC QAPP WS #12	UXOQCS or designee observes daily that the DGM team is using guidance ropes to ensure complete coverage in accordance with the project-designed line spacing for Fiducially Positioned data				

FINDINGS	
Item	**Comments**

Conducted By: _____ **Reviewed By:** _____

PREPARATORY, INITIAL, FOLLOW-UP QC SURVEILLANCE FORM - 8

CONTRACT/TO: Contract No. W912DY-10-D-0026; Task Order No. 0027

DFW: MEC Avoidance

TEAM INFORMATION		
Team:	**Location:**	**Date:**
Team Leader:		
Personnel Present:		
Phase of Inspection (check one): ***Preparatory*** ☐ ***Initial*** ☐ ***Follow-Up*** ☐		

CHECKLIST

Item	Ref.	Inspection Point	Yes	No	N/A	Comments
1	MEC QAPP WS#12; OPS-15	All non-UXO personnel requiring access to possible MEC contaminated area received MEC avoidance safety brief.				
2	MEC QAPP WS#12; OPS-15	MEC avoidance performed by UXO personnel during installation of IVS, BSI placement and Escort Duties using visual and analog instrument implementation.				
3	MEC QAPP WS#12; OPS-15	The analog instrument checked out for proper functioning and operator capabilities.				
4	MEC QAPP WS#12; OPS-15	UXOQCS or designee checked instrument operator for interfering metallic objects by scanning with instrument.				
5	MEC QAPP WS#12; OPS-15	When MEC was encountered during MEC avoidance activities, the UXO technician marked the item, recorded the location, advised personnel, and notified SUXOS and UXOSO.				
6	MEC QAPP WS#12; OPS-15	All non-UXO qualified personnel have an escort.				

FINDINGS

Item	Comments

Conducted By: _____ **Reviewed By:** _____

PREPARATORY, INITIAL, FOLLOW-UP QC SURVEILLANCE FORM

CONTRACT/TO: FORM 7:

Contract No. W912DY-10-D-0026; Task Order No. 0027

DFW: MEC Management and Disposal

TEAM INFORMATION		
Team:	**Location:**	**Date:**
Team Leader:		
Personnel Present:		
Phase of Inspection (check one): ***Preparatory*** ☐ ***Initial*** ☐ ***Follow-Up*** ☐		

CHECKLIST

Item	Ref.	Inspection Point	Yes	No	N/A	Comments
1	OPS-08, 03	All MEC Management and Disposal Team Members read and signed the SOPs.				
2	MEC QAPP WS#12; OPS-08, 03	Demolition Team Leader (DTL) reconciles delivery documents with explosives ordered and received.				
3	MEC QAPP WS#12; OPS-08, 03	DTL and UXOQCS reconcile entries on Explosives Usage Record(s) through physical count; Quantity of explosives used correctly entered				
4	OPS-08, 03	The SUXOS and UXOSO assessed all MEC and agreed that the risk associated with movement is acceptable.				
5	OPS-08, 03	The Demolitions Supervisor conducted and documented the demolitions briefing.				
6	OPS-08, 03	The appropriate EZ was established and enforced during the demolition event.				
7	OPS-08, 03	The demolition sequence observed and donor charges were properly prepared.				
8	MEC QAPP WS#12; OPS-08, 03	DTL or UXOQCS record all unused, returned or transferred items on Explosives Usage Record(s).				

FINDINGS

Item	Comments

Conducted By: _____ **Reviewed By:** _____

PREPARATORY, INITIAL, FOLLOW-UP QC SURVEILLANCE FORM - 6

CONTRACT/TO: Contract No. W912DY-10-D-0026; Task Order No. 0027

DFW: MPPEH Management

TEAM INFORMATION		
Team:	**Location:**	**Date:**
Team Leader:		
Personnel Present:		
Phase of Inspection (check one): ***Preparatory*** ☐ ***Initial*** ☐ ***Follow-Up*** ☐		

CHECKLIST						
Item	**Ref.**	**Inspection Point**	**Yes**	**No**	**N/A**	**Comments**
1	MEC QAPP WS#12; OPS-13	UXOQCS verifies identification of MEC items using review of photographs; MEC correctly identified.				
2	MEC QAPP WS#12; OPS-13	UXOQCS reconciles entries on reports through physical count; MDEH is assigned a unique ID and segregated from other materials, and accounted for; Chain of Custody (CoC) and final disposition accounted for on Daily Operations Report.				
3	MEC QAPP WS#12; OPS-13	UXOQCS reconciles entries on reports through physical count; Quantity and type of MDEH encountered is accurate.				
4	MEC QAPP WS#12; OPS-13	All recovered MPPEH undergone a 100% inspection and an independent 100% re-inspection.				
5	MEC QAPP WS#12; OPS-13	UXOQCS records all MDEH items processed in daily logs; All MDEH disposed of by detonation or reclassified MDAS				
6	MEC QAPP WS#12; OPS-13	MDAS is segregated from other materials, stored in locked container, and accounted for by weight; CoC and final disposition accounted for on DD Form 1348 1A				
7	MEC QAPP WS#12; OPS-13	SUXOS ensures QAPP and associated plans specify responsibilities and processing of MPPEH for final disposition as MD				

CHECKLIST						
Item	**Ref.**	**Inspection Point**	**Yes**	**No**	**N/A**	**Comments**
		or RRD.				
8	MEC QAPP WS#12; OPS-13	SUXOS confirms DD Form 1348-1A is complete for all MD/RRD prior to transfer.				
9	MEC QAPP WS#12; OPS-13	SUXOS performs random checks of MD/RRD is free of explosive hazards.				
10	MEC QAPP WS#12; OPS-13	SUXOS certifies RRD and MD is free of explosive hazards, engine fluids, illuminating dials and visible liquid HTRW materials.				
11	MEC QAPP WS#12; OPS-13	SUXOS ensures MDAS Certified material is properly sealed in its container, labeled and possesses the proper documentation.				

FINDINGS	
Item	**Comments**

Conducted By: _____ **Reviewed By:** _____

PREPARATORY, INITIAL, FOLLOW-UP QC SURVEILLANCE FORM - 1

CONTRACT/TO: Contract No. W912DY-10-D-0026; Task Order No. 0027

DFW: Site Preparation/Transect and Grid Layout

TEAM INFORMATION		
Team:	**Location:**	**Date:**
Team Leader:		
Personnel Present:		
Phase of Inspection (check one): ***Preparatory*** ☐ ***Initial*** ☐ ***Follow-Up*** ☐		

CHECKLIST

Item	Ref.	Inspection Point	Yes	No	N/A	Comments
1	MEC QAPP WS #12	Survey Control points are identified by PLS; control points are repeatable within 10 cm.				
2	MEC QAPP WS #12	Background survey(s) documents acceptable IVS location(s), IVS seed items placed at required depths, orientations, inclinations, IVS seed items photographed, and locations measured with RTK DGPS				
3	MEC QAPP WS #12	Geographic Information Systems (GIS) Manager or designee checks recorded coordinates of placed transects and grids against planned locations; Positional error of transects does not exceed ±0.3 m				
4	MEC QAPP WS #12	UXOQCS and Site Geophysicist inspect grid vegetation removal to ensure sufficient access for DGM and Analog and Dig				

FINDINGS

Item	Comments

Conducted By: _____ **Reviewed By:** _____

PREPARATORY, INITIAL, FOLLOW-UP QC SURVEILLANCE FORM - 5

CONTRACT/TO: Contract No. W912DY-10-D-0026; Task Order No. 0027

DFW: Subsurface Removal

TEAM INFORMATION		
Team:	**Location:**	**Date:**
Team Leader:		
Personnel Present:		
Phase of Inspection (check one): ***Preparatory*** ☐ ***Initial*** ☐ ***Follow-Up*** ☐		

CHECKLIST						
Item	**Ref.**	**Inspection Point**	**Yes**	**No**	**N/A**	**Comments**
1	MEC QAPP WS#12	DGM- Removal team checks post excavation anomaly response using Analog sensor; Resolved anomalies have no remnant anomaly response.				
2	MEC QAPP WS#12	UXOQCS or designee follows the Acceptance Sampling Table (90% confidence <1% unresolved per lot) to confirm they have been adequately resolved.				
3	MEC QAPP WS#12	Analog- Operator checks instrument to confirm response to subsurface ISOs in analog test strip (function test); all subsurface metallic test items detected.				
4	MEC QAPP WS#12	UXOQCS reviews the intrusive results for each grid; Removal teams recover all blind seeds.				
5	MEC QAPP WS#12	UXOQCS or designee checks excavated locations; UXOQCS finding no subsurface MEC or MPPEH shallower than 8x the item's diameter. -The UXOQCS finding no EM61-MK2 signal equivalent to, or greater than anomaly selection criteria as documented in the IVS Technical Memorandum or approved UFP-QAPP without an acceptable explanation. - Anomalies in the subsurface shall be resolved, following the above criteria regardless of if water is encountered.				

FINDINGS	
Item	**Comments**

Conducted By: _____ **Reviewed By:** _____

PREPARATORY, INITIAL, FOLLOW-UP QC SURVEILLANCE FORM - 2

CONTRACT/TO: Contract No. W912DY-10-D-0026; Task Order No. 0027

DFW: Surface Removal/MEC Analog Detect, Removal

TEAM INFORMATION		
Team:	**Location:**	**Date:**
Team Leader:		
Personnel Present:		
Phase of Inspection (check one): ***Preparatory*** ☐ ***Initial*** ☐ ***Follow-Up*** ☐		

CHECKLIST

Item	Ref.	Inspection Point	Yes	No	N/A	Comments
1	QAPP WS#12; OPS-14 & 17	Analog detectors are checked against known items at the designated equipment check area daily.				
2	OPS-14 & 17	EZ are established prior to conducting operations				
3	OPS-14 & 17	Grid overlays are staked accurately and as prescribed by the reference.				
4	OPS-14 & 17	Blind and coverage seeds in all Analog grids are detected				
5	OPS-14 & 17	UXO technicians adequately cover sweep lanes and overlap as prescribed by the reference.				
6	QAPP WS#12; OPS-14 & 17	UXO Team Leader collects and documents metallic debris; photographs and documents MEC items				
7	OPS-13,14 & 17	MEC and MPPEH inspected and managed for final disposition in accordance with the references.				
8	QAPP WS#12	UXOQCS or designee performs resurvey over 10% of cleared transect or grid. The UXOQCS finding no MEC or MPPEH excluding small arms ammunition (.50 cal and smaller), and no MD or RRD equivalent to, or greater than 37mm in diameter or width on the surface of the munitions response site.				

FINDINGS

Item	Comments

Conducted By: _____ **Reviewed By:** _____

EXPLOSIVES USAGE RECORD

Team Number:	Date:	Contract Number:
Team Leader:	Work Area/Grid Number:	Project Name:

Explosives	Lot Number	Quantities						Signatures	
		Issued	*Initials*	*Used*	*Initials*	*Returned*	*Initials*	*Team Leader*	*Checker*

Reviewed and Accepted: _____ **Date:** _____

Senior UXO Supervisor

057 USA Form
Original: March 2011

EXPLOSIVES VEHICLE ON-SITE INSPECTION

This form must be completed for any vehicle carrying explosives. This form is to be completed prior to loading and transporting explosives and is for On-Site use only. Any travel over public roadways requires the use of DD Form 626.

Project Location:	**Date:**
Driver Name:	**License #:**
Vehicle Type:	**Vehicle ID #:**
Inspected By:	**Time:** ☐ **AM** ☐ **PM**

Item Inspected	Satisfactory	Unsatisfactory	Comments
Horn	☐	☐	
Steering System	☐	☐	
Windshield Wipers	☐	☐	
Mirrors	☐	☐	
Vehicle Lighting	☐	☐	
Emergency Flashers	☐	☐	
Exhaust System	☐	☐	
Brake System	☐	☐	
Electrical Wiring	☐	☐	
Tires, Wheels & Rims	☐	☐	
Tailgate	☐	☐	
Fuel System	☐	☐	
Suspension System	☐	☐	
Fire Extinguishers (2 ea 10-BC)	☐	☐	
Tarpaulin/Camper Shell	☐	☐	
Cargo Area	☐	☐	
First Aid Kit	☐	☐	

Inspection Results: ☐ Accepted ☐ Rejected	
Remarks:	
Driver's Signature:	Date:
Inspector's Signature:	Date:

034 USA Form
Rev. A: July 2014

DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

1 2 3 4 5 6 7	23 24 25 26 27 28 29	45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80	1. TOTAL PRICE	2. SHIP FROM	3. SHIP TO
DOCIDENT	RI FROM / M&S	UNIT / ISS / QUANTITY	SER / SUPPLEMENTARY ADDRESS / SIG / FUND / DISTRIBUTION / PROJECT / PRI / REQD / DEATE / ADV / RI / O/P / COND / MGT	UNIT PRICE: DOLLARS, CTS	DOLLARS, CTS
				4. MARK FOR	

5. DOC DATE	6. NMFC	7. FRT RATE	8. TYPE CARGO	9. PS

10. QTY. REC'D	11.UP	12. UNIT WEIGHT	13. UNIT CUBE	14. UFC	15. SL

16. FREIGHT CLASSIFICATION NOMENCLATURE

17. ITEM NOMENCLATURE

18. TY CONT	19. NO CONT	20. TOTAL WEIGHT	21. TOTAL CUBE

22. RECEIVED BY	23. DATE RECEIVED

PREVIOUS EDITION MAY BE USED

24. DOCUMENT NUMBER & SUFFIX (30-44)

Basic Material Content:

Estimate Weight (lbs):

Container ID No.: Seal ID No.:

25. NATIONAL STOCK NO. & ADD (8-22)

Site Address:

Site Telephone No.:

26. RIC (4-6) UI (23-24) QTY (25-29) CON CODE (71) DIST (55-56) UP (74-80)

This certifies that the material listed has been 100 percent properly inspected and, to the best of our knowledge and belief, are free of explosive hazards, engine fluids, illuminating dials and other visible liquid HTWR materials.

27. ADDITIONAL DATA

Certify By: Verify By:

_____ Date:_____ _____ Date: _____

Senior UXO Supervisor / Team Leader USACE OE Safety Specialist

USA Environmental, Inc., 720 Brooker Creek Boulevard, Suite 204, Oldsmar, Florida 34677, Telephone: 813.343.6336, Fax: 813.343.637

PerFORM (DLA)

DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

1 2 3 4 5 6 7	23 24 25 26 27 28 29	45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80	1. TOTAL PRICE	2. SHIP FROM	3. SHIP TO
DOCIDENT	RI FROM / M&S	SER / SUPPLEMENTARY ADDRESS / SIG / FUND / DISTRIBUTION / PROJECT / PRI / REQD / DDATE / ADV / RI / O/P / COND / MGT	UNIT PRICE (DOLLARS, CTS) / UNIT ISS / QUANTITY	DOLLARS / CTS	4. MARK FOR

5. DOC DATE	6. NMFC	7. FRT RATE	8. TYPE CARGO	9. PS

10. QTY. REC'D	11.UP	12. UNIT WEIGHT	13. UNIT CUBE	14. UFC	15. SL

16. FREIGHT CLASSIFICATION NOMENCLATURE

17. ITEM NOMENCLATURE

18. TY CONT	19. NO CONT	20. TOTAL WEIGHT	21. TOTAL CUBE

22. RECEIVED BY	23. DATE RECEIVED

PREVIOUS EDITION MAY BE USED

24. DOCUMENT NUMBER & SUFFIX (30-44)

Basic Material Content:

Estimate Weight (lbs):

Container ID No.: Seal ID No.:

25. NATIONAL STOCK NO. & ADD (8-22)

Site Address:

Site Telephone No.:

26. RIC (4-6) UI (23-24) QTY (25-29) CON CODE (71) DIST (55-56) UP (74-80)

This certifies that the material listed has been 100 percent properly inspected and, to the best of our knowledge and belief, are inert and/or free of explosives or related material.

27. ADDITIONAL DATA

Certify By: Verify By:

_____ Date:_____ _____ Date: _____

Senior UXO Supervisor / Team Leader USACE OE Safety Specialist

USA Environmental, Inc., 720 Brooker Creek Boulevard, Suite 204, Oldsmar, Florida 34677, Telephone: 813.343.6336, Fax: 813.343.637

PerFORM (DLA)

MOTOR VEHICLE INSPECTION (TRANSPORTING HAZARDOUS MATERIALS)

(Read Instructions before completing this form.)

This form applies to all vehicles which must be marked or placarded in accordance with Title 49 CFR.	1. BILL OF LADING/TRANSPORTATION CONTROL NUMBER

SECTION 1 - DOCUMENTATION	ORIGIN a.	DESTINATION b.
2. CARRIER/GOVERNMENT ORGANIZATION		
3. DATE/TIME OF INSPECTION		
4. LOCATION OF INSPECTION		
5. OPERATOR(S) NAME(S)		
6. OPERATOR(S) LICENSE NUMBER(S)		
7. MEDICAL EXAMINER'S CERTIFICATE*		

8. *(X if satisfactory at origin)*

a. HAZMAT ENDORSEMENT		d. ERG OR EQUIVALENT COMMERCIAL:		YES		NO	
b. VALID LEASE*		e. DRIVER'S VEHICLE INSPECTION REPORT*					
c. ROUTE PLAN		f. COPY OF 49 CFR PART 397					

9. CVSA DECAL DISPLAYED ON COMMERCIAL EQUIPMENT*	YES	NO
a. TRUCK/TRACTOR		
b. TRAILER		

SECTION II - MECHANICAL INSPECTION

All items shall be checked on empty equipment prior to loading. Items with an asterisk shall be checked on all incoming loaded equipment.

10. TYPE OF VEHICLE(S)	11. VEHICLE NUMBER(S)

12. PART INSPECTED *(X as applicable)*	ORIGIN (1) SAT	ORIGIN (1) UNSAT	DESTINATION (2) SAT	DESTINATION (2) UNSAT		ORIGIN (1) SAT	ORIGIN (1) UNSAT	DESTINATION (2) SAT	DESTINATION (2) UNSAT	COMMENTS (3)
a. SPARE ELECTRICAL FUSES					k. EXHAUST SYSTEM					
b. HORN OPERATIVE					l. BRAKE SYSTEM*					
c. STEERING SYSTEM					m. SUSPENSION					
d. WINDSHIELD/WIPERS					n. COUPLING DEVICES					
e. MIRRORS					o. CARGO SPACE					
f. WARNING EQUIPMENT					p. LANDING GEAR*					
g. FIRE EXTINGUISHER*					q. TIRES, WHEELS, RIMS					
h. ELECTRICAL WIRING					r. TAILGATE/DOORS*					
i. LIGHTS AND REFLECTORS					s. TARPAULIN*					
j. FUEL SYSTEM*					t. OTHER *(Specify)*					

13. INSPECTION RESULTS *(X one)* ACCEPTED ☐ REJECTED ☐

(If rejected give reason under "Remarks". Equipment will be approved if deficiencies are corrected prior to loading.)

14. SATELLITE MOTOR SURVEILLANCE SYSTEM: *(X one)* ACCEPTED ☐ REJECTED ☐

15. REMARKS

16. INSPECTOR SIGNATURE *(Origin)*	17. INSPECTOR SIGNATURE *(Destination)*

SECTION III - POST LOADING INSPECTION

This section applies to Commercial and Government/Military vehicles. All items will be checked prior to release of loaded equipment and shall be checked on all incoming loaded equipment.

	ORIGIN (1) SAT	ORIGIN (1) UNSAT	DESTINATION (2) SAT	DESTINATION (2) UNSAT	COMMENTS (3)
18. LOADED IAW APPLICABLE SEGREGATION/COMPATIBILITY TABLE OF 49 CFR					
19. LOAD PROPERLY SECURED TO PREVENT MOVEMENT					
20. SEALS APPLIED TO CLOSED VEHICLE; TARPAULIN APPLIED ON OPEN EQUIPMENT					
21. PROPER PLACARDS APPLIED					
22. SHIPPING PAPERS/DD FORM 2890 FOR GOVERNMENT VEHICLE SHIPMENTS					
23. COPY OF DD FORM 626 FOR DRIVER					
24. SHIPPED UNDER DOT SPECIAL PERMIT 868					

25. INSPECTOR SIGNATURE *(Origin)*	26. DRIVER(S) SIGNATURE *(Origin)*
27. INSPECTOR SIGNATURE *(Destination)*	28. DRIVER(S) SIGNATURE *(Destination)*

DD FORM 626, OCT 2011 PREVIOUS EDITION IS OBSOLETE. Page 1 of 3 Pages

Adobe Professional 8.0

INSTRUCTIONS

SECTION I - DOCUMENTATION

General Instructions.

All items (2 through 9) will be checked at origin prior to loading. Items with an asterisk (*) apply to commercial operators or equipment only. Only Items 2 through 7 are required to be checked at destination.

Items 1 through 5. Self explanatory.

Item 6. Enter operator's Commercial Driver's License (CDL) number or Military OF-346 License Number. CDL and OF-346 must have the HAZMAT and other appropriate endorsements IAW 49 CFR 383.

Item 7. *Enter the expiration date listed on the Medical Examiner's Certificate.

Item 8.a. Hazardous Materials Certification. In accordance with applicable service regulations, ensure operator has been certified to transport hazardous materials. Check the expiration date on driver's HAZMAT Certification.

b. *Valid Lease. Shipper will ensure a copy of the appropriate contract or lease is carried in all leased vehicles and is available for inspection. (49 CFR 376.12 and 376.11(c)(2)).

c. Route Plan. Prior to loading any Hazard Class/Division 1.1, 1.2, or 1.3 (Explosives) for shipment, ensure that the operator possesses a written route plan in accordance with 49 CFR Part 397. Route Plan requirements for Hazard Class 7 (Radioactive) materials are found in 49 CFR 397.101.

d. Emergency Response Guidebook (ERG) or Equivalent. Commercial operators must be in possession of an ERG or equivalent document. Shipper will provide applicable ERG page(s) to military operators.

e. *Driver's Vehicle Inspection Report. Review the operator's Vehicle Inspection Report. Ensure that there are no defects listed on the report that would affect the safe operation of the vehicle.

f. Copy of 49 CFR Part 397. Operators are required by regulation to have in their possession a copy of 49 CFR Part 397 (Transportation of Hazardous Materials Driving and Parking Rules). If military operators do not possess this document, shipper will provide a copy to operator.

Item 9. *Commercial Vehicle Safety Alliance (CVSA) Decal. Check to see if equipment has a current CVSA decal and mark applicable box. Vehicles without CVSA, check documentation of the last vehicle periodic inspection and perform DD Form 626 inspection.

SECTION II - MECHANICAL INSPECTION

General Instructions.

All items (12.a. through 12.t.) will be checked on all incoming empty equipment prior to loading. All UNSATISFACTORY conditions must be corrected prior to loading. Items with an asterisk (*) shall be checked on all incoming loaded equipment. Unsatisfactory conditions that would affect the safe off-loading of the equipment must be corrected prior to unloading.

SECTION II *(Continued)*

Item 12.a. Spare Electrical Fuses. Check to ensure that at least one spare fuse for each type of installed fuse is carried on the vehicle as a spare or vehicle is equipped with an overload protection device (circuit breaker). (49 CFR 393.95)

b. Horn Operative. Ensure that horn is securely mounted and of sufficient volume to serve purpose. (49 CFR 393.81)

c. Steering System. The steering wheel shall be secure and must not have any spokes cracked through or missing. The steering column must be securely fastened. Universal joints shall not be worn, faulty or repaired by welding. The steering gear box shall not have loose or missing mounting bolts or cracks in the gear box mounting brackets. The pitman arm on the steering gear output shaft shall not be loose. Steering wheel shall turn freely through the limit of travel in both directions. All components of a power steering system must be in operating condition. No parts shall be loose or broken. Belts shall not be frayed, cracked or slipping. The power steering system shall not be leaking. (49 CFR 396 Appendix G)

d. Windshield/Wipers. Inspect to ensure that windshield is free from breaks, cracks or defects that would make operation of the vehicle unsafe; that the view of the driver is not obscured and that the windshield wipers are operational and wiper blades are in serviceable condition. Defroster must be operative when conditions require. (49 CFR 393.60, 393.78 and 393.79)

e. Mirrors. Every vehicle must be equipped with two rear vision mirrors located so as to reflect to the driver a view of the highway to the rear along both sides of the vehicle. Mirrors shall not be cracked or dirty. (49 CFR 393.80)

f. Warning Equipment. Equipment must include three bidirectional emergency reflective triangles that conform to the requirements of FMVSS No. 125. FLAME PRODUCING DEVICES ARE PROHIBITED. (49 CFR 393.95)

g. Fire Extinguisher. Military vehicles must be equipped with one serviceable fire extinguisher with an Underwriters Laboratories rating of 10 BC or more. (Commercial motor vehicles must be equipped with one serviceable 10 BC Fire Extinguisher). Fire extinguisher must be located so that it is readily accessible for use and securely mounted on the vehicle. The fire extinguisher must be designed, constructed and maintained to permit visual determination of whether it is fully charged. (49 CFR 393.95)

h. Electrical Wiring: Electrical wiring must be clean and properly secured. Insulation must not be frayed, cracked or otherwise in poor condition. There shall be no uninsulated wires, improper splices or connections. Wires and electrical fixtures inside the cargo area must be protected from the lading. (49 CFR 393.28)

INSTRUCTIONS

SECTION II *(Continued)*

i. Lights/Reflectors. (Head, tail, turn signal, brake, clearance, marker and identification lights, Emergency Flashers). Inspect to see that all lighting devices and reflectors required are operable, of proper color and properly mounted. Ensure that lights and reflectors are not obscured by dirt or grease or have broken lenses. High/Low beam switch must be operative. Emergency Flashers must be operative on both the front and rear of vehicle. (49 CFR 393.24, 25, and 26)

j. Fuel System. Inspect fuel tank and lines to ensure that they are in serviceable condition, free from leaks, or evidence of leakage and securely mounted. Ensure that fuel tank filler cap is not missing. Examine cap for defective gasket or plugged vent. Inspect filler necks to see that they are in completely serviceable condition and not leaking at joints. (49 CFR 393.83)

k. Exhaust System. Exhaust system shall discharge to the atmosphere at a location to the rear of the cab or if the exhaust projects above the cab, at a location near the rear of the cab. Exhaust system shall not be leaking at a point forward of or directly below the driver compartment. No part of the exhaust system shall be located where it will burn, char or damage electrical wiring, fuel system or any other part of the vehicle. No part of the exhaust system shall be temporarily repaired with wrap or patches. (49 CFR 393.83)

l. Brake System (to include hand brakes, parking brakes and Low Air Warning devices). Check to ensure that brakes are operational and properly adjusted. Check for audible air leaks around air brake components and air lines. Check for fluid leaks, cracked or damaged lines in hydraulic brake systems. Ensure that parking brake is operational and properly adjusted. Low Air Warning devices must be operative. (49 CFR 393.40, 41, 42, 43, 44, 45, 47, 48, 49, 50, 51, 52, 53, and 55)

m. Suspension. Inspect for indications of misaligned, shifted or cracked springs, loosened shackles, missing bolts, spring hangers unsecured at frame and cracked or loose U-bolts. Inspect for any unsecured axle positioning parts, and sign of axle misalignment, broken torsion bar springs (if so equipped). (49 CFR 393.207)

n. Coupling Devices (Inspect without uncoupling). Fifth Wheels: Inspect for unsecured mounting to frame or any missing or damaged parts. Inspect for any visible space between upper and lower fifth wheel plates. Ensure that the locking jaws are around the shank and not the head of the kingpin. Ensure that the release lever is seated properly and safety latch is engaged. Pintle Hook, Drawbar, Towbar Eye and Tongue and Safety Devices: Inspect for unsecured mounting, cracks, missing or ineffective fasteners (welded repairs to pintle hook is prohibited). Ensure safety devices (chains, hooks, cables) are in serviceable condition and properly attached. (49 CFR 393.70 and 71)

o. Cargo Space. Inspect to ensure that cargo space is clean and free from exposed bolts, nuts, screws, nails or inwardly projecting parts that could damage the lading. Check floor to ensure it is tight and free from holes. Floor shall not be permeated with oil or other substances. (49 CFR 393.84)

p. Landing Gear. Inspect to ensure that landing gear and assembly are in serviceable condition, correctly assembled, adequately lubricated and properly mounted.

SECTION II *(Continued)*

q. Tires, Wheels and Rims: Inspect to ensure that tires are properly inflated. Flat or leaking tires are unacceptable. Inspect tires for cuts, bruises, breaks and blisters. Tires with cuts that extend into the cord body are unacceptable. Thread depth shall not be less than: 4/32 inches for tires on a steering axle of a power unit, and 2/32 inches for all other tires. Mixing bias and radial on the steering axle is prohibited. Inspect wheels and rims for cracks, unseated locking rings, broken, loose, damaged or missing lug nuts or elongated stud holes. (49 CFR 393.75)

r. Tailgate/Doors. Inspect to see that all hinges are tight in body. Check for broken latches and safety chains. Doors must close securely. (49 CFR 177.835(h))

s. Tarpaulin. If shipment is made on open equipment, ensure that lading is properly covered with fire and water resistant tarpaulin. (49 CFR 177.835(h))

t. Other Unsatisfactory Condition. Note any other condition which would prohibit the vehicle from being loaded with hazardous materials.

Item 14. For AA&E and other shipments requiring satellite surveillance, ensure that the Satellite Motor Surveillance System is operable. The DTTS Message Display Unit, when operative, will display the signal "DTTS ON". The munitions carrier driver, when practical, will position the DTTS message display unit in a manner that allows the shipping inspector or other designated shipping personnel to observe the "DTTS ON" message without climbing aboard the cab of the motor vehicle.

SECTION III - POST LOADING INSPECTION

General Instructions.

All placarded quantities items will be checked prior to the release of loaded equipment. Shipment will not be released until deficiencies are corrected. All items will be checked on incoming loaded equipment. Deficiencies will be reported in accordance with applicable service regulations.

Item 18. Check to ensure shipment is loaded in accordance with 49 CFR Part 177.848 and the applicable Segregation or Compatibility Table of 49 CFR 177.848.

Item 19. Check to ensure the load is secured from movement in accordance with applicable service outload drawings.

Item 20. Check to ensure seal(s) have been applied to closed equipment; fire and water resistant tarpaulin applied on open equipment.

Item 21. Check to ensure each transport vehicle has been properly placarded in accordance with 49 CFR 172.504.

Item 22. Check to ensure operator has been provided shipping papers that comply with 49 CFR 172.201 and 202. For shipments transported by Government vehicle, shipping paper will be DD Form 2890.

Item 23. Ensure operator(s) sign DD Form 626, are given a copy and understand the hazards associated with the shipment.

Item 24. Applies to Commercial Shipments Only. If shipment is made under DOT Special Permit 868, ensure that shipping papers are properly annotated and copy of Special Permit 868 is with shipping papers.

Item 26. Ensure driver/operator signs DD Form 626 at origin.

Item 28. Ensure driver/operator signs DD Form 626 at destination.

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

037 USA Form
Original: March 2011

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:

036 USA Form
Original: March 2011

USA Environmental, Inc.

MDAS ACCUMULATION FORM FOR DRUM/CONTAINER NO.

Date	Description/NIIN	Qty (lb)	Type of Treatment*

*If applicable, the material listed on this form has been inspected or processed by DDESB-approved means, as required by DoD policy, and to the best of my knowledge and belief does not pose an explosive hazard."

CERTIFIER:

Signature: _____ Date: _____

Printed Name: _____

Position: _____

Organization Name: _____

Organization Address: _____

Organization Phone Number: _____

VERIFIER:

Signature: _____ Date: _____

Printed Name: _____

Position: _____

Organization Name: _____

Organization Address: _____

Organization Phone Number: _____

082 USA FORM
Rev. A: July 2015

MEC ACCOUNTABILITY LOG

RI/FS at Cayo Botella, Culebra, Puerto Rico

Area	Transect/ Grid	DGM Target #	Date	Type	MPPEH Qty UXO	DMM	MDAS	MDEH	Description	Condition	Depth (in)	Approx Weight (lb)	Disposal Date	X Coordinate	Y Coordinate	Photo #
Total:					**0**	**0**	**0**	**0**								

MEC/MDEH Statistics:

Type	Qty
UXO	0
DMM	0
MDAS	0
MDEH	0

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	☐	Team Separation
☐	Emergency Landing Zones	☐	Other:

5. Remarks:

5. Remarks: (con't.)

Safety Inspection Form
FOR MEC OPERATIONS

DATE:	**TIME:**	**LOG NO.:**
CONTRACT NO.:	**TASK ORDER NO.:**	
SITE NAME AND LOCATION:		
TEAM OR NAME OF INSPECTED:		
INSPECTED ITEMS OR OPERATIONS: (List by task, item or other specific identifier)		

II. INSPECTION RESULTS

Item Description	Pass Yes/No	Item Description	Pass Yes/No
1. PPE (A, B,C,D)	☐ ☐	9. MEC/UXO Disposal Operations:	☐ ☐
2. Compliance with Approved SOP's	☐ ☐	10. Motor Vehicles / MHE Inspections	☐ ☐
3. Compliance with Approved Safety Plans	☐ ☐	11. First Aid / Trauma Kit:	☐ ☐
4. Safety / Support Equipment	☐ ☐	12. Other (list):	☐ ☐
5. On- and Off-Site Communications	☐ ☐	13. Other (list):	☐ ☐
6. Explosives / Ordnance Reference Material	☐ ☐	14. Other (list):	☐ ☐
7. MSDSs and Container Labeling per APP or SOP	☐ ☐	15. Other (list):	☐ ☐
8 MEC/UXO Precautions Observed	☐ ☐	16. Other (list):	☐ ☐

SUMMARY OF DEFICIENCIES NOTED: (If Required)

CORRECTIVE ACTIONS RECOMMENDED: (If required)

REINSPECTION RESULTS: (If required)

VI. SIGNATURES:

I acknowledge that I have been briefed on the results of this inspection and will take corrective actions (if necessary)

_____
UXOSO / SSO

_____
Sr. UXO Supervisor / Project Manager

Note: Safety Inspections are to be conducted each day and documented on this form. This form will also be used to document the present status of the site/site operations, personnel, and will also be used to note the current status of deficiencies noted during daily inspections. Any daily inspection forms where deficiencies have been noted will be forwarded to the Project Manager/SUXOS and a CC to the USA Safety Manager.

031 USA Form
Rev. B: April 2015

SITE VISITORS LOG

Project Location:_____ **Month of:** _____

Date	Name	Agency or Company	Purpose of Visit	Safety Briefing	Escort Required	Time In	Time Out	Remarks

026 USA Form
Original: March 2011

Operator & Geophysical Instrument Checkout Form for MEC Operations

WEEK START DATE:	Team No.:	Instrument Serial No.: USA: Schonstedt:

Operator Name:

SITE NAME AND LOCATION:

Instrument Verification Strip:

Test Plot Area (List by grid number, lane, marker number, or other identifier): (8) Items:

#1. Test Strip Start Rebar / Vertical / Depth Flush.
#2.
#3.
#4.
#5.
#6.
#7
#8 Test Strip End Rebar / Vertical / Depth Flush

Test Results (Pass)	MON	TUE	WED	THU	FRI
Item Description	**PASS**	**PASS**	**PASS**	**PASS**	**PASS**
1. Instrument checked For Broken/ Missing Components.	Y ☐/ N ☐	Y ☐/ N ☐	Y ☐/ N ☐	Y ☐/ N ☐	Y ☐/ N ☐
2. Instrument Serviceability Check Performed.	Y ☐/ N ☐	Y ☐/ N ☐	Y ☐/ N ☐	Y ☐/ N ☐	Y ☐/ N ☐
3. Correct Settings Selected for the Instrument.	Y ☐/ N ☐	Y ☐/ N ☐	Y ☐/ N ☐	Y ☐/ N ☐	Y ☐/ N ☐
4. Correct Survey / Sweep Techniques Employed.	Y ☐/ N ☐	Y ☐/ N ☐	Y ☐/ N ☐	Y ☐/ N ☐	Y ☐/ N ☐
5. Instrument Responsive To The Test Item(s)	Y ☐/ N ☐	Y ☐/ N ☐	Y ☐/ N ☐	Y ☐/ N ☐	Y ☐/ N ☐
6. Operator Responsive to Instrument Signal / Sound.	Y ☐/ N ☐	Y ☐/ N ☐	Y ☐/ N ☐	Y ☐/ N ☐	Y ☐/ N ☐
7. Operator Locates Point of Origin For Test Item(s).	Y ☐/ N ☐	Y ☐/ N ☐	Y ☐/ N ☐	Y ☐/ N ☐	Y ☐/ N ☐
8. Operator familiar with Pass / Fail Criteria.	Y ☐/ N ☐	Y ☐/ N ☐	Y ☐/ N ☐	Y ☐/ N ☐	Y ☐/ N ☐
9. Operator Familiar with Work Plan Procedures.	Y ☐/ N ☐	Y ☐/ N ☐	Y ☐/ N ☐	Y ☐/ N ☐	Y ☐/ N ☐
10. Instrument Trained Operator.	Y ☐/ N ☐	Y ☐/ N ☐	Y ☐/ N ☐	Y ☐/ N ☐	Y ☐/ N ☐
11. Instrument Passed Test Area.	Y ☐/ N ☐	Y ☐/ N ☐	Y ☐/ N ☐	Y ☐/ N ☐	Y ☐/ N ☐
12. Operator Passed Test Area.	Y ☐/ N ☐	Y ☐/ N ☐	Y ☐/ N ☐	Y ☐/ N ☐	Y ☐/ N ☐

SUMMARY OF DEFICIENCIES NOTED: (Identify if procedural, process, instrument, or operator, number missed)

CORRECTIVE ACTIONS RECOMMENDED: (If required):

- **Instruments failing the test will be tagged and removed from service until repaired or replaced.**
- **Individuals will be corrected on deficient procedures, processes, techniques, and/or retrained to acceptable standards.**

Team Leader Signature: _____ **End of Week Date:**

NOTE: Quality Control tests are to be conducted for the instrument and operator each day and documented on this form. This form will also be used to document the current status of deficiencies noted during daily tests. Any daily test forms where deficiencies have been noted will be forwarded to the Senior UXO Specialist / Manager or the UXO Quality Control Specialist / Manager.

073 USA Form
Original: January 2012

DAILY SITE REPORT

SECTION 1		GENERAL INFORMATION		
Project Name:		Customer(s) Name:		Report No.:
Contract No.:	TO No.:	Completion Date:	Location:	Report Week Ending:
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		
Weeks Temp: High / Low		Weeks Precipitation	Average Wind Speed:	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:	Excavations:	Other:
Surface Clearance					
Subsurface Clearance					
DGM / GIS					
EMM or Support					
Survey					
Vegetation Removal					

SECTION 7 WORK DETAILS

1) % of work completed:

2) Site conditions/developments affecting production:

3) Documentation/procedures/process/equipment issues:

4) Other:

SECTION 8 SAFETY INFORMATION

1) Were safety briefings held?	☐ Y ☐ N	**2)** Were Safety Violations issued?	☐ Y ☐ N
General ☐ Visitor ☐		# and Reason:	
3) Were there any accidents?	☐ Y ☐ N	**4)** Was a "Competent Person" required?	☐ Y ☐ N
1st Aid ☐ ( ) Clinic ☐ ( ) Hospital ☐ ( )		Type of operation:	
5) Were there any near misses?	☐ Y ☐ N	**6)** Was PPE up or down graded this week?	☐ Y ☐ N
# and Brief Description:		Changed to:	

SECTION 9 QUALITY CONTROL INFORMATION

1) Were there any QC failures?	☐ Y ☐ N	**2)** Were there any QA failures?	☐ Y ☐ N
Survey ☐ MEC ☐ DGM ☐ Other ☐		Minor ☐ Major ☐ Critical ☐	
3) Were corrective actions taken?	☐ Y ☐ N	**4)** Was a Stop Work or CAR issued?	☐ Y ☐ N
Brief Description:		Issued by:	
5) Were there submittals to QA?	☐ Y ☐ N	**6)** Was a Form 948 issued?	☐ Y ☐ N
# and Type:		Issued for:	
		Response due date:	

SECTION 10 MPPEH / MDAS /MDEH

No./lbs of items remaining MPPEH.		Lbs. of MDAS processed.	
No. of MDEH items.		Lbs. of MDAS placed in a "sealed" container.	

SECTION 11 MEC / UXO SUMMARY

Type:	Quantity:	Live:	Practice:	Unknown:	Updated MEC Sum:	Location (Grid or Trans #):
Projectiles						
Grenades						
Rockets						
Bombs						
Mines						
Missiles						
Pyrotechnics						
ICM / Submunitions						
Fuzes (Type)						

SECTION 12 EXPLOSIVE DEMOLITION OPERATIONS

Location (i.e., Grid or Lat & Long):	No. of Items Destroyed:	Updated MEC Sum:	Demo Date:	Usage Report Filed:	Remarks:

SECTION 13	DAILY COMMENTS	
SECTION 14	**CUSTOMER/REGULATORY INSTRUCTIONS ISSUED:**	
SECTION 15	**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 Daily Reports, inspection forms, preprinted forms, and 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.

FIELD CHANGE 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)

Requestor's Signature:	
Change or Revision: ☐ Accepted ☐ Rejected **Reason for Rejection** –	**Safety/QC Signature:**
Corporate: ☐ Concurrence ☐ Non-Concurrence	**Corporate Approval Signature:**
USA Project Manager (Name):	**USA Project Manager Signature:**
USACE Project Manager (Name):	**USACE Project Manager Signature:**

WEEKLY QUALITY CONTROL REPORT

CONTRACT WITH TASK ORDER: d

SITE:

USA MOBILE PHONE:

USA SITE OFFICE PHONE:

REPORT SUBMITTED BY:

WEEK ENDING DATE:

QC PERSONNEL:

ADMINISTRATIVE: Number of Personnel On-Site, Week Ending:

WEEKDAY	USA		Subcontractors		Total		Visitor	Gov't
	Assigned	Present	Assigned	Present	Assigned	Present (daily)	Present	Present
Sunday								
Monday								
Tuesday								
Wednesday								
Thursday								
Friday								
Saturday								

SAFETY: Reported Work Related Injuries/Illness On-Site: See safety report; all injuries are reported by the UXOSO. For the week ending:

WEEKDAY	USA						Subcontractor						Total					
	LWD		Restricted		Other		LWD		Restricted		Other		L		R		Other	
	INJ	ILL	INJ	ILL	OFF	ILL	INJ	ILL	INJ	ILL	OFF	ILL	INJ	ILL	INJ	ILL	OFF	ILL
Sunday																		
Monday																		
Tuesday																		
Wednesday																		
Thursday																		
Friday																		
Saturday																		
See Individual Accident / Incident Reports for Specific Information.																		

INSPECTIONS CONDUCTED by DFW (See Completed Three-phase QC Surveillance Forms)

WEEKDAY	Inspection Areas						
	Site Preparation	GIS Data Management	MEC Avoidance	MEC Surface Sweep	G-858 Collection	Data Processing	Reacquisition
Sunday							
Monday							
Tuesday							
Wednesday							
Thursday							
Friday							
Saturday							
WEEKDAY	Inspection Areas cont.						
	Intrusive Investigation	MPPEH Management	Demolition Operation	Safety Briefing			
Sunday							
Monday							
Tuesday							
Wednesday							
Thursday							
Friday							
Saturday							
See Daily Safety Sign-in Sheet for Safety Meetings							

DN (948)/CAR ISSUED:

WEEKDAY	Subject Items					Response	
	Work Plan	Safety Violation	Safety Comment	Quality Control	Other	Action Required	Required Date
Sunday							
Monday							
Tuesday							
Wednesday							
Thursday							
Friday							
Saturday							
See DN/CAR for Specific Information and Response.							

WEEKLY EXPLOSIVES USAGE:

	Explosive Type (Perforator or Booster)	Blasting Caps	Detonation Cord
Sunday			
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			
Total Used			

INVENTORY:

Explosive Type					
Lot Number					
Date of Inventory Quantity					
Explosive Type					
Lot Number					
Date of Inventory Quantity					
Explosive Type					
Lot Number					
Date of Inventory Quantity					
Explosive Type					
Lot Number					
Date of Inventory Quantity					

GENERAL OBSERVATIONS:

FIELD CHANGE REQUEST OR CHANGES TO OPERATIONS:

UXOQCS Signature:

DISTRIBUTION:

1 – Site Manager/SUXOS
1 – Program QC Manager
1 – Site QC File

ROOT CAUSE ANALYSIS

PART 1 – General Information

Date Submitted:	Project Name:
Submitted To:	Contract Number:
Prepared By:	TO Number:
Title/Position:	

PART 2 – Substandard or Failed Finding

Description of Substandard or Failed Item or Condition:				
Contract/Work Plan/PWS or Project Specific Written Requirement:				
Test/Inspection/Audit Identifying Substandard or Failed Item or Condition:				
Item/UOP Size:			Quantity:	
Disposition:	Review ☐	Rework ☐	Change ☐	Reject ☐

PART 3 – Investigation/Root Cause Determination

Personnel Responsible for Investigative Process:
Investigative Process Review Items/Sections (Identify Who, What, When, Where, Why, and How as Appropriate):
Investigative Process Findings:
Probable Root and Contributing Cause(s)(See attachment for additional information):

PART 4 – Corrective Actions

Proposed Corrective Actions and Completion Dates:		
Personnel Responsible for Implementation of Corrective Actions:		
Personnel Responsible for Monitoring/Measuring Effectiveness of Corrective Actions:		
Corrective actions have been completed and monitored/measured for effectiveness.		
Signature	Title/Position	Date

PART 5 – Response Approval

Responses Accepted By: Program, Project or Site		
Signature	Title/Position	Date
Signature	Title/Position	Date

PART 6 – Quality Control Follow-Up

Comments/Findings of Follow-Up Observation / Inspection / Audit:			
Verification Results	Satisfactory ☐	Unsatisfactory ☐	
Signature	Title/Position	Date	

PART 7 – RCA Closure

RCA Closed: Corporate		
Signature	Title/Position	Date

GRID / AREA COMPLETION FORM

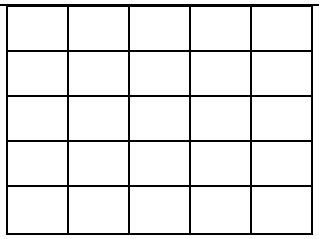
DATE START / STOP: /	TIME START / STOP:	GRID #:
TEAM #:		
TYPE OF OPERATION: ☐ Surface ☐ Subsurface ☐ Construction Support ☐ Backhoe ☐ Other		
SUPERVISOR'S NAME:		
AREAS INSPECTED: (List by grid numbers, coordinates, name, or other identifier)		

WORK CHECKS

Item Description	Y / N	Item Description	Y / N
1. Personnel compliant with the Work Plan	☐ / ☐	5. QC / QA Criteria Understood	☐ / ☐
2. Know and Understand the Task Requirements	☐ / ☐	6. Grid / Area Completed	☐ / ☐
3. Correct Instrument / Equipment Selected	☐ / ☐	7. Excavation Checked/Cleared of Anomalies	☐ / ☐
4. Correct Instrument Setting Selected / Used	☐ / ☐	8. Excavation Backfilled	☐ / ☐

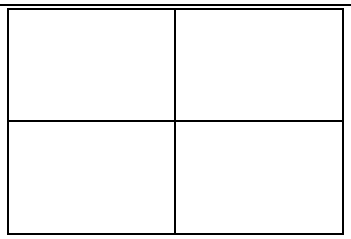
MEC / UXO ITEMS NOTED [Include type, nomenclature, #, depth, and location (map) within grid as necessary]:

Anomaly Count:



SW CORNER

Grid



Area

WORK COMMENTS:

SIGNATURE:	SIGNATURE:
Supervisor	Sr. UXO Supervisor / Site Manager

Note: Grid / Area Completion Forms are used to document operations conducted by the team prior to submission for QC. This form will also be used to document the present status of the grids / areas being worked by various teams (UXO, backhoe, sweep, etc.).

042 USA Form
Original: May 2011

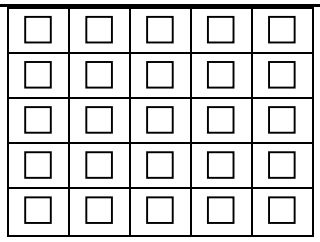
Quality Control Grid / Area Inspection Form

INSPECTION DATE:	TIME:	GRID #:
CONTRACT and TO #:		
SITE NAME AND LOCATION:		
INSPECTED BY:		
AREAS INSPECTED: (List by grid number, coordinates, name, or other identifier)		

INSPECTION RESULTS

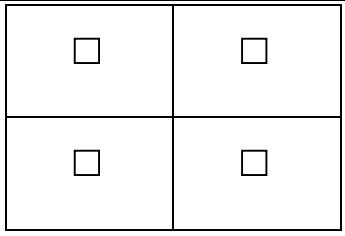
Item Description	Pass Yes/No	Item Description	Pass Yes/No
1. Work Performed IAW the Work Plan	☐ ☐	4. Correct Instrument Setting(s) Used	☐ ☐
2. Compliance with QC Requirements	☐ ☐	5. QC Criteria Understood	☐ ☐
3. Correct Instrument Used	☐ ☐	6. GRID / AREA RESULTS (Pass or Fail)	

FAILING DEFICIENCIES NOTED (Include type, #, depth, and location within grid as necessary):



SW Corner

Grid



Area

CORRECTIVE ACTIONS REQUIRED / RECOMMENDED:

REINSPECTION RESULTS: (If required)

SIGNATURES:	I acknowledge that I have been briefed on the results of this inspection and will take corrective actions (if necessary)
UXOQCS	Sr. UXO Supervisor / Project Manager

Note: QC Grid / Area Inspections are to be conducted prior to submission for QA and documented on this form. This form will also be used to document the present status of the grids / areas submitted for QC, and will also be used to note the current status of deficiencies noted during inspections. Any inspection where deficiencies have been noted will be forwarded to the Site Manager / SUXOS and a CC to the USA QC Manager.

044 USA Form
Rev. A: April 2015

Explosives Demolition Operations Record

Part 1 – General Information

Date of Demolitions:	Project Name:
Time of Demolitions:	
Prepared By:	Contract and TO Number:
Title or Position:	Prime or Subcontractor:
Is this an On-Call Delivery: ☐ Yes ☐ No	Name of: Demolitions or UXO Team Leader - SUXOS - UXOSO - UXOQCS - Other (i.e., Licensed Blaster) -
If Yes Who is the Distributor:	
Is a Seismograph Required: ☐ Yes ☐ No	

Part 2 – Notifications

Notifications Made To: Local LE ☐ Airport ☐ Base / Post ☐ Local FD ☐
Local EMS ☐ Government Representative ☐ Other ☐ _____

Part 3 – Exclusion Zones

MFD: HFD: K328:
Engineering Controls Reduce the EZ Distance To:

Part 4 – MEC / MPPEH Information for Demolitions

Grid or Area Locati	Number of Items :	Surface/BEM/Sandbag Water Mitigation/Other:	Consolidated Shot / BIP:	Remarks:

Part 5 – Responsible Person

By signing below the responsible person is acknowledging that this Explosives Demolitions Report is accurate, complete and that operations took place on the date and place indicated.

Signature	Title or Position	Date

Part 6 – Administrative Records Verification

Ensure a copy of any required record is completed and filed.

Verification Results: Explosive Usage Report ☐ MEC Log ☐ Magazine Data Card ☐
Explosive Distributor Receipt ☐ Other ☐_____

Signature	Title or Position	Date

APPENDIX E. MSD DATA SHEETS

This appendix contains the following Minimum Separation Distance (MSD) data sheets:

- 2.75 inch Rocket (specific model is not specified, M229 is indicated in the ASRs as a possible model used and the M229 has the largest Hazardous Fragment Distance (HFD) of the listed 2.75 inch rockets that may have been used per the ASRs and other historical documents.
- 2000 pound Practice Bomb Mk 67
- 250 pound Mk 81 Mod 1 General Purpose Bomb
- 500 pound Mk 82 Mod 1 General Purpose Bomb
- 1000 pound Mk 83 General Purpose Bomb
- 2000 pound Mk 84 General Purpose Bomb
- Mk 4 Signal (spotting) Cartridge

  Note: MK 76 Practice Bomb with the Mk 4 Signal Cartridge (explosive payload) was used on the Cayo however the Fragmentation Data Review Forms do not reference the MK 76 practice bomb or the Bomb Dummy Unit 33, therefore the Mk 89 Mod 0 Practice bomb which possess the Mk 4 Signal Cartridge has been provided in this appendix as it possesses the same explosive payload.

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Fragmentation Data Review Form

Database Revision Date 3/7/2016

Category:	Surface-Launched HE Rounds
Munition:	2.75 in M229 Rocket
Case Material:	Steel, Mild
Fragmentation Method:	Naturally Fragmenting
Secondary Database Category:	Rocket
Munition Case Classification:	Robust

DODIC:	H469
Date Record Created:	9/21/2004
Record Created By:	MC
Last Date Record Updated:	9/14/2011
Individual Last Updated Record:	SDH
Date Record Retired:	

Munition Information and Fragmentation Characteristics

Explosive Type:	Composition B
Explosive Weight (lb):	4.8
Diameter (in):	2.7500
Cylindrical Case Weight (lb):	11.43684
Maximum Fragment Weight (Intentional) (lb):	0.0564
Design Fragment Weight (95%) (Unintentional) (lb):	0.0062
Critical Fragment Velocity (fps):	5773

Theoretical Calculated Fragment Distances

HFD [Hazardous Fragment Distance: distance to no more than 1 hazardous fragment per 600 square feet] (ft):	308
MFD-H [Maximum Fragment Distance, Horizontal] (ft):	1434
MFD-V [Maximum Fragment Distance, Vertical] (ft):	1135

Overpressure Distances

TNT Equivalent (Pressure):	1.16
TNT Equivalent Weight - Pressure (lbs):	5.568
Unbarricaded Intraline Distance (3.5 psi), K18 Distance:	32
Public Traffic Route Distance (2.3 psi); K24 Distance:	43
Inhabited Building Distance (1.2 psi), K40 Distance:	71
Intentional MSD (0.0655 psi), K328 Distance:	581

Note: Per V5.E3.2.2.1 of DoD 6055.09-M the minimum sited K328 distance may be no smaller than 200 ft.

Sandbag and Water Mitigation Options

TNT Equivalent (Impulse):	1.14
TNT Equivalent Weight - Impulse (lbs):	5.472
Kinetic Energy 10^6 (lb-ft²/s²):	0.9406

Single Sandbag Mitigation

Required Wall & Roof Thickness (in)	24
Expected Max. Throw Distance (ft):	125
Minimum Separation Distance (ft):	125

Double Sandbag Mitigation

Required Wall & Roof Thickness (in)	Not Permitted
Expected Max. Throw Distance (ft):	Not Permitted
Minimum Separation Distance (ft):	Not Permitted

Water Mitigation

Minimum Separation Distance (ft):	200
Water Containment System:	1100 gal tank

Note: Use Sandbag and Water Mitigation in accordance with all applicable documents and guidance. If a donor charge larger than 32 grams is utilized, the above mitigation options are no longer applicable. Subject matter experts may be contacted to develop site specific mitigation options.

Minimum Thickness to Prevent Perforation

	Intentional	Unintentional
4000 psi Concrete (Prevent Spall):	7.78	3.16
Mild Steel:	1.45	0.61
Hard Steel:	1.19	0.50
Aluminum:	2.96	1.30
LEXAN:	7.04	4.11
Plexi-glass:	5.41	2.65
Bullet Resist Glass:	4.58	2.07

Item Notes

Distribution authorized to the Department of Defense and U.S. DoD contractors only for Administrative-Operational Use (17 October 2002). Other requests shall be referred to the Chairman, Department of Defense Explosives Safety Board, Room 856C, Hoffman Building I, 2461 Eisenhower Avenue, Alexandria, VA 22331-0600.

Fragmentation Data Review Form

Database Revision Date 3/7/2016

Category:	Non-Fragmenting Rounds
Munition:	2000 lb Practice Bomb Mk67
Case Material:	Steel, Mild
Fragmentation Method:	Non-Fragmenting
Secondary Database Category:	Practice Round
Munition Case Classification:	Non-Fragmenting

DODIC:	
Date Record Created:	4/21/2008
Record Created By:	MC
Last Date Record Updated:	12/15/2010
Individual Last Updated Record:	SDH
Date Record Retired:	

Munition Information and Fragmentation Characteristics

Explosive Type:	Black Powder
Explosive Weight (lb):	2
Diameter (in):	23.0000
Cylindrical Case Weight (lb):	
Maximum Fragment Weight (Intentional) (lb):	
Design Fragment Weight (95%) (Unintentional) (lb):	
Critical Fragment Velocity (fps):	

Theoretical Calculated Fragment Distances

HFD [Hazardous Fragment Distance: distance to no more than 1 hazardous fragment per 600 square feet] (ft):	
MFD-H [Maximum Fragment Distance, Horizontal] (ft):	
MFD-V [Maximum Fragment Distance, Vertical] (ft):	

Overpressure Distances

TNT Equivalent (Pressure):	0.43
TNT Equivalent Weight - Pressure (lbs):	0.860
Unbarricaded Intraline Distance (3.5 psi), K18 Distance:	17
Public Traffic Route Distance (2.3 psi); K24 Distance:	23
Inhabited Building Distance (1.2 psi), K40 Distance:	38
Intentional MSD (0.0655 psi), K328 Distance:	312

Note: Per V5.E3.2.2.1 of DoD 6055.09-M the minimum sited K328 distance may be no smaller than 200 ft.

Sandbag and Water Mitigation Options

TNT Equivalent (Impulse):	1.4
TNT Equivalent Weight - Impulse (lbs):	2.800
Kinetic Energy 10^6 (lb-ft²/s²):	

Single Sandbag Mitigation

Required Wall & Roof Thickness (in)	Non-Fragmenting
Expected Max. Throw Distance (ft):	Non-Fragmenting
Minimum Separation Distance (ft):	Non-Fragmenting

Double Sandbag Mitigation

Required Wall & Roof Thickness (in)	Non-Fragmenting
Expected Max. Throw Distance (ft):	Non-Fragmenting
Minimum Separation Distance (ft):	Non-Fragmenting

Water Mitigation

Minimum Separation Distance (ft):	Non-Fragmenting
Water Containment System:	Non-Fragmenting

Note: Use Sandbag and Water Mitigation in accordance with all applicable documents and guidance. If a donor charge larger than 32 grams is utilized, the above mitigation options are no longer applicable. Subject matter experts may be contacted to develop site specific mitigation options.

Minimum Thickness to Prevent Perforation

	Intentional	Unintentional
4000 psi Concrete (Prevent Spall):		
Mild Steel:		
Hard Steel:		
Aluminum:		
LEXAN:		
Plexi-glass:		
Bullet Resist Glass:		

Item Notes

The TNT equivalency for black powder rounds has been updated from 0.4 to 0.43 to agree with Rev 4 of TP 16. This has resulted in minor changes in values.

Distribution authorized to the Department of Defense and U.S. DoD contractors only for Administrative-Operational Use (17 October 2002). Other requests shall be referred to the Chairman, Department of Defense Explosives Safety Board, Room 856C, Hoffman Building I, 2461 Eisenhower Avenue, Alexandria, VA 22331-0600.

Fragmentation Data Review Form

Database Revision Date 3/7/2016

Category:	Air-Launched HE Rounds
Munition:	250 lb Mk 81 Mod 1 Bomb (H-6 Fill)
Case Material:	Steel, Mild
Fragmentation Method:	Naturally Fragmenting
Secondary Database Category:	Bomb
Munition Case Classification:	Robust

DODIC:	E462
Date Record Created:	9/21/2004
Record Created By:	MC
Last Date Record Updated:	12/23/2009
Individual Last Updated Record:	SDH
Date Record Retired:	

Munition Information and Fragmentation Characteristics

Explosive Type:	H-6
Explosive Weight (lb):	100
Diameter (in):	9.0000
Cylindrical Case Weight (lb):	92.38323
Maximum Fragment Weight (Intentional) (lb):	0.4011
Design Fragment Weight (95%) (Unintentional) (lb):	0.0427
Critical Fragment Velocity (fps):	7657

Theoretical Calculated Fragment Distances

HFD [Hazardous Fragment Distance: distance to no more than 1 hazardous fragment per 600 square feet] (ft):	569
MFD-H [Maximum Fragment Distance, Horizontal] (ft):	2726
MFD-V [Maximum Fragment Distance, Vertical] (ft):	2160

Overpressure Distances

TNT Equivalent (Pressure):	1.38
TNT Equivalent Weight - Pressure (lbs):	138.000
Unbarricaded Intraline Distance (3.5 psi), K18 Distance:	93
Public Traffic Route Distance (2.3 psi); K24 Distance:	124
Inhabited Building Distance (1.2 psi), K40 Distance:	207
Intentional MSD (0.0655 psi), K328 Distance:	1695

Note: Per V5.E3.2.2.1 of DoD 6055.09-M the minimum sited K328 distance may be no smaller than 200 ft.

Sandbag and Water Mitigation Options

TNT Equivalent (Impulse):	1.15
TNT Equivalent Weight - Impulse (lbs):	115.000
Kinetic Energy 10^6 (lb-ft²/s²):	11.7584

Single Sandbag Mitigation

Required Wall & Roof Thickness (in)	Not Permitted
Expected Max. Throw Distance (ft):	Not Permitted
Minimum Separation Distance (ft):	Not Permitted

Double Sandbag Mitigation

Required Wall & Roof Thickness (in)	Not Permitted
Expected Max. Throw Distance (ft):	Not Permitted
Minimum Separation Distance (ft):	Not Permitted

Water Mitigation

Minimum Separation Distance (ft):	Not Permitted
Water Containment System:	Not Permitted

Note: Use Sandbag and Water Mitigation in accordance with all applicable documents and guidance. If a donor charge larger than 32 grams is utilized, the above mitigation options are no longer applicable. Subject matter experts may be contacted to develop site specific mitigation options.

Minimum Thickness to Prevent Perforation

	Intentional	Unintentional
4000 psi Concrete (Prevent Spall):	26.50	10.36
Mild Steel:	4.31	1.77
Hard Steel:	3.53	1.46
Aluminum:	8.39	3.65
LEXAN:	13.28	7.69
Plexi-glass:	12.53	6.07
Bullet Resist Glass:	11.51	5.14

Item Notes

Distribution authorized to the Department of Defense and U.S. DoD contractors only for Administrative-Operational Use (17 October 2002). Other requests shall be referred to the Chairman, Department of Defense Explosives Safety Board, Room 856C, Hoffman Building I, 2461 Eisenhower Avenue, Alexandria, VA 22331-0600.

Fragmentation Data Review Form

Database Revision Date 3/7/2016

Category:	Air-Launched HE Rounds
Munition:	500 lb Mk 82 Mod 1 (H-6 Fill)
Case Material:	Steel, Mild
Fragmentation Method:	Naturally Fragmenting
Secondary Database Category:	Bomb
Munition Case Classification:	Robust

DODIC:	E480
Date Record Created:	9/21/2004
Record Created By:	MC
Last Date Record Updated:	1/30/2014
Individual Last Updated Record:	SDH
Date Record Retired:	

Munition Information and Fragmentation Characteristics

Explosive Type:	H-6
Explosive Weight (lb):	192
Diameter (in):	10.7500
Cylindrical Case Weight (lb):	202.60791
Maximum Fragment Weight (Intentional) (lb):	0.8649
Design Fragment Weight (95%) (Unintentional) (lb):	0.1531
Critical Fragment Velocity (fps):	4721

Theoretical Calculated Fragment Distances

HFD [Hazardous Fragment Distance: distance to no more than 1 hazardous fragment per 600 square feet] (ft):	686
MFD-H [Maximum Fragment Distance, Horizontal] (ft):	3074
MFD-V [Maximum Fragment Distance, Vertical] (ft):	2371

Overpressure Distances

TNT Equivalent (Pressure):	1.38
TNT Equivalent Weight - Pressure (lbs):	264.960
Unbarricaded Intraline Distance (3.5 psi), K18 Distance:	116
Public Traffic Route Distance (2.3 psi); K24 Distance:	154
Inhabited Building Distance (1.2 psi), K40 Distance:	257
Intentional MSD (0.0655 psi), K328 Distance:	2107

Note: Per V5.E3.2.2.1 of DoD 6055.09-M the minimum sited K328 distance may be no smaller than 200 ft.

Sandbag and Water Mitigation Options

TNT Equivalent (Impulse):	1.15
TNT Equivalent Weight - Impulse (lbs):	220.800
Kinetic Energy 10^6 (lb-ft²/s²):	15.1303

Single Sandbag Mitigation

Required Wall & Roof Thickness (in)	Not Permitted
Expected Max. Throw Distance (ft):	Not Permitted
Minimum Separation Distance (ft):	Not Permitted

Double Sandbag Mitigation

Required Wall & Roof Thickness (in)	Not Permitted
Expected Max. Throw Distance (ft):	Not Permitted
Minimum Separation Distance (ft):	Not Permitted

Water Mitigation

Minimum Separation Distance (ft):	Not Permitted
Water Containment System:	Not Permitted

Note: Use Sandbag and Water Mitigation in accordance with all applicable documents and guidance. If a donor charge larger than 32 grams is utilized, the above mitigation options are no longer applicable. Subject matter experts may be contacted to develop site specific mitigation options.

Minimum Thickness to Prevent Perforation

	Intentional	Unintentional
4000 psi Concrete (Prevent Spall):	29.68	11.18
Mild Steel:	4.78	1.90
Hard Steel:	3.92	1.56
Aluminum:	9.25	3.89
LEXAN:	14.13	8.04
Plexi-glass:	13.61	6.46
Bullet Resist Glass:	12.61	5.63

Item Notes

Distribution authorized to the Department of Defense and U.S. DoD contractors only for Administrative-Operational Use (17 October 2002). Other requests shall be referred to the Chairman, Department of Defense Explosives Safety Board, Room 856C, Hoffman Building I, 2461 Eisenhower Avenue, Alexandria, VA 22331-0600.

Fragmentation Data Review Form

Database Revision Date 3/7/2016

Category:	Air-Launched HE Rounds
Munition:	1000 lb Mk 83 Bomb
Case Material:	Steel, Mild
Fragmentation Method:	Naturally Fragmenting
Secondary Database Category:	Bomb
Munition Case Classification:	Robust

DODIC:	E506
Date Record Created:	10/5/2009
Record Created By:	SDH
Last Date Record Updated:	9/14/2011
Individual Last Updated Record:	SDH
Date Record Retired:	

Munition Information and Fragmentation Characteristics

Explosive Type:	H-6
Explosive Weight (lb):	445
Diameter (in):	13.9400
Cylindrical Case Weight (lb):	390.13511
Maximum Fragment Weight (Intentional) (lb):	0.9877
Design Fragment Weight (95%) (Unintentional) (lb):	0.1375
Critical Fragment Velocity (fps):	8129

Theoretical Calculated Fragment Distances

HFD [Hazardous Fragment Distance: distance to no more than 1 hazardous fragment per 600 square feet] (ft):	816
MFD-H [Maximum Fragment Distance, Horizontal] (ft):	3447
MFD-V [Maximum Fragment Distance, Vertical] (ft):	2727

Overpressure Distances

TNT Equivalent (Pressure):	1.38
TNT Equivalent Weight - Pressure (lbs):	614.100
Unbarricaded Intraline Distance (3.5 psi), K18 Distance:	153
Public Traffic Route Distance (2.3 psi); K24 Distance:	204
Inhabited Building Distance (1.2 psi), K40 Distance:	340
Intentional MSD (0.0655 psi), K328 Distance:	2788

Note: Per V5.E3.2.2.1 of DoD 6055.09-M the minimum sited K328 distance may be no smaller than 200 ft.

Sandbag and Water Mitigation Options

TNT Equivalent (Impulse):	1.15
TNT Equivalent Weight - Impulse (lbs):	511.750
Kinetic Energy 10^6 (lb-ft²/s²):	27.9983

Single Sandbag Mitigation

Required Wall & Roof Thickness (in)	Not Permitted
Expected Max. Throw Distance (ft):	Not Permitted
Minimum Separation Distance (ft):	Not Permitted

Double Sandbag Mitigation

Required Wall & Roof Thickness (in)	Not Permitted
Expected Max. Throw Distance (ft):	Not Permitted
Minimum Separation Distance (ft):	Not Permitted

Water Mitigation

Minimum Separation Distance (ft):	Not Permitted
Water Containment System:	Not Permitted

Note: Use Sandbag and Water Mitigation in accordance with all applicable documents and guidance. If a donor charge larger than 32 grams is utilized, the above mitigation options are no longer applicable. Subject matter experts may be contacted to develop site specific mitigation options.

Minimum Thickness to Prevent Perforation

	Intentional	Unintentional
4000 psi Concrete (Prevent Spall):	39.86	14.81
Mild Steel:	6.19	2.44
Hard Steel:	5.08	2.00
Aluminum:	11.84	4.94
LEXAN:	16.47	9.28
Plexi-glass:	16.67	7.79
Bullet Resist Glass:	15.76	6.76

Item Notes

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Fragmentation Data Review Form

Database Revision Date 3/7/2016

Category:	Air-Launched HE Rounds
Munition:	2000 lb Mk 84 Bomb (H-6 filled)
Case Material:	Steel, Mild
Fragmentation Method:	Naturally Fragmenting
Secondary Database Category:	Bomb
Munition Case Classification:	Robust

DODIC:	F126
Date Record Created:	10/5/2009
Record Created By:	SDH
Last Date Record Updated:	9/14/2011
Individual Last Updated Record:	SDH
Date Record Retired:	

Munition Information and Fragmentation Characteristics

Explosive Type:	H-6
Explosive Weight (lb):	945
Diameter (in):	17.9600
Cylindrical Case Weight (lb):	762.08101
Maximum Fragment Weight (Intentional) (lb):	1.4509
Design Fragment Weight (95%) (Unintentional) (lb):	0.1940
Critical Fragment Velocity (fps):	8250

Theoretical Calculated Fragment Distances

HFD [Hazardous Fragment Distance: distance to no more than 1 hazardous fragment per 600 square feet] (ft):	963
MFD-H [Maximum Fragment Distance, Horizontal] (ft):	4021
MFD-V [Maximum Fragment Distance, Vertical] (ft):	3175

Overpressure Distances

TNT Equivalent (Pressure):	1.38
TNT Equivalent Weight - Pressure (lbs):	######
Unbarricaded Intraline Distance (3.5 psi), K18 Distance:	197
Public Traffic Route Distance (2.3 psi); K24 Distance:	262
Inhabited Building Distance (1.2 psi), K40 Distance:	437
Intentional MSD (0.0655 psi), K328 Distance:	3584

Note: Per V5.E3.2.2.1 of DoD 6055.09-M the minimum sited K328 distance may be no smaller than 200 ft.

Sandbag and Water Mitigation Options

TNT Equivalent (Impulse):	1.15
TNT Equivalent Weight - Impulse (lbs):	1086.750
Kinetic Energy 10^6 (lb-ft²/s²):	47.9799

Single Sandbag Mitigation

Required Wall & Roof Thickness (in)	Not Permitted
Expected Max. Throw Distance (ft):	Not Permitted
Minimum Separation Distance (ft):	Not Permitted

Double Sandbag Mitigation

Required Wall & Roof Thickness (in)	Not Permitted
Expected Max. Throw Distance (ft):	Not Permitted
Minimum Separation Distance (ft):	Not Permitted

Water Mitigation

Minimum Separation Distance (ft):	Not Permitted
Water Containment System:	Not Permitted

Note: Use Sandbag and Water Mitigation in accordance with all applicable documents and guidance. If a donor charge larger than 32 grams is utilized, the above mitigation options are no longer applicable. Subject matter experts may be contacted to develop site specific mitigation options.

Minimum Thickness to Prevent Perforation

	Intentional	Unintentional
4000 psi Concrete (Prevent Spall):	50.59	18.35
Mild Steel:	7.70	2.97
Hard Steel:	6.32	2.44
Aluminum:	14.54	5.94
LEXAN:	18.80	10.46
Plexi-glass:	19.88	9.12
Bullet Resist Glass:	19.15	8.06

Item Notes

Distribution authorized to the Department of Defense and U.S. DoD contractors only for Administrative-Operational Use (17 October 2002). Other requests shall be referred to the Chairman, Department of Defense Explosives Safety Board, Room 856C, Hoffman Building I, 2461 Eisenhower Avenue, Alexandria, VA 22331-0600.

Fragmentation Data Review Form

Database Revision Date 3/7/2016

Category:	Non-Fragmenting Rounds
Munition:	56 lb Mk 89 Mod 0 Practice Bomb with Mk 4 Signal Cartridge
Case Material:	Cast Iron, Grey, CL35
Fragmentation Method:	Non-Fragmenting
Secondary Database Category:	Practice Round
Munition Case Classification:	Non-Fragmenting

DODIC:	
Date Record Created:	8/21/2012
Record Created By:	SDH
Last Date Record Updated:	
Individual Last Updated Record:	
Date Record Retired:	

Munition Information and Fragmentation Characteristics

Explosive Type:	Red Phosphorus
Explosive Weight (lb):	4.53514739229025E-03
Diameter (in):	4.0000
Cylindrical Case Weight (lb):	
Maximum Fragment Weight (Intentional) (lb):	
Design Fragment Weight (95%) (Unintentional) (lb):	
Critical Fragment Velocity (fps):	

Theoretical Calculated Fragment Distances

HFD [Hazardous Fragment Distance: distance to no more than 1 hazardous fragment per 600 square feet] (ft):	
MFD-H [Maximum Fragment Distance, Horizontal] (ft):	
MFD-V [Maximum Fragment Distance, Vertical] (ft):	

Overpressure Distances

TNT Equivalent (Pressure):	1
TNT Equivalent Weight - Pressure (lbs):	0.005
Unbarricaded Intraline Distance (3.5 psi), K18 Distance:	3
Public Traffic Route Distance (2.3 psi); K24 Distance:	4
Inhabited Building Distance (1.2 psi), K40 Distance:	7
Intentional MSD (0.0655 psi), K328 Distance:	54

Note: Per V5.E3.2.2.1 of DoD 6055.09-M the minimum sited K328 distance may be no smaller than 200 ft.

Sandbag and Water Mitigation Options

TNT Equivalent (Impulse):	1
TNT Equivalent Weight - Impulse (lbs):	0.005
Kinetic Energy 10^6 (lb-ft²/s²):	

Single Sandbag Mitigation

Required Wall & Roof Thickness (in)	Non-Fragmenting
Expected Max. Throw Distance (ft):	Non-Fragmenting
Minimum Separation Distance (ft):	Non-Fragmenting

Double Sandbag Mitigation

Required Wall & Roof Thickness (in)	Non-Fragmenting
Expected Max. Throw Distance (ft):	Non-Fragmenting
Minimum Separation Distance (ft):	Non-Fragmenting

Water Mitigation

Minimum Separation Distance (ft):	Non-Fragmenting
Water Containment System:	Non-Fragmenting

Note: Use Sandbag and Water Mitigation in accordance with all applicable documents and guidance. If a donor charge larger than 32 grams is utilized, the above mitigation options are no longer applicable. Subject matter experts may be contacted to develop site specific mitigation options.

Minimum Thickness to Prevent Perforation

	Intentional	Unintentional
4000 psi Concrete (Prevent Spall):		
Mild Steel:		
Hard Steel:		
Aluminum:		
LEXAN:		
Plexi-glass:		
Bullet Resist Glass:		

Item Notes

Distribution authorized to the Department of Defense and U.S. DoD contractors only for Administrative-Operational Use (17 October 2002). Other requests shall be referred to the Chairman, Department of Defense Explosives Safety Board, Room 856C, Hoffman Building I, 2461 Eisenhower Avenue, Alexandria, VA 22331-0600.

APPENDIX F. PERSONNEL QUALIFICATIONS

Personnel for this Task Order will be determined prior to mobilization.

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SOUTHAMPTON SAFETY TRAINING

CERTIFICATE OF COMPLETION

AWARDED TO

Rolando Soler Feliciano

FOR SUCCESSFULLY COMPLETING

OSHA 8-HR ANNUAL HAZWOPER REFRESHER

SATISFIES 29 CFR 1910.120(E)(8)

AUGUST 26, 2015
DATE

CERTIFYING OFFICIAL

13290 Corinth Road
Ivor, Virginia
23866

SOUTHAMPTON SAFETY TRAINING

CERTIFICATE OF COMPLETION

AWARDED TO

Rolando Soler Feliciano

FOR SUCCESSFULLY COMPLETING

40 HOUR OSHA 1910.120 HAZARDOUS WASTE OPERATIONS & EMERGENCY RESPONSE (HAZWOPER) COURSE

APRIL 8, 2011
DATE

CERTIFYING OFFICIAL

13290 CORINTH ROAD, IVOR, VIRGINIA, 23866

Section I - Applicant Information

Last Name:	First Name:	Middle Name:	Suffix: *(Jr., Sr., III)*
FELICIANO	ROLANDO	SOLER	
Age:	**Date of Birth** *(MM/DD/YYYY)*:	**Social Security Number:**	
58	03/02/1957	583-62-9706	

Applicant Certification *(to be signed by applicant)*

My signature below attests, subject to prosecution under 18 USC 1001, that all information that I have reported is true and correct to the best of my knowledge, and that I have not knowingly omitted to report any material information relevant to this form.

Date:	Printed Name:
08/18/2016	ROLANDO SOLER
	Signature: Rolando Soler

How do you wish to be contacted? *(phone, e-mail, letter, fax)* Please include contact information below:

CEL:787 220-1185
RSOLER02@YAHOO.COM

Section II – Release

I hereby authorize the verifying medical practitioner (VMP), who has signed the certification on page 9 of this form, to release to, or discuss with authorized Coast Guard personnel, any pertinent information in his/her possession regarding any physical or medical condition that may require review by the Coast Guard prior to determining whether the Coast Guard should issue a credential(s) for maritime service

I understand that this authorization is voluntary. I also understand that failure to provide authorization could affect the Coast Guard's ability to make a timely determination as to whether the Coast Guard should issue me a credential(s) for maritime service. This authorization will remain in effect until the Coast Guard determines whether to issue me the requested credential(s) for maritime service, but no longer than one year.

I have read and understand the following statement about my rights:

- I may revoke this authorization at any time prior to its expiration date by notifying the verifying medical practitioner in writing, but the revocation will not have any effect on any actions taken before they received the notification.
- Upon request, I may see or copy the information described in this release.
- I am not required to sign this release to receive my medical evaluation.

Applicant:

Name *(Printed)*:	Signature:	Date:
ROLANDO SOLER	Rolando Soler	08/18/2016

Applicant Name: ROLANDO SOLER Date of Birth: 03/02/1957

Previous Edition Obsolete

Section III - Medications *(must be completed by applicant and reviewed by verifying medical practitioner)*

Credential applicants who are required to complete a general medical exam are required to report all prescription medications prescribed, filled or refilled and/or taken within 30 days prior to the date that the applicant signs the CG-719K. In addition, all prescription medications, and all non-prescription (over-the-counter) medications including dietary supplements and vitamins, that were used for a period of 30 or more days within the last 90 days prior to the date that the applicant signs the CG-719K or approved equivalent form, must also be reported.

The information reported by the applicant must be verified by the verifying medical practitioner or other qualified medical practitioner to the satisfaction of the verifying medical practitioner to include the following two items.

1. Report all medications (prescription and non-prescription), dietary supplements, and vitamins.
2. Include dosages of every substance reported on this form, as well as the condition for which each substance is taken.

Additional sheets may be added by the applicant and/or qualified medical practitioner if needed to complete this section *(include applicant name and date of birth on each additional sheet)*.

If none, check "NONE."

☑ NONE

Section IV - Certification of Medical Conditions *(must be completed by applicant and reviewed by verifying medical practitioner)*

Applicants must report their relevant medical conditions to the best of their knowledge, and the verifying medical practitioner must verify the medical conditions, using the table below. Check "yes" if the applicant has had a previous diagnosis or treatment of the condition by a healthcare provider, or if the applicant is currently under treatment or observation for the condition, or if the condition is present regardless of treatment.

If the verifying medical practitioner, or any other health care provider to the satisfaction of the verifying medical practitioner, discovers a condition not reported by the applicant, he/she must check "yes" in the appropriate block and explain in the remarks.

The verifying medical practitioner must address all reported relevant conditions in detail in this Section. This detailed explanation should include, at a minimum, identification of the condition, approximate date of diagnosis, any limitations, whether the condition is controlled, the prognosis and any additional information as appropriate, referring to the evaluation data listed in enclosure (3) of NVIC 4-08 for each condition.

Additional sheets may be added by the applicant and/or verifying medical practitioner if needed to complete this section of the form. *(include applicant name and DOB on each additional sheet)*.

To the best of the applicant's knowledge, does the applicant have, or have ever suffered from, any of the following?

If YES, the applicant must **PROVIDE THE TEST RESULTS AND/OR RECORDS AS INDICATED**, referring to the evaluation data listed in enclosure (3) of NVIC 4-08 for each condition. Documentation of evaluation data specified in this table for all applicable medical conditions potentially requiring further review should be submitted with each application, unless otherwise specified by the NMC. Mariners, including first class pilots and those individuals "serving as" pilots (as well as Great Lakes pilots) who are required to submit annual physical examinations to the Coast Guard, may be issued a letter by the NMC specifying the extent of the evaluation data, if any, that should be submitted to the Coast Guard for any medical conditions that have been previously reported to, and evaluated by, the NMC.

The verifying medical practitioner shall make comments on all answers marked "yes" on the following page for which no evaluation data has been submitted. If known to the VMP, the VMP may comment that a condition has been previously reported on a prior CG-719K, but only for those CG-719Ks submitted after December 31, 2008, and only for those conditions which have not changed since the condition was previously reported on a prior CG-719K.

Applicant Name: ROLANDO SOLER Date of Birth: 03/02/1957

Previous Edition Obsolete

1. **Identify the Condition**	3. **Is Condition Controlled?**	5. **Prognosis**	
2. **List Any Limitations**	4. **Approximate Date of Diagnosis**	6. **Additional Information**	

	YES	NO			YES	NO	
1.	☐	☒	Ear surgery,	45.	☐	☒	Kidney stones
2.	☐	☒	Hearing loss, hearing aid	46.	☐	☒	Protein/sugar/blood in urine
3.	☐	☒	Impaired speech or stuttering	47.	☐	☒	Back surgery or injury
4.	☐	☒	Deformities of face	48.	☐	☒	Ruptured/herniated disc
5.	☐	☒	Open tracheostomy	49.	☐	☒	Fractures requiring surgery
6.	☐	☒	Poor vision	50.	☐	☒	Limitation of any major joint
7.	☐	☒	History of eye disease or injury	51.	☐	☒	Bone or joint surgery
8.	☐	☒	History of eye surgery	52.	☐	☒	Dislocated joint
9.	☐	☒	Abnormal color vision	53.	☐	☒	Recurrent neck or back pain
10.	☐	☒	Glaucoma	54.	☐	☒	Swollen or painful joint
11.	☐	☒	Asthma	55.	☐	☒	Arthritis or bursitis
12.	☐	☒	Emphysema or COPD	56.	☐	☒	Trick or locked knee
13.	☐	☒	Collapsed lung/pneumothorax	57.	☐	☒	Amputation or prosthesis
14.	☐	☒	Irregular heart beat	58.	☐	☒	Carpal tunnel
15.	☐	☒	Heart murmur or valve replacement	59.	☐	☒	Difficulty walking or climbing
16.	☐	☒	Chest pain or angina	60.	☐	☒	Sciatica or nerve pain
17.	☐	☒	Heart attack/ myocardial infarction	61.	☐	☒	Other bone/joint disorder
18.	☐	☒	Congestive heart failure	62.	☐	☒	Motion/sea sickness
19.	☐	☒	Heart surgery/stent/angioplasty	63.	☐	☒	Impaired balance, or balance disorder or difficulty
20.	☐	☒	Pacemaker or defibrillator	64.	☐	☒	Vertigo or dizziness
21.	☐	☒	Any other heart condition	65.	☐	☒	Numbness or paralysis
22.	☐	☒	High blood pressure/hypertension	66.	☐	☒	Head injury or skull fracture
23.	☐	☒	Aneurysm or blockages	67.	☐	☒	Seizures or epilepsy
24.	☐	☒	Pulmonary embolus or blood clots	68.	☐	☒	Recurrent headaches
25.	☐	☒	Gastrointestinal bleeding or ulcers	69.	☐	☒	Narcolepsy
26.	☐	☒	Crohn's disease or ulcerative colitis	70.	☐	☒	Sleep apnea
27.	☐	☒	Hepatitis or jaundice	71.	☐	☒	Restless leg
28.	☐	☒	Gallbladder problems or stones	72.	☐	☒	Fainting spells or loss of consciousness
29.	☐	☒	Intestinal surgery	73.	☐	☒	Stroke or TIA
30.	☐	☒	Any form of cancer	74.	☐	☒	Brain tumor
31.	☐	☒	Anemia	75.	☐	☒	Other brain or nerve disease
32.	☐	☒	Hemophilia or polycythemia	76.	☐	☒	ADD, ADHD, or bipolar
33.	☐	☒	Any other blood disorders	77.	☐	☒	Depression
34.	☐	☒	Thyroid disease	78.	☐	☒	History of suicide attempt
35.	☐	☒	Diabetes	79.	☐	☒	Schizophrenia
36.	☐	☒	HIV or AIDS	80.	☐	☒	Anxiety
37.	☐	☒	Lymphoma or leukemia	81.	☐	☒	Alcohol or substance abuse
38.	☐	☒	Tuberculosis	82.	☐	☒	Loss of memory or amnesia
39.	☐	☒	Neurofibromatosis	83.	☐	☒	Other psychiatric disease or counseling
40.	☐	☒	Skin tumors or cancer	84.	☐	☒	Sleepwalking
41.	☐	☒	Scleroderma	85.	☐	☒	Bedwetting since age 12
42.	☐	☒	Lupus	86.	☐	☒	Sex change
43.	☐	☒	Kidney transplant or dialysis	87.	☐	☒	Allergic reactions
44.	☐	☒	Kidney disease or cancer	88.	☐	☒	Any other disease, surgery or hospitalization

Condition #	Comment

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Section V (a) – Visual Acuity

This section must be completed by the verifying medical practitioner, or any other healthcare provider to the satisfaction of the verifying medical practitioner see encl 5 of NVIC 4-08. Additional information must be reported in Section VII. If corrective lenses are required to meet the standard, both corrected and uncorrected vision must be tested.

Distant Uncorrected	Distant Corrected To	Field of Vision	
Right: 20 / 20	Right: 20 /	This applicant must have a **100**-degree horizontal field of vision.	☒ Normal
Left: 20 / 20	Left: 20 /		☐ Abnormal

Section V (b) – Color Vision

The following color sense testing methodologies are acceptable:

- ☐ AOC (1965) – (6 or fewer errors on plates 1-15)
- ☐ AOC-HRR (2nd Edition) – (No errors in test plates 7-11)
- ☐ Richmond (1983) – (6 or fewer errors)
- ☒ Ishihara pseudoisochromatic plates test, 14 plate (5 or less errors), 24 plate (6 or less errors) 38 plate (8 or less errors)
- ☐ Titmus Vision Tester / OPTEC 2000 – (No errors on six plates)
- ☐ Farnsworth Lantern (colored lights) Test per instruction booklet.
- ☐ Optec 900 (colored lights) Test per instruction booklet.
- ☐ An alternative test approved by the Coast Guard (indicate test) _____

The verifying medical practitioner must indicate test used and results (number of errors). Additional information must be reported in Section VII. Color sensing lenses (e.g. X-Chrome) are prohibited.

Color Vision: Normal Color Vision ☒ Abnormal Color Vision ☐

Number of Errors _____

Section VI – Hearing

Normal	Abnormal Hearing	Hearing Aid Required
☒	☐	☐

If abnormal hearing or hearing aid required, perform audiogram or functional speech discrimination test.

An applicant with normal hearing does not need to complete either the audiometer test or the functional speech discrimination test. The verifying medical practitioner, in consultation with any other healthcare provider he/she deems appropriate, determines whether the audiometer and/or functional speech discrimination tests are necessary. If hearing is abnormal or a hearing aid is required, refer to enclosure (5) of NVIC 4-08 for guidance.

If audiometric testing is required, the audiometer test should include testing at the following thresholds, 500Hz, 1,000 Hz, 2,000 Hz and 3000 Hz. The frequency responses for each ear are averaged to determine the measure of an applicants hearing ability. The Applicant should demonstrate an unaided threshold of 20dB in each ear.

Additional information must be reported in Section VII.

Audiometer Threshold Value		500Hz	1,000Hz	2,000Hz	3,000Hz			
	Right Ear (Unaided)							
	Left Ear (Unaided)							
	Right Ear (Aided)							
	Left Ear (Aided)							
Functional Speech Discrimination Test @ 55dB		Right Ear (Unaided):			%	Right Ear (Aided)		%
		Left Ear (Unaided):			%	Left Ear (Aided)		%

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Section VII (a) - Physical Information

This section to be completed by the verifying medical practitioner, or other medical staff to the satisfaction of the verifying medical practitioner. Additional information must be reported in Section VII.

Height *(inches only)*: 67	Weight *(lbs)*: 168	Body Mass Index *(BMI)*: 26.3	Gender: M
Pulse Resting: 70	Initial Blood Pressure: 110/70	Repeat Blood Pressure *(if needed)*: N/A.	

Section VII (b)– Physical Exam *(must be completed by verifying medical practitioner)*

#	Normal	Abnormal	System/Organ	#	Normal	Abnormal	System/Organ
1.	X		Head, Face, Neck, Scalp	10.	X		Skin
2.	X		Eyes / Pupils / EOM	11.	X		Lymphatic
3.	X		Mouth And Throat	12.	X		Neurologic
4.	X		Ears / Drums	13.	X		Vascular System
5.	X		Lungs And Chest	14.	X		Genital-Urinary System
6.	X		Heart	15.	X		Hernia
7.	X		Abdomen	16.	X		Missing extremities / Digits
8.	X		Upper / Lower Extremities	17.	X		General / Systemic
9.	X		Spine / Musculoskeletal				

Please make numbered comments on abnormal systems/organs:

Section VIII - Demonstration of Physical Ability *(to be completed by the verifying medical practitioner)*

- If the examining medical practitioner doubts the applicant's ability to meet the guidelines contained within this table, and for all applicants with a Body Mass Index (BMI) of 40.0 or higher, the practitioner shall require that the applicant demonstrate the ability to meet the guidelines. This does not mean, for example, that the applicant must actually don an exposure suit, pull an uncharged 1.5 inch diameter 50' fire hose with nozzle to full extension, or lift a charged 1.5 inch diameter fire hose to fire fighting position. Rather, the medical practitioner may utilize alternative measures to satisfy himself or herself that the applicant possesses the ability to meet the guidelines in the third column. A description of the methods utilized by the medical practitioner should be reported in Section IX.

- All practical demonstrations, if required, should be performed by the applicant without assistance. Any prosthesis normally worn by the applicant, and other aid devices, may be used by the applicant in all practical demonstrations except when the use of such items would prevent the proper wearing of mandated personal protection equipment (PPE).

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- If the verifying medical practitioner is unable to conduct the practical demonstration, the applicant should be referred to a competent evaluator of physical ability. The Coast Guard recognizes that all medical practitioners may not have the equipment necessary to test all of the tasks as listed. Equivalent alternate testing methodologies may be used. For further information, see enclosure (2) of NVIC 4-08.
- If the applicant is unable to perform any of the following functions, the examining practitioner should provide information on the degree or the severity of the applicant's inability to meet the standards. The results of any practical demonstration or attendant physical evaluation should be recorded in the Section IX.

List of tasks considered necessary for performing ordinary and emergency response shipboard functions:

Shipboard Tasks, function, event or condition:	*Related Physical Ability:*	*The examiner should be satisfied that the applicant:*
Routine Movement on slippery, uneven, and unstable surfaces.	Maintain Balance (equilibrium).	Has no disturbance in sense of balance.
Routine access between levels.	Climb up and down vertical ladders and stairways.	Is able, without assistance, to climb up and down vertical ladders and stairways.
Routine movement between spaces and compartments.	Step over high door sills and coamings, and move through restricted accesses.	Is able without assistance, to step over a door sill or coaming of 24 inches (61 centimeters) in height. Able to move through a restricted opening of 24 inches.
Open and close watertight doors, hand cranking systems, open/close valve.	Manipulate mechanical devices using manual and digital dexterity, and strength.	Is able, without assistance, to open and close watertight doors that may weigh up to 55 pounds (25 kilograms). Should be able to move hands/arms to open and close valve wheels in vertical and horizontal directions; rotate wrists to turn handles. Reach above shoulder height.
Handle ship's stores.	Lift, pull, push, and carry a load.	Is able, without assistance, to lift at least a 40 pound (18.1 kilogram) load off the ground, and to carry, push or pull the same load.
General vessel maintenance.	Crouch (lowering height by bending knees); kneel (placing knees on ground); and stoop (lowering height by bending at the waist). Use hand tools such as spanners, valve wrenches, hammers, screwdrivers, pliers.	Is able, without assistance, to grasp, lift and manipulate various common shipboard tools.
Emergency response procedures, including escape from smoke-filled spaces.	Crawl (the ability to move the body with hands and knees); feel (the ability to handle or touch to examine or determine differences in texture and temperature).	Is able, without assistance, to crouch, keel and crawl, and to distinguish differences in texture and temperature by feel.
Stand a routine watch.	Stand a routine watch.	Is able, without assistance, to intermittently stand on feet for up to four hours with minimal rest periods.
React to visual alarms and instructions, emergency response procedures.	Distinguish an object or shape at a certain distance.	Fulfills the eyesight standards for the merchant mariner credential(s) applied for. *See footnote 1 of this table & enclosure (5) of NVIC 4-08.*
React to audible alarms and instructions, emergency response procedures.	Hear a specified decibel (dB) sound at a specified frequency.	Fulfills the hearing capacity standards for the merchant mariner credential(s) applied for.
Make verbal reports or call attention to suspicious or emergency conditions.	Describe immediate surroundings and activities, and pronounce words clearly.	Is capable of normal conversation.
Participate in firefighting activities.	Be able to carry and handle fire hoses and fire extinguishers.	Is able, without assistance, to pull an uncharged 1.5 inch diameter, 50' fire hose with nozzle to full extension, and to lift a charged 1.5 inch diameter fire hose to fire fighting position.
Abandon ship.	Use survival equipment.	Has the agility, strength and range of motion to put on a personal flotation device and exposure suit without assistance from another individual.

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Section IX – Verifying Medical Practitioner Recommendation

☒ Recommended Competent	☐ Not Recommended Competent *(explain in comments)*	☐ Needing Further Review *(explain in comments)*

Comments on Recommendation:

Pt. can perform all tasks listed.

To work with hazardous materials in accordance with 29 CFR 1910.120

To use respiratory protective equipment in accordance with 29 CFR 1910.134

Verifying Medical Practitioner:

This signature attests, subject to criminal prosecution under 18 USC § 1001, that all information reported by the verifying medical practitioner is true and correct to the best of his/her knowledge and that the verifying medical practitioner has not knowingly omitted or falsified any material information relevant to this form.

Name *(Printed)*: Antonio R. Del Toro	Signature:
	Date: 8/18/16
License Number: 12495	Office Address, City, State, Zip Code: Calle Salisburry Culebra P.R. 00775
Office Telephone: 742-0495	

U. S. Dept. of Homeland Security, USCG, CG 719K, Rev. 01-09

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APPENDIX G. STANDARD OPERATING PROCEDURES (SOPS)

This appendix contains the following Standard Operating Procedures (SOPs) for the TCRA. Laboratory SOPs are provided separately, in Appendix H: Laboratory SOPs and Certification, of this MEC-QAPP for the TCRA.

- HSP-01: Accident Reporting
- HSP-23: Weather Emergencies
- OPS-03: Demolition/Disposal Operations
- OPS-04: DGM Anomaly Investigations
- OPS-05A: DGM Geophysical Mapping
- OPS-5B: Geophysical Data Processing and Interpretation
- DGM-01 Instrument Verification Strip and Analog Test Strip
- OPS-07: Explosives Storage and Accountability
- OPS-08: Explosives Transportation
- OPS-11: Hand and Power Tool Operation
- OPS 12: Heavy Equipment Operation
- OPS-13: MPPEH Management
- OPS-14: MEC Analog Detection and Removal Actions
- OPS-15: UXO/MEC Avoidance
- OPS-17: MEC Surface Sweeps
- OPS-21: Vegetation Removal
- OPS-29: Explosives Transportation via Water Vessel
- OPS-34: Sample Packing and Shipping Field Guidance
- OPS 36A: Soil Sampling Field Guidance
- OPS-40: Location Surveys
- OPS-41: Small Boat Operations
- 1.11.0: Blind Seeding Procedures
- Standard Operating Procedures For Endangered Species Conservation And their Habitat on DERP-FUDS Project No. I02PR0068. Culebra, Puerto Rico

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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.

5.1.3 If Someone is Struck by Lightning:

- Initiate the site EMS response system.
- Render First Aid and CPR, as necessary.

5.1.4 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.

5.1.5 If Someone is Injured:

- Initiate the site EMS response system.
- Render First Aid and CPR as necessary.

5.1.6 Information Requirements for Floods

5.1.6.1 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.

5.1.6.2 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.

5.1.6.3 If Someone is Injured:

- Initiate the site EMS response system.
- Render First Aid and CPR as necessary.

5.1.7 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.

5.1.7.1 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:

- Work site evacuation will be evaluated as a contingency and will be evaluated with the Project PM and USACE PM. Locations in which the team may be evacuated to may be to San Juan if it is known the Hurricane is not predicted to hit San Juan or to Continental US if applicable.

5.1.7.2 If the team is to stay on Culebra:

- Ensure all site personnel are briefed on the location of storm shelters or safest locations for shelter.
- 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.

5.1.7.3 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.

5.1.7.4 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.

5.1.7.5 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.

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STANDARD OPERATING PROCEDURE
OPS-03 – DEMOLITION/DISPOSAL OPERATIONS

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide the minimum procedures and safety and health requirements applicable to the conduct of demolition/disposal operations on sites contaminated with unexploded ordnance (UXO) or munitions and explosives of concern (MEC).

2.0 SCOPE

This SOP applies to all USA Environmental, Inc. (USA) site personnel, including contractor and subcontractor personnel, involved in the conduct of UXO/MEC demolition/disposal 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. Consult the documents listed in Section 12.0 of this SOP for additional compliance issues.

3.0 RESPONSIBILITIES

3.1 PROJECT MANAGER

The Project Manager (PM) 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.

3.2 SENIOR UXO SUPERVISOR

The Senior UXO Supervisor (SUXOS) will be responsible for assuring that adequate safety measures and housekeeping are performed during all phases of site operations, to include demolition activities, and will visit site demolition locations, as deemed necessary, to ensure that demolition operations are carried out in a safe, clean, efficient, and economic manner. The demolition activities will then be conducted under the direct control of the SUXOS, who will have the responsibility of supervising all demolition operations within the area.

The SUXOS will be responsible for training all on-site UXO personnel regarding the nature of the materials handled, the hazards involved, and the precautions necessary. The SUXOS will also ensure that the Daily Operational Log, Ordnance Accountability Log, USA Demolition Shot Records, and inventory records are properly filled out and accurately depict the demolition events and demolition material consumption for each day's operations. The SUXOS will be present during all demolition operations or designate a competent, qualified person to be in charge during any absences.

3.3 UXO SAFETY OFFICER

The UXO Safety Officer (UXOSO) for the site is responsible for ensuring that all demolition operations are being conducted in a safe and healthful manner, and is required to be present during all MEC demolition operations. The UXOSO will ensure the compliance of the demolition team with the above referenced documents that are applicable to the particular task being performed.

3.4 UXO QUALITY CONTROL SPECIALIST

The UXO Quality Control Specialist (UXOQCS) is responsible for ensuring the completeness of demolition operations records and for weekly inspection of the Ordnance Accountability Log, the Daily Operational Log, the USA Demolition Shot Record, and the inventory of MEC and demolition material. The UXOQCS, assisted by demolition team personnel, will inspect each demolition pit and an area of appropriate radius

after each demolition shot, in accordance with the approved explosive siting plan, to ensure that there are no kick-outs, hazardous UXO/MEC components, or other hazardous items. In addition, the pit may be checked with a magnetometer and large metal fragments, and any hazardous debris, will be removed on a per use basis in accordance with the SOW. Any UXO/MEC discovered during the QC check will be properly disposed of using the demolition procedures in the WP. Extreme caution must be exercised when disposing of UXO/MEC, which has been exposed to the forces of a detonation. Personnel must adhere to acceptable safe practices and procedures when determining the condition of munitions and fuzes that have not been consumed in the disposal process.

3.5 Explosive Blaster

Puerto Rico (PR) Permitted Blaster under Commonwealth PR Law 134 will ensure the transport of the explosives and use is under the supervision of a PR Explosive Permit. Transportation will be coordinated with San Juan Police Department prior to delivery of the explosives. The Blaster is the only authorized user of the explosives unless other employees have been provided the PR Explosive Permit. Shipment of the explosives is provided by the explosive vendor who maintains their own PR Explosive Permit. When transporting the explosives via small boat the Blaster with the PR Explosive Permit will accompany the explosive shipment.

4.0 GENERAL OPERATIONAL AND SAFETY PROCEDURE

All personnel, including contractor and subcontractor personnel, involved in operations on UXO/MEC-contaminated sites will be familiar with the potential safety and health hazards associated with the conduct of demolition/disposal operations, and with the work practices and control techniques used to reduce or eliminate these hazards. During demolition operations, the general safety provisions listed below will be followed by all demolition personnel, at all times. Noncompliance with the general safety provisions listed below will result in disciplinary action, which may include termination of employment.

All safety regulations applicable to demolition range activities and demolition and MEC materials involved will be complied with.

- Demolition of any kind is prohibited without an approved siting plan.
- The quantity of MEC to be destroyed will be determined by the range limit, fragmentation and K-Factor distance calculations.
- In the event of an electrical storm, dust storm, or other hazardous meteorological conditions, immediate action will be taken to cease all demolition range operations and evacuate the area.
- In the event of a fire, which does not include explosives or energetic material, put out the fire using the firefighting equipment located at the site; if unable to do so, notify the fire department and evacuate the area. If injuries are involved, remove the victims from danger, administer first aid, and seek medical attention.
- The UXOSO is responsible for reporting all injuries and accidents that occur.
- Personnel will not tamper with any safety devices or protective equipment.
- Any defect or unusual condition noted that is not covered by this SOP will be reported immediately to the SUXOS or UXOSO for evaluation and/or correction.
- Methods of demolition will be conducted in accordance with this SOP and approved changes or revisions thereafter.
- Adequate fire protection and first aid equipment will be provided at all times.
- All personnel engaged in the destruction of MEC will wear clothing made of natural fiber, close-weave clothes, such as cotton. Synthetic material such as nylon is not authorized unless treated with anti-static material.

- Care will be taken to minimize exposure to the smallest number of personnel, for the shortest time, to the least amount of hazard, consistent with safe and efficient operations.
- Work locations will be maintained in a neat and orderly condition.
- All hand tools will be maintained in a good state of repair.
- Each heavy equipment and/or vehicle operator will have a valid operator's permit or license for the equipment being operated.
- Equipment and other lifting devices designed and used for lifting will have the load rating and date of next inspection marked on them. The load rating will not be exceeded and the equipment will not be used without a current inspection date.
- Leather or leather-palmed gloves will be worn when handling wooden boxes, munitions, or UXO/MEC.
- Lifting and carrying require care. Improper methods cause unnecessary strains. Observe the following preliminaries before attempting to lift or carry:
  - When lifting, keep your arms and back as straight as possible, bend your knees and lift with your leg muscles.
  - Be sure you have good footing and hold, and lift with a smooth, even motion.
- The demolition range will be provided with two forms of communication, capable of contacting appropriate personnel or agencies (i.e., medical response, Quick Response Force (QRF).
- Motor vehicles and material handling equipment (MHE) used for transporting MEC or demolition materials must meet the following requirements:
  - Exhaust systems will be kept in good mechanical repair at all times.
  - Lighting systems will be an integral part of the vehicle.
  - One Class 10B:C rated, portable fire extinguisher will, if possible, be mounted on the vehicle outside of the cab on the driver's side, and one Class 10B:C fire extinguisher will be mounted inside the cab.
  - Wheels of carriers must be chocked and brakes set during loading and unloading.
  - No demolition material or MEC will be loaded into or unloaded from motor vehicles while their motors are running.
- Motor vehicles and MHE used to transport demolition material and MEC will be inspected prior to use to determine that:
  - Fire extinguishers are filled and in good working order.
  - Electrical wiring is in good condition and properly attached.
  - Fuel tank and piping are secure and not leaking.
  - Brakes, steering, and safety equipment are in good condition.
  - The exhaust system is not exposed to accumulations of grease, oil, gasoline, or other fuels, and has ample clearance from fuel lines and other combustible materials.
- Employees are required to wear leather, or rubber, gloves when handling demolition materials. The type of glove worn is dependent on the type of demolition material.
- A red warning flag, such as an “Active Range Flag” or a wind sock, will be displayed at the entrance to the demolition range during demolition operations when required by local authority. If applicable, the entrance gate will be locked when demolition work is in process.

- Unless otherwise directed or authorized by the explosives siting plan, all demolition shots will be tamped with an appropriate amount of earth/dirt.
- An observer will be stationed at a location where there is a good view of the air and surface approaches to the demolition range, before material is detonated. It will be the responsibility of the observer to order the SUXOS to suspend firing if any aircraft, vehicles, or personnel are sighted approaching the general demolition area.
- Two-way radios will not be operated in close proximity of the demolition range while the pit is primed or during the priming process. Radio transmissions and explosives will be separated by a minimum of 50 ft.
- No demolition operation will be left unattended during the active portion of the operation (i.e., during the burn or once any explosives or UXO/MEC are brought to the range).
- A minimum radius (approximately 50 feet) around the demolition pit will be cleared of dry grass, leaves, and other extraneous combustible materials around the demolition pit area.
- No demolition activities will be conducted if there is less than a 2,000-ft ceiling or if wind velocity is in excess of 20 mph.
- Demolition shots must be fired during daylight hours (minimum time for sunrise and sunset is determined by the firing procedure used (i.e., electric, non-electric, shock tube 30/60/60).
- Notification of the local authorities will be made in accordance with the site requirements.
- No more than two persons will ride in a truck transporting demolition material or MEC, and no person will be allowed to ride in the trailer/bed.
- Vehicles will not be refueled when carrying demolition material or MEC, and must be 100 ft from magazines or trailers containing such items before refueling.
- All explosive vehicles will be cleaned of visible explosive and other contamination, before releasing the vehicles for other tasks.
- Prior to conducting any other task, personnel will wash their faces and hands after handling demolition material or MEC.
- Demolition pits will be spaced a safe distance apart, with no more than 10 pits prepared for a series of shots at any one time.

5.0 SPECIAL REQUIREMENTS FOR DEMOLITION ACTIVITIES

The following safety and operational requirements will be met during demolition range operations. Any deviations from this procedure will be allowed only after receipt of written approval from the PM and the client. Failure to adhere to the requirements and procedures listed in the paragraphs below could result in serious injury or death; therefore, complete compliance with these requirements and procedures will be strictly enforced.

5.1 GENERAL REQUIREMENTS

The general demolition requirements listed below will be followed at all times:

- The CEHNC "Procedures for Demolition of Multiple Rounds (Consolidated Shots) on Munitions and Explosives of Concern (MEC) Sites," will be followed when destroying multiple munitions by detonation on site. This document will be present on site during site operations.
- White Phosphorus and propellant will be disposed of only in an approved manner and following the guidance for maximum temperature exposure (90 degrees Fahrenheit).
- .

- Prevailing weather condition information can be obtained from the local weather service, or other acceptable source and the data logged in the Demolition Shot Log before each shot or round of shots.
- All shots will be dual primed.
- Upon completion of the project, all disturbed demolition areas will be thoroughly inspected for UXO/MEC. Depending upon contract requirements, the site may have to be backfilled and leveled. If necessary, this will be coordinated with the contractor representative.
- Prior to and after each shot, the USA Demolition Shot Record is to be filled out by the SUXOS with all applicable information. This record will be kept with the Ordnance Accountability Log and reflect each shot.

5.2 ELECTRIC DETONATOR USE

The following requirements are necessary when using electric detonators and blasting circuits:

- Electric detonators and electric blasting circuits may be energized to dangerous levels from outside sources such as static electricity, induced electric currents, and radio communication equipment. Safety precautions will be taken to reduce the possibility of a premature detonation of the electric detonator and explosive charges of which they form a part. Radios will not be operated while the pit is primed or during the priming process.
- The shunt will not be removed from the leg wires of the detonator until the continuity check of the detonator is to be performed.
- When uncoiling, or straightening, the detonator leg wires, keep the explosive end of the detonator pointing away from the body and away from other personnel. When straightening the leg wires, do not hold the detonator itself; rather, hold the detonator leg wires approximately 1 in. from the detonator body. Straighten the leg wires by hand; do not throw or wave the wires through the air to loosen them.
- Prior to use, the detonators will be tested for continuity. To conduct the test, place the detonators in a pre-bored hole in the ground or place them under a sand bag, and walk facing away from the detonators and stretch the wires to their full length, being sure to not pull the detonators from the hole or sand bag. With the leg wires stretched to their fullest length, test the continuity of the detonators one at a time by un-shunting the leg wires and attaching them to the galvanometer and checking for continuity. After the test, re-shunt the wires by twisting the two ends together. Repeat this process for each detonator until all detonators have been tested. This process will be accomplished at least 50 ft from and downwind of any MEC or demolition materials and out of the demolition range personnel and vehicle traffic flow pattern. In addition, all personnel on the demolition range will be alerted prior to the test being conducted.

  NOTE: When testing the detonator, prior to connecting the detonator to the firing circuit, the leg wires of the detonator must be shunted by twisting the bare ends of the wires together immediately after testing. The wires will remain short circuited until time to connect them to the firing line or Remote Firing Device (RFD) Receiver.

- At the power source end of the blasting circuit, the ends of the wires will be shorted or twisted together (shunted) at all times, except when actually testing the circuit or firing the charge. The connection between the detonator and the circuit firing wires must not be made, unless the power ends of the firing wires are shorted and grounded or the firing panel is off and locked.
- The firing line will be checked using pre-arranged hand signals or through the use of two-way radios, if the demolition pit is not visible from the firing point. If radios are used, communication will be accomplished a minimum of 50 ft from the demolition pit and detonators. The firing line will be checked for electrical continuity in both the open and closed positions, and will be closed/shunted after the check is completed.

- UXO/MEC to be detonated will be placed in the demolition pit and the demolition material placed/attached in such a manner as to ensure the total detonation of the UXO/MEC. Once the UXO/MEC and demolition material are in place and the shot has been tamped, the detonators will be connected to the det cord. Prior to handling any detonators that are connected to the firing line or RDF, personnel will ensure that they are grounded. The detonators will then be carried to the demolition pit with the end of the detonators pointed away from the individual. The detonators are then connected to the detonation cord, Non-El, etc., ensuring that the detonator is not covered with tamping material to allow for ease of recovery/investigation in the event of a misfire.
- Prior to making connections to the blasting machine or RFD Transmitter, the entire firing circuit will be tested for electrical continuity and ohms resistance, or transmitting power (as applicable), to ensure the blasting machine or RFD Transmitter (distance) has the capacity to initiate the shot.
- The individual assigned to make the connections at the blasting machine or panel will not complete the circuit at the blasting machine or panel, and will not give the signal for detonation, until satisfied that all personnel in the vicinity have been evacuated to a safe distance. When in use, the blasting machine, or its actuating device, will be in the blaster's possession at all times. When using the panel, the switch must be locked in the open position until ready to fire, and the single key must be in the blaster's possession.
- Prior to initiating a demolition shot(s), a warning will be given; the type and duration of such warning will be determined by the prevailing conditions at the demolition range. At a minimum, this should be an audible signal using a siren, air horn, or megaphone, which is sounded for a duration of one minute, five minutes prior to the shot and again one minute prior to the shot.

5.3 NON-EL USE (SHOCK TUBE)

The following requirements are necessary when using NON-EL (Shock Tube) systems:

- After cutting a piece of shock tube, either immediately tie a tight overhand knot in one or both cut ends or splice one exposed end and tie of the other.
- Always use a sharp knife or razor blade to cut shock tube so as to prevent the tube from being pinched or otherwise obstructed.
- Always cut shock tube squarely across and make sure the cut is clean.
- Use only the splicing tubes provided by the manufacturer to make splices.
- Every splice in the shock tube reduces the reliability of the priming system; therefore keep the number of splices to a minimum.
- Always dispose of all short, cut-off pieces in accordance with local laws as they relate to flammable material.

The shock tube system is a thin plastic tube of extruded polymer with a layer of Pentaerythritol Tetranitrate (PETN) coated on its interior surface. The PETN propagates a shock wave, which is normally contained within the plastic tubing. The shock tube offers the controlled instantaneous action of electric initiation without the risk of premature initiation of the detonator by radio transmissions, high-tension power lines, or static electricity discharge. The NON-EL system uses detonators in the bunch blocks and in the detonator assembly, which are to be handled in accordance with approved procedures.

The high reliability of the shock tube initiating system is due to the fact that all of the components are sealed and, unlike standard non-electric priming components, cannot be easily degraded by moisture. Cutting the shock tube makes the open end vulnerable to moisture and foreign contamination; therefore, care must be taken to prevent moisture and foreign matter from getting in the exposed ends of the shock tubes.

5.3.1 Shock Tube Demolition Procedures

WARNING

Although the detonation along the shock tube is normally contained within the plastic tubing, burns may occur if the shock tube is held.

5.3.2 Shock Tube Assembly

- Spool out the desired length of shock tube from firing point to demolition site and cut it off with a sharp knife or razor blade. Weight down the loose end of trunk line.
- Immediately seal off the shock tube remaining on the spool by tying a tight overhand knot in the cut-off end or use a push-over sealer.
- Using a sharp knife or razor, cut the sealed end off the detonator assembly.
- Push one of the shock tube ends to be spliced firmly into one of the pre-cut splicing tubes provided by the manufacturer at least ¼ inch. Push the other shock tube end firmly into the other end of the splicing tube at least ¼ inch. Secure splice with tape if needed.

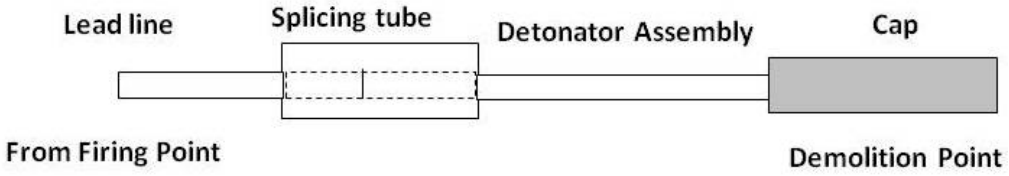

Figure 1

5.3.3 Firing Assembly Setup

1) If there are multiple items to be destroyed using bunch block(s) supplied by the manufacturer, lay out lead lines at demo site to the shot(s) and secure the bunch block with a sandbag, or some other item which will keep it from moving.

NOTE: No more than six leads may be used from any one bunch block.

2) If the detonator assembly has not been attached yet, then, using the splicing tube, splice the detonator assembly to the shock tube branch line as explained in the splicing instructions above.
3) If this is a non-tamped shot, place the detonator assembly into the demolition material. If the shot is to be tamped, then prepare the demolition material with a detonating cord lead long enough to stick out of the tamping at least 1 ft.
4) Tape the detonator assembly with cap to the detonating cord lead as shown in Figure 2.

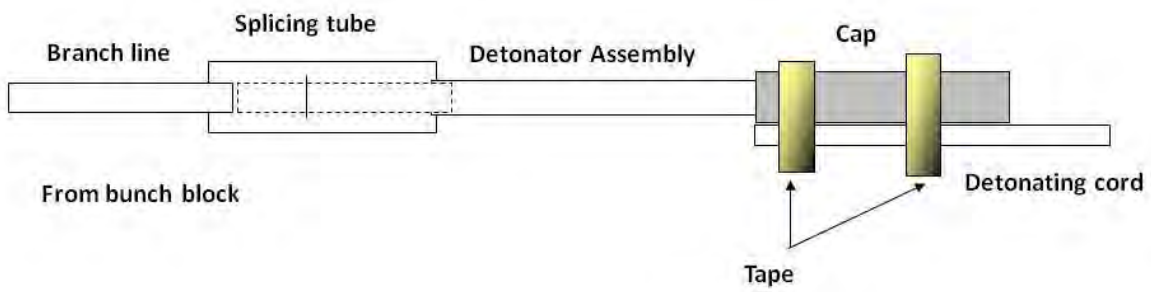

Figure 2

5) Return to the firing position.
6) Cut off the sealed end of shock tube, proceed to the directions listed in Step 7. If you are using a previously cut piece of shock tube, using a sharp knife or razor blade cut approximately 18 inches from the previously cut end, whether or not it was knotted in accordance with the above guidance.
7) Insert a primer into the firing device and connect the shock tube lead line to the firing device ensuring that the shock tube is properly seated in the firing device.
8) Take cover.
9) Signal **"Fire in the hole"** three times and initiate charge.
10) Observe a 5-minute wait time after the detonation.
11) Remain in designated safe area until Demolition Supervisor announces **"All Clear."**

5.4 DETONATING CORD USE

The following procedures are required when using detonating cord (det cord):

- Det cord should be cut using approved crimpers, and only the amount required should be removed from inventory.
- When cutting det cord, the task should be performed outside the magazine.
- For ease of inventory control, remove det cord only in 1-ft increments.
- Det cord should not be placed in clothing pockets or around the neck, arm, or waist, and should be transported to the demolition location in either an approved “day box”, original container, or a cloth satchel, depending upon the magazine location and proximity to the demolition area.
- Det cord should be placed at least 50 ft away from detonators and demolition materials until ready for use. To ensure consistent safe handling, each classification of demolition material will be separated by at least 25 ft until ready for use.
- When ready to “tie in” either the det cord to demolition materials, or det cord to detonator, the det cord will be connected to the demolition material and secured to the UXO/MEC. The cord is then strung out of the hole and secured in place with soil, or filled sandbags, being sure to leave a minimum of 6 ft of det cord exposed outside the hole.
- Once the hole is filled, make a loop in the det cord large enough to accommodate the detonator, place the detonator in the loop, and secure it with tape. The detonator’s explosive end will face down the det cord toward the demolition material or parallel to the main line.
- In all cases, ensure that there is a minimum of 6 ft of det cord extending out of the hole to allow for ease of detonator attachment and detonator inspection/replacement should a misfire occur.

- If the det cord detonators are electric, they will be checked, tied in to the firing line, and shunted prior to being taped to the loop. If the det cord detonators are non-electric, the time/safety fuse will be prepared with the igniter in place prior to taping the detonators to the det cord loop. If the det cord detonators are Non-EI, simply tape the detonators into the loop as described above.
- In the event that a time/safety fuse is used, an igniter is not available, and a field expedient initiation system is used (i.e., matches), do not split the safety fuse until the detonator is taped into the det cord loop.

5.5 TIME/SAFETY FUSE USE

The following procedures are required when using a time/safety fuse:

- Prior to each daily use, the burn rate for the time/safety fuse must be tested to ensure the accurate determination of the length of time/safety fuse needed to achieve the minimum burn time of five minutes needed to conduct demolition operations.
- To ensure both ends of the time/safety fuse are moisture free, use approved crimpers to cut 6 inches off the end of the time/safety fuse roll, and place the 6 inch piece in the time/safety fuse container.
- If quantity allows, accurately measure and cut off a 6-ft-long piece of the time/safety fuse from the roll.
- Take the 6 ft section out of the magazine, and attach a fuse igniter.
- In a safe location, removed from demolition materials and UXO/MEC, ignite the time/safety fuse, measure the burn time from the point of initiation to the "spit" at the end, and record the burn time in the SUXOS's Log.
- To measure the burn time, use a watch with a second hand or chronograph.
- To calculate the burn rate in seconds per foot, divide the total burn time (in seconds) by the length (in feet) of the test fuse.
- When using time/safety fuse for demolition operations, the minimum amount of fuse to be used for each shot will be the amount needed to permit a minimum burn time of five minutes.

5.6 DEMOLITION RANGE INSPECTION SCHEDULE

The schedule for the demolition range inspection will be followed when demolition operations are being conducted. This inspection will be conducted by the UXOSO or UXOQCS and will be documented in the Site Safety or QC Log. If any deficiencies are noted, demolition operations will be suspended and the deficiency reported to the SUXOS. Once the deficiencies are corrected, demolition operations may be resumed.

6.0 METEOROLOGICAL CONDITIONS

In order to control the effects of demolition operations and to ensure the safety of site personnel, the following meteorological limitations and requirements will apply to demolition operations:

- Demolition operations will not be conducted during electrical storms or thunderstorms.
- No demolition operations will be conducted if the surface wind speed is greater than 20 miles per hour.
- Demolition operations will not be conducted during periods of visibility of less than one mile caused by, but not limited to, dense fog, blowing snow, rain, sand storms, or dust storms.
- Demolition will not be carried out on extremely cloudy days, defined as overcast (more than 80% cloud cover) with a ceiling of less than 2,000 ft.

- Demolition operations will not be initiated until an appropriate time after sunrise, and will be secured at an appropriate time prior to sunset (see Section 4.0).

7.0 PRE-DEMOLITION/DISPOSAL PROCEDURES

7.1 PRE-DEMO/DISPOSAL OPERATIONAL BRIEFING

It is the belief of USA that the success of any operation is dependent upon a thorough brief, covering all phases of the task, which is presented to all affected personnel. The SUXOS will brief all personnel involved in range operations in the following areas:

- Type of UXO/MEC being destroyed
- Type, placement, and quantity of demolition material being used
- Method of initiation (electric, non-electric, or NON-EL)
- Means of transporting and packaging MEC
- Route to the disposal site
- Equipment being used (i.e., galvanometer, blasting machine, firing wire, etc.)
- Misfire procedures
- Post-shot clean-up of range.

7.2 PRE-DEMO/DISPOSAL SAFETY BRIEFING

The USA SUXOS, Team Leader, or UXOSO will conduct a safety brief for all personnel involved in range operations in the following areas:

- Care and handling of explosive materials
- Personal hygiene
- Two man rule, and approved exceptions
- Personnel roles and responsibilities
- Potential trip/fall hazards
- Horseplay on the range
- Stay alert for any explosive hazards on the range
- Calling a safety stop for hazardous conditions
- Location of emergency shelter (if available)
- Parking area for vehicles (vehicles must be positioned for immediate departure, with the keys in the ignition
- Location of range emergency vehicle
- Location of the assigned paramedic
- Wind direction (to assess potential toxic fumes)
- Locations of first aid kit and fire extinguisher
- Route to nearest hospital or emergency aid station
- Type of communications in event of an emergency
- Storage location of demolition materials and MEC awaiting disposal

- Demolition schedule.

7.3 TASK ASSIGNMENTS

Individuals with assigned tasks will report the completion of the task to the SUXOS. The types of tasks that may be required are:

- Contact local military authorities and fire response personnel, and get air clearance, as required.
- Contact hospital/emergency response/medevac personnel, if applicable.
- Secure all access roads to the range area.
- Visually check range for any unauthorized personnel.
- Check firing wire for continuity and shunt.
- Prepare designated pits as required.
- Check continuity of detonators.
- Check time/safety fuse and its burn rate.
- Designate a custodian of the blasting machine, fuse igniters, or Non-EI initiator.
- Secure detonators in a safe location.
- Place UXO/MEC in pit, and place charge in desired location.

7.4 PREPARING EXPLOSIVE CHARGE FOR INITIATION

To prepare the explosive charge for initiation, the procedures listed below will be followed:

- Ensure firing wire is shunted.
- Connect detonator to the firing wire.
- Isolate or insulate all connections.
- Prime the demolition charge.
- Place demolition charge on UXO/MEC.
- Depart to firing point (if using non-electric firing system, obtain head count, pull igniters, and depart to designated safe area).
- Obtain a head count.
- Give one minute warning signal, using a bullhorn or siren, five minutes prior to detonation, and again at one minute prior to detonation.
- Check the firing circuit.
- Signal **"fire in the hole"** three times (or an equivalent warning), and take cover.
- If using electric firing system, connect firing wires to blasting machine, and initiate charge.
- Remove firing wires from blasting machine and shunt or turn off RFD Transmitter.
- Remain in designated safe area until SUXOS announces **"All Clear."** This will occur after a post-shot waiting period of 5 minutes and the SUXOS has inspected the pit(s).

8.0 POST DEMOLITION/DISPOSAL PROCEDURES

Do not approach a smoking hole or allow personnel out of the designated safe area until cleared to do so, and follow the procedures listed below:

- After the **"All Clear"** signal, check pit for low orders or kick outs.
- Examine pit, and remove any large fragmentation, as needed.
- Back fill hole, as necessary.
- Police all equipment.
- Notify military authorities, fire department, etc., that the operation is complete.

9.0 MISFIRE PROCEDURES

A thorough check of all equipment, firing wire, and detonators will prevent most misfires. However, if a misfire does occur, the procedures outlined below will be followed.

9.1 ELECTRIC MISFIRES

To prevent electric misfires, one technician will be responsible for all electrical wiring in the circuit. If a misfire does occur, it must be cleared with extreme caution, and the responsible technician will investigate and correct the situation, using the steps outlined below:

- Check firing line and blasting machine connections, and make a second initiation attempt.
- If unsuccessful, disconnect and connect to another blasting machine (if available), and attempt to initiate a charge.
- If unsuccessful, commence a 30-minute wait period.
- After the maximum delay predicted for any part of the shot has passed, the designated technician will proceed down range to inspect the firing system, and a safety observer must watch from a protected area.
- Disconnect and shunt the detonator wires, connect a new detonator to the firing circuit, check the replacement detonator for continuity, and prime the charge without disturbing the original detonator.
- Follow normal procedures for effecting initiation of the charge.

9.2 NON-ELECTRIC MISFIRES

Working on a non-electric misfire is the most hazardous of all operations. Occasionally, despite all painstaking efforts, a misfire will occur. Investigation and corrective action should be undertaken only by the technician who placed the charge, using the following procedure:

- If charge fails to detonate at the determined time, initiate a 60-minute wait period plus the time of the safety fuse, i.e., 5-minute safety fuse plus 60 minutes for a total of 65 minutes.
- After the wait period has expired, a designated technician will proceed down range to inspect the firing system. A safety observer must watch from a protected area.
- Prime the shot with a new non-electric firing system, and install a new fuse igniter.
- Follow normal procedures for initiation of the charge.

9.3 NON-EL MISFIRE

The use of a shock tube for blast initiation can present misfires, which require the following actions:

- If charge fails to detonate, it could be the result of the shock tube not firing. Visually inspect the shock tube; if it is not discolored (i.e., slightly black residue), it has not fired.
- If it has not fired, cut a 1 ft piece off the end of the tube, re-insert the tube into the firing device, and attempt to fire again.
- If the device still does not fire, wait 60 minutes and proceed down range to replace the shock tube per the instructions outlined below.
- If the shock tube has been fired and the detonator did not function, a misfire has occurred and the shock tube will have to be replaced after observing a 60-minute wait time. When replacing the shock tube, be sure to remove the tube with the detonator in place. Without removing the detonator from the end of the tube, dispose of by demolition.

9.4 DETONATING CORD MISFIRE

USA uses det cord to tie in multiple demolition shots, and to ensure that electric detonators are not buried. Since det cord initiation will be either electrical or non-electrical, the procedures presented in Paragraphs9.1, 9.2, or 9.3, as appropriate to the type of detonator used, will be used to clear a det cord misfire. In addition, the following will be conducted:

- If there is no problem with the initiating system, wait the prescribed amount of time, and inspect the initiator to the cord connection to ensure it is properly connected. If it was a bad connection, simply attach a new initiator, and follow the appropriate procedures in Paragraph 9.0.
- If the initiator detonated and the cord did not, inspect the cord to ensure that it is det cord and not time fuze. Also, check to ensure that there is PETN in the cord at the connection to the initiator.
- It may be necessary to uncover the det cord and replace it. This must be accomplished carefully, to ensure that the demolition charge and the MEC item are not disturbed.

10.0 RECORD KEEPING REQUIREMENT

To document the demolition operations procedures and the completeness of the demolition of MEC, the following record keeping requirements will be met:

- USA (as directed) will obtain and maintain all required permits.
- The SUXOS will ensure the accurate completion of the logs, and the SUXOS and UXOQCS will monitor the entries in the log for completeness, accuracy, and compliance with meteorological conditions.
- The SUXOS will enter the appropriate data on the Ordnance Accountability Log and the Demolition Shot Record, to reflect the MEC destroyed, and will complete the appropriate information on the Explosives Accountability Log (a.k.a. the Magazine Data Card) which indicates the demolition materials used to destroy the MEC.
- The quantities of MEC recovered must also be the quantities of MEC destroyed or disposed.
- USA will retain a permanent file of all demolition records, including permits; magazine data cards; training and inspection records; waste manifests, if applicable; and operating logs.
- Copies of ATF License and any required permits must be on hand.

11.0 SAFETY AND PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS

The following safety measures and personal protective equipment (PPE) will be used in preventing or reducing exposure to the hazards associated with UXO/MEC demolition/disposal operations. These requirements will be implemented unless superseded by site-specific requirements stated in the SSHP.

- Hard hats are required only when working around heavy equipment or when an overhead or head impact hazard exists.
- Steel toe/shank boots are not required during surface/subsurface location of anomalies, unless a serious toe hazard exists, whereupon a fiber safety toe will be used.
- Safety glasses will be required whenever an eye hazard exists, for example, when working around flying dirt/debris, using hand tools, etc. Safety glasses will provide protection from impact hazards and, if necessary, ultraviolet radiation (i.e., sunlight).
- Positive means will be required to secure the PPE and prevent it from falling and causing an accidental detonation.

12.0 REGULATORY REFERENCES

Applicable sections and paragraphs in the documents listed below will be used as references for the conduct of UXO demolition/disposal operations:

- USA Corporate Safety and Health Program
- OSHA General Industry Standards, 29 CFR 1910
- OSHA Construction Standards, 29 CFR 1926
- DDESB TP-16, Methodology for Calculation of Fragmentation Characteristics
- DoD 4160.21-M, Defense Reutilization and Marketing Manual
- DoD 6055.9-STD, DoD Ammunition and Explosives Safety Standards
- AR 385-64, U.S. Army Explosives Safety Program
- AR 385-10, Army Safety Program
- DA PAM 385-64, U.S. Army Explosives Safety Program
- TM 9-1300-200, Ammunition General
- TM 9-1300-214, Military Explosives
- Applicable TM 60 Series Publications
- AR 190-11, Physical Security of Arms, Ammunition, and Explosives
- ATF 5400.7, Alcohol, Tobacco, and Firearms Explosives Laws and Regulations
- DOT, 49 CFR, Parts 100 to 199, Transportation (applicable sections)
- EPA, 40 CFR Parts 260 to 299, Protection of Environment (applicable sections).
- AR 385-40 w/ USACE Supplement 1, Accident Reporting & Records
- Basic Safety Concepts and Considerations for Ordnance and Explosives Operations, EP 385-1-95a
- USACE EM 385-1-1, Safety and Health Requirements Manual
- TM 60 Series Publication, 60A-1-1-31

STANDARD OPERATING PROCEDURE -OPS-04
DGM ANOMALY INVESTIGATIONS

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide USA Environmental, Inc. (USAE) employees and subcontractors with the minimum procedures and safety and health requirements applicable to the conduct of digital geophysical mapping (DGM) anomaly investigation operations on sites contaminated with unexploded ordnance (UXO) or munitions and explosives of concern (MEC).

2.0 SCOPE

This SOP applies to all USAE site personnel, including contractor and subcontractor personnel, involved in the conduct of DGM operations on a UXO/MEC contaminated site. The following USAE policies and procedures are not all inclusive nor are they applicable in all situations. This SOP is not a stand-alone document and is to be used together with Work Plans, other USAE SOPs, the USAE Site Safety and Health Plan (SSHP), applicable Federal, State, and local regulations, and contract restrictions and guidance. Consult the documents listed in Section 5.0 of this SOP for additional compliance issues.

3.0 INTRUSIVE INVESTIGATION OPERATIONS

All intrusive operations at MEC sites will be under the supervision of UXO qualified personnel. Non-UXO qualified personnel will not be allowed in the exclusion zone (EZ) during intrusive operations. The EZ will encompass an area large enough to protect personnel from fragmentation by an unplanned detonation. In addition, if non-UXO qualified personnel or personnel not deemed as essential personnel or are not approved as an authorized visitor enters the EZ, all work will stop while they are within the EZ. Authorized visitors must be approved in writing by the USACE. During operations, USAE personnel will strictly adhere to the SSHP and the following general safety practices:

- Operations will be conducted during daylight hours only.
- Access to operating areas will be limited to only those personnel necessary to accomplish the specific operation.
- UXO will only be handled by qualified UXO Technicians.
- During UXO operations the minimum separation distance (MSD) between UXO and non-UXO operations is the munition with the greatest fragmentation distance (MGFD), as stated in the Work Plan.
- MEC Teams will adhere to the team separation distance as established in the WP.
- During demolition operations personnel remaining on site will be limited to those personnel needed to safely and efficiently prepare the item/s for destruction.
- All personnel will attend the daily safety briefing (tailgate safety briefing) prior to entering the operating area.
- Anyone can stop operations for an unsafe act or situation.
- Safety violations and/or unsafe acts will be immediately reported to the UXO Safety Officer (UXOSO).
- Failure to comply with safety rules/procedures may result in termination of employment.

DETECTION AND REMOVAL PROCEDURES

Grid Layout

A surveyor team will survey each of the clearance areas, accompanied by a UXO escort. Surveying activities will consist of locating clearance area boundaries, establishing permanent survey monuments, and establishing grids for geophysical investigation activities within the clearance areas.

Anomaly Reacquisition and Marking

The DGM personnel will reacquire all geophysical anomalies identified for excavation on the tracking sheets, loaded into the RTK DGPS survey controller, and linked for daily use. The team sets up the RTK DGPS base station and back checks it to the metrics identified in the QAPP worksheet #12. Once the back check is complete and passes the team stakes out each anomaly location. Using a polyvinylchloride (PVC) flag with the unique identifier number recorded in indelible ink, the actual field location of each reacquired anomaly shown on the tracking sheet will be flagged. Such reacquisition will be carried out concurrently with other site activities, taking into account proper explosive safety quantity distance (ESQD) requirements related to adjoining work and off-site personnel.

Intrusive Investigation of Anomalies

Intrusive Teams

Intrusive investigation teams usually consist of a Team Leader (UXO Technician III) and at least one UXO Technician II or I. During Intrusive operations UXO Technicians I will operate under the supervision of UXO Technicians II or III. Only qualified UXO technicians will perform UXO operations, which are defined as:

- MEC identification
- Access procedures such as excavation, either by hand or using heavy equipment
- Handling of MEC, explosives or explosive items
- Disposal, including movement, transportation, and final disposal of MEC

The UXO Team will be assigned a set of anomalies. Using the Dig Sheets provided, the dig team(s) will excavate each of the selected target anomalies. Site-specific conditions (e.g., a larger ordnance item found than was anticipated) may warrant modification of the EZ/MSD and removal procedures described herein. As necessary, any changes will be prepared and submitted separately for approval prior to initiation of further activities on site.

Manual Excavations

Excavations for individual anomalies will be conducted using Minelab ETRAC or other equivalent all-metals detector to assist the team in determining the location and orientation of the target item. The personnel excavating an anomaly shall initially remove no more than a 6-inch layer of soil at the location of the anomaly. A visual and electronic search of the excavation shall then be made. This process shall be repeated until the audible signal from the magnetometer indicates the object is close to the surface. Once this determination has been made, soil will be removed by hand until the source of the anomaly is located. Excavations on individual anomalies greater than 4 ft below the ground surface (bgs) will not be made without prior approval of the U.S. Army Corps of Engineers (USACE) OE Safety Specialist.

Disposal Pits

Excavations for disposal pits using MHE will be performed in a similar manner as specified in Section 3.1.3.2. However, because individual anomalies cannot be discerned within the disposal pits, material from the disposal pit will be excavated carefully in 2-foot lifts.

ANOMALY EXCAVATION REPORTING

The MEC Subcontractor will excavate and identify the sources of the reacquired anomalies in the field. Data to be recorded for each item discovered during anomaly excavation will include the following (as applicable):

- Type (e.g., MD, MPPEH, MEC, and UXO)
- Description (e.g., “20mm projectile, MK105 practice bomb, 40mm hand grenade” and “base, coupling, firing device”)
- Initial Condition (e.g., expended, inert, live, and to be determined [TBD])
- Approximate length
- Approximate width
- Depth
- Approximate weight
- Approximate inclination (per Figure 1-1)
- Approximate orientation (Azimuth per Figure 1-1)
- Approximate distance from flag
- Approximate orientation from flag
- Found in a pit?
- Piece of fragmentation?
  - Initial disposition (e.g., left in place or removed to scrap pile)
  - Requires demolition?

All data will be turned into the Site Geophysicist at the end of the day.

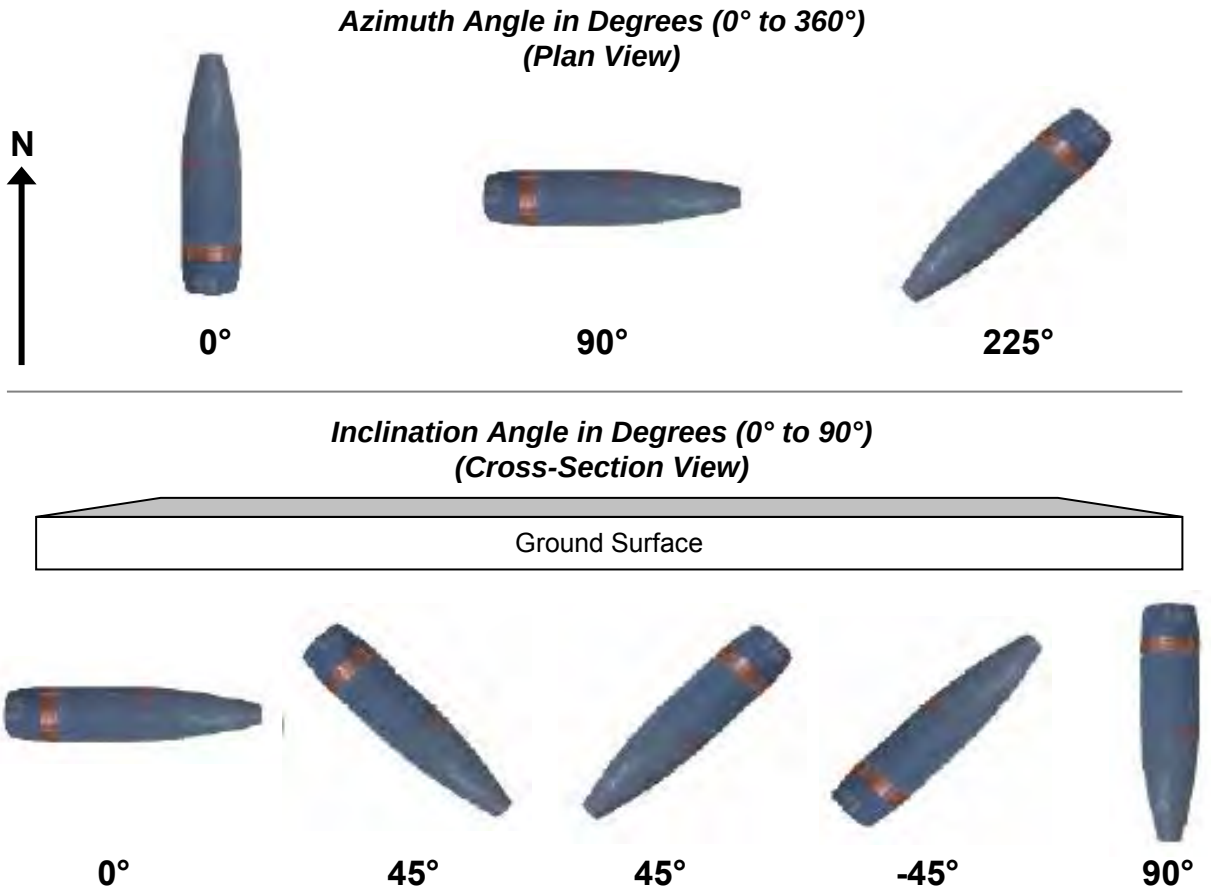

Figure 1-1: Azimuth and Inclination Examples

4.0 DISPOSAL OPERATIONS

Fuzed UXO/MEC items will be blown in place (BIP), and un-fuzed UXO/MEC items will be consolidated whenever possible in accordance with USACE Engineer Pamphlet (EP) 1110-1-17, *Establishing a Temporary Open Burn and Open Detonation Site for Conventional Ordnance and Explosives Projects*, dated 16 July 1999, Appendix D. In no case shall the SUXOS authorize or undertake destruction of UXO/MEC when there is sufficient reason to believe that the disposal action will result in personnel casualties or property damage. The USACE OE Safety Specialist will be consulted for guidance in the event that there is sufficient reason to believe that the disposal action will result in personnel casualties or property damage.

5.0 REFERENCES

- USACE Safety Considerations for UXO/MEC
- USAE Corporate Safety and Health Program (CSHP)
- OSHA, 29 CFR 1910, Occupational Safety and Health Standards
- OSHA, 29 CFR 1926, Construction Standards
- Applicable sections of EPA, 40 CFR Parts 260 to 299, Protection of Environment

- Applicable sections of DOT, 49 CFR Parts 100 to 199, Transportation
- USACE EM 385-1-1, Safety and Health Requirements Manual
- USACE ER 385-1-92, Safety and Occupational Health Document Requirements for Hazardous Waste Remedial Actions
- DOD 4145.26-M, Contractors' Safety Manual for Ammunition and Explosives
- DOD 6055.9-STD, DOD Ammunition and Explosives Safety Standards
- DOD 4160.21-M, Defense Reutilization and Marketing Manual
- DA PAM 385-64, Ammunition and Explosives Safety Standards
- AR 385-64, Ammunition and Explosives Safety Standards
- AR 200-1, Environmental Protection and Enhancement
- AR 385-10, The Army Safety Program
- AR 385-16, System Safety Engineering and Management
- AR 385-40 w/USACE supplement, Accident Reporting and Records
- TM 9-1300-200, Ammunition General
- TM 9-1300-214, Military Explosives
- TM 60 Series Publications

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STANDARD OPERATING PROCEDURE – OPS-05A
DIGITAL GEOPHYSICAL MAPPING

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to provide procedures and technical guidance on performing geophysical surveys to detect the presence of Munitions and Explosives of Concern (MEC). This SOP outlines personnel qualifications and responsibilities, training requirements, preparatory activities, essential equipment set-up and use, data acquisition procedures, and general quality control (QC) procedures to be performed by field personnel and verification points for use by the UXO Quality Control Specialist (UXOQCS). The geophysical instrumentation will be used in conjunction with positioning equipment that will include a Trimble RTK DGPS for DGM during the field activity. In addition, this SOP ensures that data will be acquired and processed in a consistent manner during this investigation.

2.0 SCOPE

This SOP outlines the procedures used for the collection of geophysical and associated position data. USA will use the Geonics EM61-MK2 or EM61-MK2A, a high-resolution time domain electromagnetic induction sensor capable of detecting both ferrous and non-ferrous metallic objects in conjunction with the Trimble RTK DGPS positioning system to detect subsurface metallic objects related to MEC.

To ensure that the instrumentation can attain an acceptable measure of performance, a Geophysical System Verification (GSV) Instrument Verification Strip (IVS) will be installed and the results evaluated prior to the start of Digital Geophysical Mapping (DGM) field activities. The primary objectives of the IVS are to validate the use of the EM61-MK2 or EM61-MK2A time-domain electromagnetic (TDEM) sensor and positioning system and to determine the detection performance criteria for the purpose of assessing the adequacy of the planned sampling method.

3.0 PROCEDURES

- The following set of procedures is subdivided into procedures for the RTK DGPS base station and procedures followed for conducting DGM.

3.1.1 Personnel Qualifications and Responsibilities

The contractor Site Geophysicist is responsible for the overall coordination of data acquisition, data analysis, technical content, and technical review of data on site. The Site Geophysicist reports to the Project Geophysicist and Project Manager (PM). The Project Geophysicist and Site Geophysicist will be assisted by Geographic Information Systems (GIS) Manager and other assigned personnel as needed. The geophysical survey team consists of the Site Geophysicist, an Instrument Operator (Field Engineer or UXO Technician I II or III), and a UXO escort (UXO Technician II or III).

The Site Geophysicist will oversee all equipment setup and daily QC tests (e.g., static test, spike test, cable shake, IVS, etc.) and will participate in data acquisition activities as needed. The UXO escort will perform UXO avoidance for the entire geophysical survey team as well as assist in daily geophysical data collection.

3.1.2 Training Requirements

All personnel assigned to the geophysical survey team require an initial certification. Each team member must demonstrate the ability to perform their assigned task associated with the geophysical investigation with the equipment at the IVS.

This equipment includes:

- Trimble RTK DGPS systems
- EM61-MK2 OR EM61-MK2A deployed in wheel or stretcher mode (including Data Logger)

During field activities, if any fundamental electronic geophysical equipment requires repair or replacement (excluding cables and the Data Logger), the equipment must be re-certified at the IVS prior to field use. Any newly assigned personnel must complete certification at the IVS.

Prior to the initiation of geophysical survey data collection, all geophysical survey team personnel will receive training on survey methodology, data requirements, and field note protocol. The training will include an overall discussion of the survey approach and how the data collection and field documentation tasks integrate into the overall program. Training will also include review of the internal QC procedures listed in this SOP. The Site Geophysicist will be responsible for this training and any follow-up training deemed necessary.

3.2 PREPARATORY ACTIVITIES

3.2.1 Production Area Layout and Methods

Prior to collecting DGM data, an instrument-assisted detection and removal of excess metal from the surface prior to the DGM survey will be conducted by the UXOTII. Because there is a potential that ordnance could have been disposed of in these areas, the UXOTII also identifies any suspect ordnance item, flags it, records the location, and directs the DGM survey team to avoid the location.

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3.3 DGPS AND GEOPHYSICAL DATA COLLECTION

The following set of procedures is subdivided into procedures for the DGPS and procedures followed for geophysical surveys. In addition, Attachment 1 provides step-by-step instructions for equipment operation.

3.3.1 RTK DGPS Procedures

USA's field team or designee will establish two survey control points for this site. All survey control points will be documented and reported in the project report.

1. Beginning of day:

   Every survey day the RTK DGPS will be set up and checked at a control point to verify location accuracy. This reoccupation test should confirm the measured location is within measurement performance criteria specified in the QAPP Worksheet #12 from its known location. If deviations are greater than the project specified requirement, the GPS planning software results will be re-examined using a current satellite ephemeris file and a project-specific coordinate. The DGPS set up is checked and the check is repeated.

2. End of day:

   Deactivate DGPS and pack all equipment. Return to storage location. Recharge batteries.

3.3.2 Geophysical Data Collection

1. Mount the RTK DGPS rover antenna on the EM61-MK2 or EM61-MK2A using the antenna mount. The antenna should be mounted and centered directly above the particular geophysical sensor for optimum positioning and position recorded. Skip this step if using line/station/fiducials.

2. Turn on the EM61-MK2 or EM61-MK2A and positioning units, if used. Perform morning daily QC tests (see Attachment 1).
3. Proceed with the geophysical survey. Daily survey procedures include:
    - Sensor warm up for at least 5 minutes.
    - Sensor nulling and positioning input check (operator at typical handle distance from coil).
    - Input and record file name for survey.
    - Acquire survey data along longest area survey line.
    - Monitor sensor, battery, and positioning input periodically.
    - Continue until transect or grid is completely covered, battery needs replacing (e.g. sensor battery reaches <12.0 volts or data logger battery reaches last segment or GPS power light flashes), or a break is required.
    - Download morning survey data with daily instrument checks and lunch break.
    - Change and charge batteries, as required.
    - Acquire afternoon instrument checks and afternoon survey data.
    - Download afternoon survey data with instrument checks.
    - Secure the EM61-MK2 or EM61-MK2A and positioning equipment.
    - Charge all batteries overnight.
    - Photocopy the day's field logbook pages and transfer to the Site Geophysicist.
    - Submit the data files to the Site Geophysicist.
    - The completed survey areas are recorded in the tracking log and/or reported to the Site Geophysicist.
    - The logbook pages are accessible for verification by the UXOQCS who may inspect them daily.
    - Plan next day's activities.
4. One member of the team will be responsible for maintaining the logbook. Record the following information in the logbook:
    - Survey area ID
    - Time survey started and initial battery voltages
    - Time survey completed and final battery voltages
    - Names of team members
    - Weather conditions
    - Serial numbers of positioning equipment, if applicable, and geophysical instrumentation
    - File names for the digitally recorded data. Each page of the logbook will be dated, sequentially numbered, and identified by the logbook number; all entries will be signed. The assigned DGM team member will provide photocopies of the logbook pages to the Site Geophysicist at the end of each.

3.3.3 Data Acquisition

For 100% site coverage, USA surveys 100% of accessible terrain to completely cover the area within the site boundary. Surveys typically begin along the site's longest boundary to minimize turnaround time. Areas of the site that remain inaccessible to the DGM team [e.g., obstacles,] will be documented in the positioned sensor data maps and may be used for subsequent characterization following traditional analog and dig techniques. Daily survey procedures are described in Attachment 1.

3.4 INACCESSIBLE AREA DOCUMENTATION

Deviations from any geophysical survey grid or transect spacing and orientation will be determined and documented in the field logbook. DGPS coordinates will be obtained at the beginning and the end of the

deviation. The Site Geophysicist/and or UXO escort will be responsible for determining whether an area is considered inaccessible due to site conditions. The Site Geophysicist will designate one member of the team to document deviations from planned surveys due to terrain, slope, or other conditions that make the area impassable by foot. The following steps are recommended to perform transect deviation documentation:

- The Site Geophysicist will designate one member of the team to perform documentation activities. The team member will be responsible for completion of the transect deviation logbook entries and photo documentation.
- Deviations will be tied to planned transect designations. If deviation is necessary, the waypoints included in the total extent of the deviation will be noted and provided in specific map coordinates.
- Logbook deviation documentation will include:
  1. Date
  2. Time
  3. Transect or grid point number
  4. Slope measurements (if necessary)
  5. Photo number
  6. Photo description including orientation
  7. Feature type and description
  8. Reason for deviation
- A photographic record of the deviation will be generated by the documentation team member. A digital camera will be used to record a minimum of one photo of each deviation area. The photographs will be downloaded by the Site Geophysicist at the end of each day.
- The area of deviation will also be noted on the Survey Area Report form (see Attachment 2).

All documentation will be archived in the same manner as other survey documentation.

3.5 FIELD DATA COLLECTION

Three types of data will be collected during the geophysical surveys:

- EM61-MK2 or EM61-MK2A data with integrated position data
- Digital photographs
- Inaccessible area measurements

The management and internal QC review procedures for each type of data are discussed in the following sections.

3.5.1 Survey Data Collection and Recording

EM61-MK2 or EM61-MK2A survey data include all electronic geophysical instrument data produced during the survey, including all integrated positional data produced during the survey. Procedures for use of the EM61-MK2 or EM61-MK2A and positioning systems are provided in Attachment 1.

The DGM team will document all aspects of their activities using the field logbook and the Survey Area Report Form (see Attachment 2) in either digital or paper format.

The logbook and Survey Area Report Form will be reviewed daily by the Site Geophysicist and/or the UXOQCS.

3.5.1.1 Photographs

Digital photographs will be taken of all geophysical survey areas. Digital photographs will also be taken to document site conditions and/or obstructions during geophysical surveying (e.g. standing water, debris, inaccessible areas). The geophysical survey team will maintain a photo log in their field logbook. The date, time, direction facing, approximate grid or X, Y location, and subject of each photograph will be recorded at the time the photograph is taken. The digital cameras and copies of the photo logs will be given daily to the Site Geophysicist for entry into the photo tracking form and uploaded to the project computer.

3.6 QUALITY CONTROL

The DGM teams will conduct and document the daily quality control test listed in Subsection 3.6.1 and meet the QC metrics listed on the attached QC Surveillance check sheet as Attachment 4.

The UXOQCS will verify the quality of the task through the three-phased surveillance process and document the results on the check sheet. Any DGM tasks the UXOQCS determines to not meet the quality control metrics will be considered deficient or non-conforming. If the deficiency or nonconformance cannot be resolved immediately, the UXOQCS will prepare a nonconformance report and submit to the SUXOS. The UXOQCS will conduct an analysis of the cause of the deficiency or nonconformance and prepare and submit a response to the project manager within 48 hours.

3.6.1 Daily Quality Control Tests

The DGM team will set up the equipment, verify that all equipment has survived transportation and is operational, and perform the following daily instrument tests:

- RTK DGPS Reoccupation checks (rover reports known location within 0.1 meter (0.328 ft)
- Sensor warm up of at least 5 minutes each time the sensor is turned on
- Sensor nulling and positioning input check (DGPS or LSF Marker)
- Acquire Morning Static check (metrics are for all 4 EM61-MK2 or EM61-MK2A time gates or as established at the GSV:
    - Background for 1 minute (3 mV peak to peak)
    - Spike test for 1 minute (± 10% of standard item response after background correction)
    - Return to Background for 1 minute (3 mV peak to peak)
    - 30 seconds of cable shake (Data profile does not exhibit data spikes)
    - 30 seconds of Operator/Personnel testing (3 mV peak to peak)
- Morning Repeat line test over a known object (e.g. IVS).
    - Repeatability of response amplitudes are repeatable to +/- 25% of the expected response, or as finalized in the IVS Technical Memorandum,
    - RTK DGPS positional accuracy <= 0.25 meter (0.82 ft), or as established at the IVS Letter Report

The Site Geophysicist will transfer these morning instrument checks (e.g. exchange memory cards) while the DGM team begins production DGM. The instrument checks will be examined for conformance to project metrics. In the afternoon, the DGM team acquires:

- Afternoon Repeat line test over a known object (e.g. IVS)
    - Repeatability of response amplitudes are at least 75% of the expected response or as finalized in the IVS Letter Report,
    - RTK DGPS positional accuracy <= 0.25 meter (0.82 ft)] or as established in the IVS Letter Report.

4.0 HAZARD ANALYSIS/RISK ASSESSMENT AND HAZARD CONTROL BRIEF

The hazard analysis matrix below lists the existing and potential hazards associated with conducting the DGM task along with methods to mitigate the hazards.

Table 1: Hazard Analysis Matrix

Activity	Hazard	Triggering Events	Initial Risk Index	Hazard Mitigation	Final Risk Index
Digital Geophysical Mapping	Slips, Trips or Falls	Climbing; debris, holes, or crevasses obstructed from view by vegetation.	C/III/4	Personnel will assess their surroundings prior to proceeding with field activities. Ensure footing at all times.	D/IV/5
	Heat Stress	Seasonal weather patterns	C/III/4	Drink water often, recognize symptoms of heat stress Monitor team members for signs of heat stress disorder in accordance with the APP	D/IV/5
	Biological	Biting/stinging insect contact.	C/III/4	Wear long sleeve garments and apply repellent to exposed skin as needed as detailed in the APP.	D/IV/5
	MPPEH	MPPEH reacts to impact by equipment, tools or personnel.	C/II/3	Maintain the TSD between teams (see the hazard control briefing that follows) All personnel will receive a safety briefing prior to commencing site activities A UXO-qualified person will escort all non-UXO-qualified personnel and will strictly adhere to the directions of the UXO-qualified escort.	D/III/5
	Severe Weather	Seasonal weather patterns	C/II/3	Account for all team personnel and, if required, implement the emergency response procedures outlined in the APP.	C/IV/5

4.1 HAZARD CONTROL BRIEF

All personnel will attend the tailgate safety briefing given by the TL, on the existing and potential hazards within Parcel 5C prior to commencing any activities.

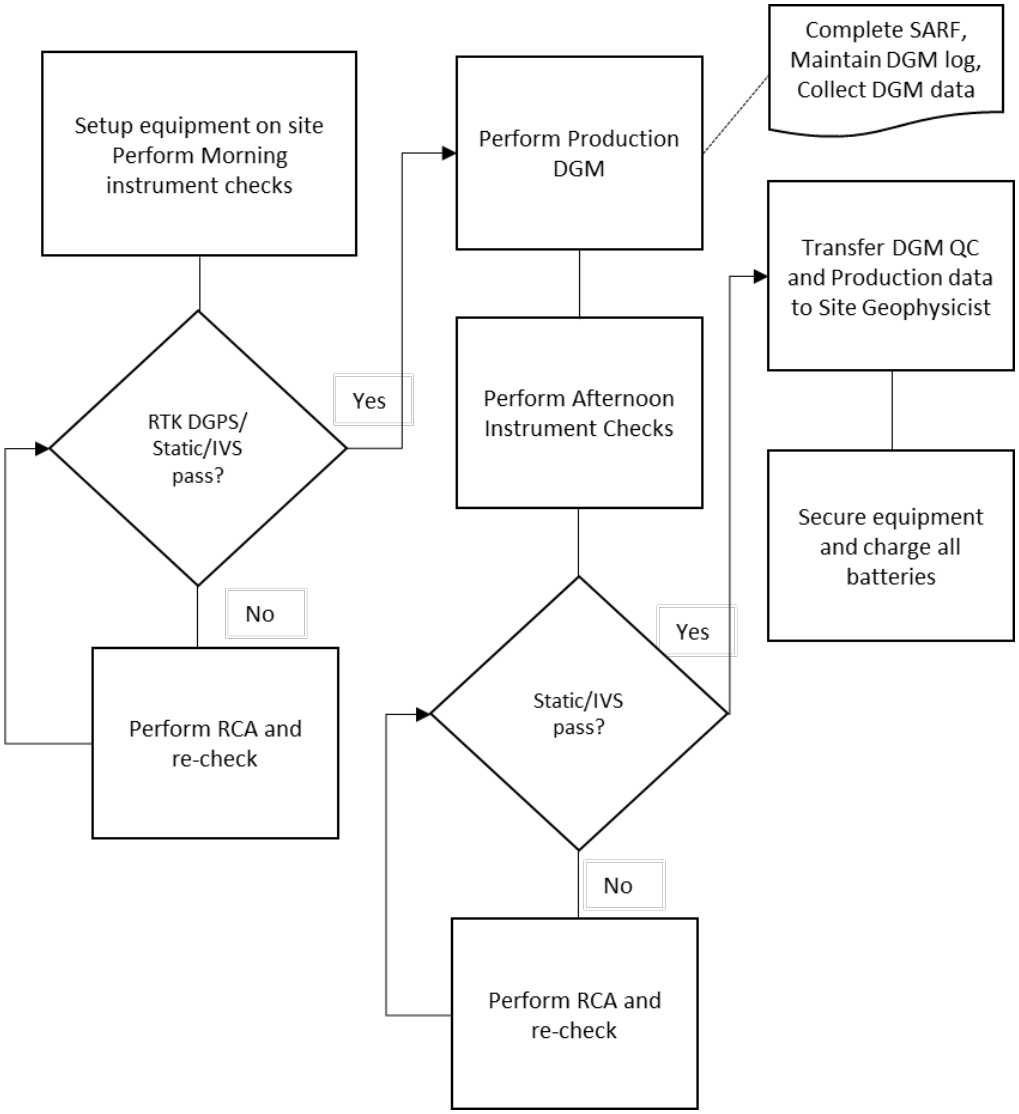
Personnel will be cognizant of the surroundings at all times and remain observant of their footing as they traverse the work area. All personnel will be aware of the signs of heat stress and be able to recognize the onset of heat stress disorders in themselves and their team members.

Wear long sleeve clothing and apply insect repellant as warranted to mitigate the impact of biting/stinging insects. Wear sunscreen to protect exposed skin as well.

In the event of severe weather, account for all team personnel; contact the UXOSO, SUXOS or Site Manager for instructions and follow the Emergency Response Plan in the SSHP.

5.0 DIAGRAMS

The following diagram describes the data collection (DGM) process steps:



6.0 EQUIPMENT

The UXO teams conducting intrusive investigations will be equipped with the following:

- EM61-MK2 OR EM61-MK2A

- Trimble RTK DGPS
- Field computers to support data transfer, processing, analysis, and data archiving,
- Printers,
- Computer networking equipment,
- Logbooks and PDAs for recording data
- Camera
- Communications equipment

Safety equipment required includes the following:

- First-Aid kit
- Level D Person Protection Equipment
- Inclement weather gear as needed

7.0 EMERGENCY RESPONSE PROCEDURES

In the case of an emergency, the procedures detailed in the Section 12.2 of the APP fill be followed.

The single point of contact for incidents on site will be the UXOSO.

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/rescue personnel and the nearest hospital.

In the event of an emergency requiring evacuation, the evacuation signal will be given through verbal instructions. Personnel will evacuate to a pre-determined evacuation point in the support zone identified at the daily safety briefing. The UXOSO will account for all personnel and will summon emergency response personnel, if required. If the Fire Department is summoned, the UXOSO will meet them upon their entrance to the site and will inform them of the presence of MEC, and provide the appropriate fragmentation distance from the fire for the purpose of fighting or preventing the spread of fire from the site 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.

After allowing the appropriate wait time (24 hours in the case of a fire), the SUXOS and the UXOSO will enter the site together and determine if the site is safe for re-entry.

After the emergency situation has been controlled and eliminated, or has passed the Project Manager, UXOSO, and SUXOS will review the way the emergency was handled and change procedures if necessary.

8.0 REFERENCES

The following references apply to the conduct of operations associated with this standard operating procedure (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:

- TCRA MEC-QAPP
- Accident Prevention Plan (APP)
- IVS Letter Report for TCRA
- 29 Code of Federal Regulations 1910, Occupational Safety and Health Standards

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ATTACHMENT 1.
EM61 and DGPS OPERATION

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EM61-MK2 or EM61-MK2A and DGPS OPERATION

The following is intended to provide general instructions for data acquisition with an EM61-MK2 or EM61-MK2A geophysical instrument coupled to a DGPS system. As various independent government contractors use a variety of RTK DGPS systems, the set up and collection of RTK DGPS or DGPS data will vary with each system. The manufacturer's instruction manual should be consulted if any questions arise.

The following procedures are provided to assist in establishing a consistent data acquisition process. The procedures will be adhered to during data acquisition activities to ensure that the data collected are of sufficient quantity and quality to meet the program objectives. The Site Geophysicist is responsible for ensuring that these guidelines are followed, and that the data acquisition staff is adequately trained to operate the equipment.

RTK DGPS or DGPS Equipment and Set-up

As each independent government contractor may use various RTK DGPS or DGPS systems. The set up and collection of GPS position data will vary with each system. The manufacturer's instruction manual should be consulted in these situations. Check base station or DGPS set up will include reoccupying and measuring a known point with a rover receiver prior to daily data acquisition. Each RTK DGPS measured location should be within +/- 10 cm (0.328 ft) from the known location.

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EM61-MK2 or EM61-MK2A Setup:

1. Assemble coil assemblies
2. Attach wheels and handle or stretcher [as demonstrated at the Geophysical System Verification]
3. Attach rover GPS antenna mount and mount rover GPS
4. Connect upper coil to lower coil connector or attach shorting plug for bottom coil only
5. Attach battery to electronics
6. Connect coil cable to electronics
7. Connect data cable to electronics and Data Logger COM1
8. Connect GPS to EM Data Logger COM2
9. Move to an electromagnetically clean area
    a. Set the EM61-MK2 OR EM61-MK2A Mode Switch to:
        i. 4 – for logging four (4) bottom coil time gates
    b. Set the Master/Slave Switch to M for single sensor operation
    c. Push In the Circuit Breaker on the EM61-MK2 or EM61-MK2A electronics and warm up for at least 5 minutes.
    d. Turn on Rover GPS
    e. Push the ON/OFF button to turn on the Data Logger
        i. Set Antenna Coil Size (e.g. Standard 1 x .5 m)
        ii. Set Up Logger
            1. Date
            2. Time
            3. Units (e.g. feet)
            4. COM port (e.g. COM1)
            5. Audio
            6. Pause Key: (e.g. Alt F1 or any key)
            7. Display (e.g. Text or Graphic)
        iii. Set GPS Port
            1. GPS Input: (Enabled)
            2. COM Port (COM2)
            3. Baud Rate: (9600 or higher)
            4. Parity: (No)
            5. Data Bits: 8
            6. Stop Bits: 1
            7. Can monitor GPS data in terminal mode
        iv. Set Output Port – Not used unless logging data to external PC
    f. Monitor/Null Coils – After 5 minute warm-up, null EM61-MK2 or EM61-MK2A – all channels should be close to 0 +/- 1 mV

g. Acquire Data:
    i. Create File (see data logger software manual)
    ii. Survey Setup (see EM61-MK2 or EM61-MK2A manual) with Reads per second = 10 or greater
    iii. LOG DATA
        1. Wait for data display (0 to 100% internal calibration)
        2. Observe time gate values
        3. Observe position data input (observe toggle bar and correction status for letter D, letter A is unusable GPS, or manual fiducial marker "M")
        4. Enter to log data– System is ready to log data. Move to start of survey line.

h. When coil is centered over start point, press ENTER again. Display will show "logging" on the top display line. Observe coil readings. Observe Station Number (STN). Note any unusual recordings on Field Survey Sheet.

i. Walk along survey line slowly (about 1.5 to 5 feet per second). Periodically observe Data Logger display. Note any unusual recordings, any deviations from the survey line, or any observed surface metal objects. Escort should log these observations in the field logbook. For grid surveys, mark the outer coil edge with marking paint, plastic pin flags, or equivalent to insure sensor overlap on a return transect

(If fiducial marks are available, press Marker button when coil is centered over fiducial mark for 1 second)

j. Press Pause Key (e.g. Alt F1 or Any Key) when coil is centered over the line end to stop logging EM61-MK2 or EM61-MK2A data.

(If in the Auto mode, simply continue to next line and keep moving until survey session is complete or manually set new lines)

k. When survey is complete, exit logging. Enter a new file name to continue surveying, or return to main menu to transfer data.

l. Data Transfer (may vary with controller-see manufacturer's owner manual)

m. Once data transfer is complete and data has been positioned, exported (*.xyz file), and processed successfully, clear the data logger memory

Daily EM61 Static Check

1. Setup as above (metrics are for all 4 EM61-MK2 or EM61-MK2A time gates or as established at the IVS
2. In a quiet area, log static EM61 background data for 1 minute (observe meter readings near 0, +/- 2-3 mV)
3. Pause and increment line
4. Place a "known object (e.g. a small ISO)" over the coil and log data (Enter) for 1 minute (observe meter readings #> 0, +/- 2-3 mV)
5. Pause, remove target, and increment line
6. Log static background data for 1 more minute (observe meter readings near 0 +/- 2-3 mV)
7. Pause, and increment line
8. Log static data for 30 seconds while all system cables are shaken (observe meter readings near 0 +/- 2-3 mV – no jumps or spikes),
9. Pause, and increment line
10. Log static data for 30 seconds while operators kick towards coil, twist left/right, and bend up/down (observe meter readings near 0 +/- 2-3 mV).
11. QC checks:
    a. Look for near zero readings during lines 0, 2, 3, and 4 – re-null coil or replace battery as necessary
    b. Check for consistent target readings +/-10% on line 1 from previous readings. Replace battery as necessary

Daily IVS Check

1. Setup as above
2. Acquire line 0 from start (0,0) to end (0,50) directly over the IVS centerline
3. Daily repeat peak responses, after leveling, should be repeatable to +/- 25% of the expected response and latency or lag corrected position should be within:
    a. +/- 1.0 m (3.28ft) or as established at the GSV for LSF positioning,
    b. +/- 0.25 m (0.82 ft) or as established in the IVS Letter Report for DGPS positioning

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ATTACHMENT 2
DGM CHECKLISTS

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Checklist for Out of Box Equipment Tests

Project Name: _____

Project Location: _____

Contractor POC: _____

Equipment Source: _____

Equipment Serial Numbers: _____

_____

Reviewer's Name and Title: _____

Date of Review: _____

	Y	N	N/A
1. Has the equipment been inventoried and inspected for damage or wear?			
2. Has the cable shake test been performed? (Replace any faulty components if necessary)	____	____	____
3. Has the instrument (EM only) been nulled?	____	____	____
4. Has a nearby, noise-free site been selected for static background and static response tests?	____	____	____
5. Have the following instrument function tests been successfully performed:	____	____	____
• Static background test demonstrating <20% deviation in response for at least 3 minutes?	____	____	____

Background values: TG1_____, TG2_____, TG3_____, TG4_____

• Instrument response test demonstrating <20% deviation in response from test to test?	_____	_____	_____

Response values: TG1_____, TG2_____, TG3_____, TG4_____

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Checklist for Daily Instrument Checks

Project Name: _____

Project Location: _____

Contractor POC: _____

Equipment Source: _____

Equipment Serial Numbers: _____

_____

Reviewer's Name and Title: _____

Date of Review: _____

	Y	N	N/A
1. Has the RTK or DGPS Reoccupation check been performed over a known location)?			
2. Has the cable shake test been performed? (Replace faulty components if necessary)	____	____	____
3. Has instrument (EM only) been nulled?	____	____	____
4. Has a static background test been performed (metrics for all 4 EM61-MK2 time gates or as established at GSV and demonstrated <20% deviation in response over at least 1 minute:			
- Start of day?	____	____	____
Background values: TG1_____, TG2_____, TG3_____, TG4_____			
- End of day?	____	____	____
Background values: TG1_____, TG2_____, TG3_____, TG4_____			
1. Has instrument static response test been performed and demonstrated <10% deviation in response from test to test:			
- Start of day?	____	____	____
Response values: TG1_____, TG2_____, TG3_____, TG4_____			
- End of day?	____	____	____
Response values: TG1_____, TG2_____, TG3_____, TG4_____			
1. Has the operators been thoroughly examined with the geophysical instrument for any sources of response that may not be readily	____	____	____

apparent?

2. Has the IVS repeat data tests been utilized to evaluate the following factors:

- Repeatability of response amplitude? ____ ____ ____
- Positional accuracy? ____ ____ ____

Has there been an equipment or DQO metric failure?

Document any failure:

Document any corrective action (repair/retest)

Has corrective action solved failure?

Survey Area Report Form

☐ **QC checked by**: _____ ☐ **QA checked by** _____

Date: _____ **Date:** _____

Project Name: _____, **Project Location:** _____

Geophysical Contractor: _____, **Design Center POC:** _____

Project Geophysicist: _____, **Site Geophysicist:** _____

Survey Area ID: _____ **Date:** _____, **Field Team:** _____

Survey Type: ☐**Grid** ☐**Meandering Path** ☐**Transect** ☐**Other** _____ **Unit of Measure:** ☐ **meters**☐ **feet**

Coordinate System: ☐**UTM** ☐**State Plane NAD** _____ ☐**Local** ☐**Other** _____

Sketch of Survey Area: **Approx. Scale:** _____ **North Arrow:**

Terrain: ☐**Level** ☐**Moderate Slope** ☐**Steep (≥30°)** ☐**Rolling** ☐**Ruts** ☐**Gullies** ☐**Rocky** ☐**Swampy** ☐**Dangerous**

Tree Cover: Tree Height: _____

☐**None** ☐**Light** ☐**Medium** ☐**Thick**

Brush:

☐**None** ☐**Light** ☐**Medium** ☐**Thick**

Weather:

☐**Sunny** ☐**Cloudy** ☐**Drizzle** ☐**Rain**

☐**Thunderstorms** ☐**Hail** ☐**Fog** ☐ **Humid**

Grid Corner Coordinates:

UTM/State Plane	Local	Start	End

SW _____, _____ _____, _____ **Battery Voltage:** _____ _____

NW _____, _____ _____, _____ **Static Background Values:** _____ _____ _____, _____

NE _____, _____ _____, _____ **Static Response Values:** _____ _____ _____, _____

SE _____, _____ _____, _____ **Static File Name:** _____

Instrument Sampling Rate:_____

Raw Data File Name: _____ **Repeat Data File Name:** _____

Geophysical Instrumentation: _____ **Serial Number:** _____

Sensor Separation (if applicable): _____**; Source (rental agency, contractor, etc.):**
_____

Base Station: _____; **Source:** _____**Serial Number:** _____

Navigation Method: _____; **Source:** _____ **Serial Number:** _____

Additional Comments: _____

_____

_____

_____

STANDARD OPERATING PROCEDURE – OPS-05B
GEOPHYSICAL DATA PROCESSING AND INTERPRETATION

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to provide procedures and technical guidance on performing geophysical data processing and interpretation to characterize the presence of Munitions and Explosives of Concern (MEC) during the MEC Investigation of project site. This SOP outlines personnel qualifications and responsibilities, data transfer procedures, data interpretation guidelines, anomaly selection criteria, and general quality control (QC) procedures to be performed by USA personnel.

2.0 SCOPE

This SOP outlines the procedures used for initial and advanced data processing and reporting of geophysical and position data provided by DGPS equipment, or traditional Line/Station/Fiducials during field activities at Project site. It applies to all aspects of geophysical data management and quality control from collection, through processing and analysis, to anomaly selection and dig list development, and data transfer to the project database and geographic information system (GIS). The major elements of this procedure are electronic data transfer, data processing, data interpretation, data archiving, and data tracking.

3.0 PROCEDURES

PERSONNEL REQUIREMENTS AND RESPONSIBILITIES

The Site Geophysicist is responsible for overseeing all activities constituting the management of geophysical project data including downloading data from field PC, manual and digital entry of data into the project database, review of data, storage of data and backup of data files. The Site Geophysicist will be assisted by the Data Processor, Project Geophysicist, and Geographic Information Systems (GIS) Manager at the Oldsmar, Florida home office as needed.

All project staff that process, analyze, and interpret geophysical/GPS data are responsible for understanding and following the general procedures described in this document. The Project Geophysicist and the UXOQCS are responsible for ensuring adherence to these procedures.

TRAINING REQUIREMENTS

All USA site personnel involved with Digital Geophysical Mapping (DGM) will attend an on-site orientation to review site-specific procedures. The data management process outlined in this SOP will be reviewed and explained to all associated personnel. The Site Geophysicist and CQC Representative will review the IVS data processing and data management process to evaluate adherence to this SOP.

4.0 TRANSFER OF FIELD DATA AND DATA TRACKING

During geophysical survey activities, multiple digital files and paper documents are generated by the geophysical survey team. Digital survey data are stored on the geophysical data logger during data acquisition activities and field team activities are recorded in the team logbook and on Survey Area Report Forms. After morning QC instrument tests and the end of the day, all data collected by geophysical survey team will be turned over to the Site Geophysicist. All digital files are uploaded to the on-site data management computer via PCMCIA (or equivalent) media and logbooks and survey forms are scanned and logged. The following file types are generated for each survey:

- Geophysical data file with signal intensity and position (relative or absolute) measurements

- Digital photo files (*.jpg)
- Log Books
- Survey Area Report Form (Attachment 2 SOP OPS-05A Digital Geophysical Mapping SOP and Check Lists).

All EM61-MK2 or MK2A, with embedded position data (both EM61-MK2 and DGPS or LSF positioning data are stored in a single file); files will be electronically logged upon receipt. The following items will be recorded for each EM61-MK2 or MK2A file collected:

- Dataset ID
- File Type (QC Test, IVS, Transect, Grid, etc.)
- Survey Area (e.g. IVS, transect or grid)
- Date Collected
- Team ID
- DGM Instrument ID
- Geodetic Instrument ID
- Positioning System Used (DGPS, Line/Station/Fiducial, etc.)
- QC instrument test, Transect, IVS, etc.
- EM61-MK2 or MK2A start and stop times
- Battery Voltage start and ending values
- Weather, Terrain, and Vegetation notes
- Field Notes

The EM61-MK2 or MK2A and position data will be processed on site. The following information will be tracked on the project MS Access database:

- Dataset ID
- Date EM61-MK2 or MK2A data is processed
- Initials of data processor
- Leveling Method and parameters
- Latency/Lag Correction
- Additional Filtering
- Gridding Parameters
- Noise Statistics
- Speed Statistics (Along line sample separation)
- Data Coverage Statistics (Across line data point spacing)
- Processor Comments

Target anomaly selection may be processed on or off site. The target anomaly locations will be added to the project database. The following information will be tracked in the project MS Access database:

- Target Dataset ID
- Date target dataset file created
- Number of anomalies
- Unique anomaly ID, location, and signal intensity as determined at the IVS
- Anomaly Selection Criteria
- In addition to the MS Access database, the contractor will digitally track all files uploaded to and downloaded from the project ftp site. In the event of an electronic transmission error, contact will be made with the appropriate center to resend the file. Specifics of the error and date and time of transmission will be recorded at the remote processing or on-site processing center. The tracking file(s) will be available for QC personnel upon request.

5.0 GEOPHYSICAL DATA PROCESSING, ANALYSIS, AND INTERPRETATION

Data will be interpreted using a combination of Geonics (or equivalent) and Geosoft Oasis montaj (or equivalent) software to provide coordinate location information for each target. The analysis of the geophysical data is accomplished through the systematic application of the laws of physics, the principle of statistics, and professional knowledge of UXO data. The data processing interpretation tasks are a combination of automated scripts for coordinate projection, leveling and filtering the data, initial anomaly selection, and statistical analysis and manual interpretation of the data based on UXO site experience.

The primary interpreter of the data on-site will be a qualified site geophysicist.

GEOPHYSICAL DATA PRE-PROCESSING

The Data Processor will receive and track the data from the field and load the data onto the data management computer. The geophysical data will require computer pre-processing prior to interpretation. Daily instrument QC tests will be utilized to assess the quality of the geophysical and positioning data collected.

DGPS position data will be collected at a 1 Hz rate with the Trimble DGPS with external antenna and the data will be merged with the EM-61MK2 geophysical survey data in one file in the EM61-MK2 or MK2A data collector.

Geonics software may be used to convert the raw EM61-MK2 or MK2A data to ASCII with units of mV and corresponding time stamp for each record. The ASCII format file (*.M61) data or the raw EM61-MK2 or MK2A data (*.R61) will be imported into Geosoft Oasis Montaj. The data will then be corrected for any lag or latency offsets, a leveling or drift correction will be applied, any GPS positioning “fliers” will be corrected, and the positioned data will be converted to the project specific coordinate system. The DGPS fix quality allows the analyst to know if the radio link was down or if the fix quality was poor. Areas with poor positioning that cannot be repaired by Geosoft’s software are flagged for recollection. If the area still presents a DGPS positioning challenge, the DGM data will be recollected positioned with L/S/F.

The specific parameters used to process the EM61 and GPS data may vary; however, the processing parameters and results are documented in digital computer files so that the sequence of events can be reconstructed and analyzed at a later date, if necessary. This level of documentation assists in ensuring that the overall process is repeatable.

GEOPHYSICAL DATA ANALYSIS AND INTERPRETATION

Following pre-processing, the Data Processor will conduct advanced interpretation of the geophysical data with analysis parameters established from the IVS Technical Memorandum to create a target dig list and target map. All data processing steps will be documented in the project MS Access database, including gridding parameters, any and all filtering parameters (e.g. drift correction), any and all data corrections (e.g. latency or lag correction), data quality statistics (e.g. noise, along-track data separation, etc.), and

anomaly selection thresholds and procedures. Anomaly selection parameters may include anomaly mV selection threshold, signal to noise ratio, signal strength, response size and target size.

Oasis Montaj will be used to generate color-coded images of the EM61-MK2 or MK2A data for each survey line. Potential target locations will be selected using a combination of two target selection methods; automatic and manual. The automatic method utilizes the target selection algorithm within the Geosoft Oasis Montaj software (e. g. pick peaks long transect or Blakely Test). This procedure selects anomaly locations based solely on the signal intensity. The second method (herein referred to as "manual") utilizes a data interpreter who manually selects potential target locations using data characteristics such as the signal intensity from the coil and different time gates, anomaly footprint, anomaly shape and trend, track line characteristics (i.e., spatial sample density), terrain, previous intrusive information, the IVS Technical Memorandum, and comments entered by the geophysical survey crew regarding geology, terrain, weather, etc. The automatic target selector will select a pipeline, known cultural feature, or terrain-induced "noise" while the manual selection procedure generally will not. However, the automatic target selector prevents the interpreter from potentially "missing" an anomaly; i.e., it provides immediate feedback to the interpreter in the form of a quality control check. The automatic target selector time gate and amplitude will be set to a value that is determined during analysis of the data from the initial IVS. Portions of the site may be heavily contaminated with metal that may cause the EM61-MK2 or MK2A response to remain above anomaly selection threshold. The Data Processor will identify these heavily contaminated areas with a polygon surrounding the saturated portion of a grid and add these boundary points to the dig list. The Data Processor may also prioritize anomalies based on peak response and spatial extent. Anomaly selection criteria, including any prioritization will be established during the GSV and submitted to the project team for review/approval.
If the interpreter selects any anomalies that may have a high probability of being an artifact of the data acquisition and/or data processing sequence, they will enter a comment in the interpretation file (e.g., noise due to coil bump). These anomalies will be reviewed a minimum of once per week. If the results of this review indicate that 85% or more of the anomalies flagged as potential noise or data processing artifacts, correspond to no detectable metallic material recovered during the subsequent reacquisition and excavation, the Data Processor may request and suggest a change in the anomaly selection methodology. Any request or suggestion for change will be submitted to the project team for review and approval prior to any implementation.

A master Oasis Montaj database that contains all of the individual data acquisition files for the project will be generated and updated each day in order to track the daily progress of the geophysical survey.

DIG LIST DEVELOPMENT

The interpreted data are digitally recorded in a Geosoft *.gdb file, that is exported as an ASCII XYZ file and a Microsoft Access database and/or Microsoft Excel spreadsheet. The dig list data for each survey transect will be organized by a unique transect identifier, and contain a unique anomaly identifier for each target selection, its x-y coordinate location, and peak signal intensity value(s) from the EM61-MK2 or MK2A. Other pertinent information, such as relative anomaly size may be included, as necessary, depending upon the results of the Geophysical System Verification. The coordinates for any polygon will be appended to the dig list, listing each unique polygon point ID and its x-y coordinate location. Any additional anomalies meeting the anomaly selection criteria established during the GSV that are identified by the UXO Quality Control Specialist (UXOQCS) or the Navy will also be appended to the dig list.

USA's Data Processor will deliver dig lists in Excel format (*.xls or *.csv) within 5 work days after survey completion.

INTERPRETATION SUMMARY

The objective of the interpretation is to select all of the legitimate targets caused by buried metallic items while minimizing the false alarm rate. For this project, the targets are primarily selected based on the anomaly footprint and shape, anomaly intensity for the different data channels, and information derived from previously-excavated targets. The interpreter will utilize information acquired from the Geophysical System Verification test to assist target selection.

During intrusive investigation, the Data Processor will review 100% of the intrusive results and compare with the DGM characteristics. A certain percentage of selected anomalies may turn out to be "no find," targets for which no metallic items consistent with the geophysical data are found at the anomaly location. If directed by the PM, some or all of these anomalies will also be reviewed by the Project Geophysicist or their designee to determine the nature of their origin. If they appear to be legitimate metallic targets rather than noise, the intrusive team will be informed and asked to recheck that location. If the "no find" target is determined to be an artifact of the data acquisition, processing, or interpretation processes, the specifics of the analysis will be noted in the project database so the interpreters can utilize this information during subsequent interpretation efforts.

6.0 DATA COLLECTION AND PROCESSING QC

The following procedures are applied during the data processing phase of the project and are performed each day in the field to ensure the integrity of the data and will be reported in the final report. The Site Geophysicist and UXOQCS are responsible for ensuring the data collected is of sufficient quality and quantity to meet the project objectives. Any discrepancies shall be documented and data of insufficient quality will be recollected, if necessary.

Procedural checks during the processing of the data include the following:

- Daily RTK DGPS Reoccupation check is within 10 cm (0.328 ft) from the established location. If deviations are greater than the project specified range, the GPS planning software results will be re-examined using a current satellite ephemeris file and a project-specific coordinate. The RTK DGPS set up is checked and the reoccupation check is repeated.
- Static Background data does not deviate more than 3.0 mV peak to peak or as established at the Geophysical System Verification. EM61-MK2 or MK2A static noise above the established threshold is documented and a root cause analysis performed prior to collecting additional data
- Static Spike data does not deviate by more than +/- 10% from previous spike tests
- Cable shake does not induce spikes into the data
- Personnel signature tests show operator signature does not exceed 3 mV peak to peak or as established at the Geophysical System Verification
- Evaluation of dynamic geophysical sensor IVS check. This QC test evaluates amplitude response and positioning repeatability. Check will include that test amplitude response over a known small industry standard object (ISO) (e.g. 1" x 4" pipe nipple) is repeatable to +/- 25%, of the expected response as finalized in the IVS Technical Memorandum and positioning accuracy is within +/- 0.25m (0.82 ft) for RTK DGPS positioning or as established IVS Technical Memorandum.
- Data positioning quality shows coverage of the survey area with 98% of along-line spacing ≤ 0.25 m (0.82 ft), > 95% of grid surveys with across-track gaps > 0.75 m (2.5 ft) unless around known obstacles for Cayo Del Agua and >95% coverage at 0.6m (2 ft) unless around known obstacles for Cayo Botella.
- DGM data quality demonstrates:
    - Proper time gate response (e.g. Gate 1>gate 2>gate 3>gate 4)
    - Sensor drift is acceptable (e.g. Battery voltage observed in the field remains =>11.9 volts or as determined acceptable at the Geophysical System Verification and drift does not exceed the ability of the leveling filter to correct)
    - For Cayo Botella, 90% of BSIs are located <=25 cm + ½ line/sensor spacing (55 cm) and 100% is <=35cm + ½ line/sensor (65 cm) for RTK DGPS positioned data and <=50cm +

1/2 line spacing (80 cm) for fiducially positioned data. For Cayo del Agua, 90% positioning offset is <=25 cm + ½ line/sensor spacing (63 cm) and 100% is <=35cm + ½ line/sensor (73 cm) for RTK DGPS positioned data and <=50cm + 1/2 line spacing (88 cm) for fiducially positioned data.

- Recovered Object size and depth meet DGM expectations more than 90% of the time
- There are less than 15% false positives (intrusive results reported as "no find")

The guidelines above are for geophysical data where the "background" is a prevalent data characteristic. In areas of high anomaly density (i.e., "cluttered" areas), the above guidelines may not apply.

The UXOCQS will review daily QC tests to ensure data quality objectives are being met. If they find an issue that calls in question the validity of the data, the remainder of that teams data will be checked. Any unacceptable data will be reported to the Project Geophysicist and the Project Manager. The effected transects or grids will be marked for recollection. The UXOQCS will record the result of this surveillance in the QC log book.

Quality control measures applied during the interpretation of the data include the following:

- Targets selected interactively by the user are compared to those selected automatically by Oasis montaj. This process ensures that anomalies that meet a certain criteria for selection are not "missed" by the interpreter and thus included on the dig list.
- Comparison of the position and EM61-MK2 or MK2A data to the site features map (e.g., above-ground cultural features) are documented (should be variance in track path)
- Interpreted data characteristics are compared to the known responses acquired during the initial test program (e.g. IVS).
- Additionally, DGM data, copies of log books and field data forms are available for independent processing and analysis. Data collection metrics for instrument check results, production DGM sample separation and line to line spacing will be reviewed, and additional anomaly selections may be provided for inclusion on the dig list.

7.0 GEOPHYSICAL DATA ARCHIVING

All geophysical data including all raw (sensor and position data files), processed data (positioned, corrected, transect/grid data), and final data (target databases, dig lists, and target maps) and data processing documentation on the data management computer will be archived daily. The entire database and all associated data files will be copied to a writable CD or equivalent digital media. The archive disks will be stored on-site. Maintenance of the backup data will be verified by the UXOQCS according to the schedule specified in the QC Plan. Ultimately the project DGM data are transferred to USA's Local Area Network and backed up weekly.

The UXOQCS verifies the quality of the DGM task through the three-phased surveillance process and documents the results on the check sheet. Any data the UXOQCS determines to not meet the quality control metrics will be considered deficient or non-conforming. If the deficiency or nonconformance cannot be resolved immediately, the UXOQCS will prepare a nonconformance report and submit to the SUXOS. The UXOQCS will conduct an analysis of the cause of the deficiency or nonconformance and prepare and submit a response to the project manager within 48 hours.

8.0 HAZARD ANALYSIS/RISK ASSESSMENT AND HAZARD CONTROL BRIEF

The hazard analysis matrix below lists the existing and potential hazards associated with conducting the digital geophysical data processing and interpretation task along with methods to mitigate the hazards.

Table 1: Hazard Analysis Matrix

Activity	Hazard	Triggering Events	Initial Risk Index	Hazard Mitigation	Final Risk Index
DGM Data Processing and Analysis	Slips, Trips or Falls	Walking, climbing stairs; obstructed view	C/III/4	Personnel will assess their surroundings prior to proceeding with activities. Ensure footing at all times.	D/IV/5
	Heat Stress	Seasonal weather patterns	C/III/4	Drink water often, recognize symptoms of heat stress Monitor team members for signs of heat stress disorder in accordance with the APP	D/IV/5
	Biological	Biting/stinging insects contact.	C/III/4	Wear long sleeve garments and apply repellent to exposed skin as needed as detailed in the APP.	D/IV/5
	Severe Weather	Seasonal weather patterns	C/II/3	Account for all team personnel and, if required, implement the emergency response procedures outlined in the APP.	C/IV/5

HAZARD CONTROL BRIEF

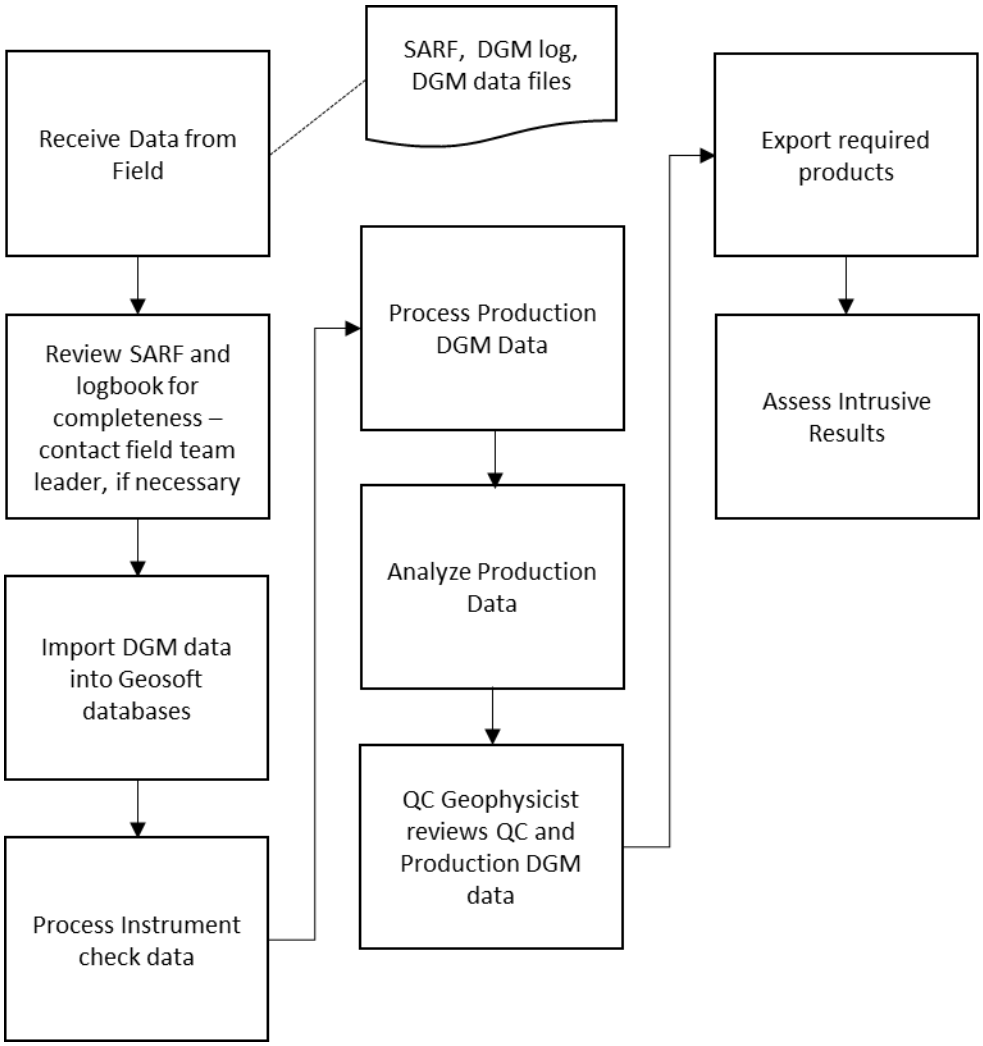
All field personnel will attend the daily safety briefing. Personnel will be cognizant of the surroundings at all times and remain observant of their footing in the work space. All personnel shall be aware of the signs of heat stress as described in the APP and be able to recognize the onset of heat stress disorders in themselves and their team members.

Wear long sleeve clothing and apply insect repellant as warranted to mitigate the impact of biting/stinging insects. Wear sunscreen to protect exposed skin as well.

In the event of severe weather, account for all team personnel; contact the UXO Safety Officer or Senior UXO Supervisor for instructions and follow the Emergency Response Plan in the Site Health and Safety Plan (SHSP).

9.0 DIAGRAMS

The following diagram describes the data processing steps:



10.0 EQUIPMENT

The personnel tasked with processing and interpreting the digital geophysical data will use computers, specialized software and using the internet to transmit the data to the project team.

Safety equipment required during data collection includes the following:

- First-Aid kit
- Level D Personal Protective Equipment
    - The following constitute Level D equipment; it may be used as appropriate:

- Coveralls.
- Gloves. (1)
- Boots/shoes, chemical-resistant safety-toe and shank.
- Boots, outer, chemical-resistant (disposable). (1)
- Safety glasses or chemical splash goggles. (1)
- Hard hat. (1)
- Escape mask. (1)
- Face shield. (1)
- Footnote (1) Optional, as applicable
- Inclement weather gear as needed

11.0 EMERGENCY RESPONSE PROCEDURES

In the case of an emergency, the procedures detailed in the Section 12.2 of the APP fill be followed. Figure 1 illustrates the hospital emergency route.

The single point of contact for incidents on site will be the UXOSO.

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/rescue personnel and the nearest hospital.

In the event of an emergency requiring evacuation, the evacuation signal will be given through verbal instructions. Personnel will evacuate to a pre-determined evacuation point in the support zone identified at the daily safety briefing. The UXOSO will account for all personnel and will summon emergency response personnel, if required. If the Fire Department is summoned, the UXOSO will meet them upon their entrance to the site and will inform them of the presence of MEC, and provide the appropriate fragmentation distance from the fire for the purpose of fighting or preventing the spread of fire from the site 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.

After allowing the appropriate wait time (24 hours in the case of a fire), the SUXOS and the UXOSO will enter the site together and determine if the site is safe for re-entry.

After the emergency situation has been controlled and eliminated, or has passed the Project Manager, UXOSO, and SUXOS will review the way the emergency was handled and change procedures if necessary.

1.0 REFERENCES

The following references apply to the conduct of operations associated with this standard operating procedure (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:

- TCRA MEC-QAPP
- Accident Prevention Plan (APP)
- IVS Technical Memorandum for TCRA
- 29 Code of Federal Regulations 1910, Occupational Safety and Health Standards

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STANDARD OPERATING PROCEDURE DGM/ANALOG-01
TEST SENSOR AND SYSTEM AT THE INSTRUMENT VERIFICATION STRIP (IVS)/ANALOG TEST STRIP (ATS)

1.0 PURPOSE AND SCOPE

The purpose of this standard operating procedure (SOP) is to identify the means and methods to be employed when verifying the operation of a digital geophysical mapping (DGM) and analog geophysical sensor systems prior to and during site surveys. The DGM Instrument Verification Strip (IVS) and Analog Test Strip (ATS) are constructed using a series of buried inert munitions or industry standard objects (ISOs). During the IVS/ATS process the sensor systems measure the response of each item in the IVS/ATS via dynamic survey/sweep. DGM measured responses are compared to a predetermined expected response to ensure and document proper function of the system. Analog systems (sensor and operator) are checked daily at the analog test strip for 100% seed item detection.

2.0 PERSONNEL, EQUIPMENT AND MATERIALS

This section describes the personnel, equipment and materials required to implement this SOP. The following is a list of required equipment and materials:

- EM61-MK2 sensor coupled with a real-time kinematic (RTK) differential global positioning system (DGPS) or traditional Line/Station/Fiducial positioning.
- Analog Sensor (e.g. Minelab E-Trac)
- ISOs to construct the IVS.
- Hand tools including shovels, pick axes, breaker bars, tape measures, digital camera, plastic stakes, line, etc. to construct the IVS.

2.1 PERSONNEL AND QUALIFICATION

The following individuals will be involved in verifying correct operation of the EM61-MK2 at the IVS:

- UXOQCS
- Project Geophysicist
- QC Geophysicist
- Field Team Leader
- Data Processor

See QAPP Worksheet 7 for the minimum qualifications for the UXOQCS, Project and QC Geophysicists and the Field Team Leader.

3.0 PROCEDURES AND GUIDELINES

3.1 DIGITAL AND ANALOG GEOPHYSICAL MAPPING SYSTEM

DGM will be performed using the EM61-MK2 all metals detector, which has been used extensively on MMRP projects for over a decade. The Minelab E-Trac all metals detector, or equivalent, will be used as the analog geophysical system.

Positioning of the EM61-MK2 will be accomplished using RTK DGPS in areas mostly open to the sky, where consistent GPS initialization is expected to be possible. Traditional line and fiducial positioning will be used in areas with extensive tree/brush canopy that may impede the use of the more accurate RTK DGPS. With adequate satellite visibility, RTK DGPS can provide antenna locations with accuracies on the order of 5 cm; Line and Station accuracies are on the order of 1 meter. Line/station/fiducial positioning will be used for grids under canopy.

Positioning of the analog system is managed using 4-ft wide sweep lanes using ropes, across each analog grid.

3.2 INSTRUMENT VERIFICATION STRIP (IVS) AND ANALOG TEST STRIP (ATS) CONSTRUCTION

Verification of the DGM and analog system is accomplished using an IVS/ATS. Multiple IVS/ATS locations may be constructed during the project for convenience (for example, to avoid long travel times to reach the IVS on large sites). The construction details and verification procedures described in this document apply to each IVS/ATS location.

3.2.1 Location and Configuration of the IVS/ATS

IVS/ATS locations will be determined during initial site reconnaissance by the DGM and Analog field teams. The IVS/ATS should be established in an area that is easily accessible, not prone to flooding and other weather- related phenomena, and is determined to be relatively free of subsurface metal objects. The IVS/ATS is constructed as one or more survey transects.

3.2.2 IVS/ATS Objects

ISOs serve as the seed objects in the IVS/ATS. The ISOs selected for use should approximate the size of the MEC expected to be found on the site. Small, medium, or large ISOs, singly or in combination, can be selected. Table 1 shows the specifications for the three possible ISOs and Figure 1 is a photograph of the three ISOs.

Table 1: Industry Standard Objects Characterized for Use as Munitions Surrogates

Item	Nominal Pipe Size	Outside Diameter	Length	Part Number[1]	Schedule
Small ISO	1"	1.315" (33 mm)	4" (102 mm)	44615K466	40
Medium ISO	2"	2.375" (60 mm)	8" (204 mm)	44615K529	40
Large ISO	4"	4.500" (115 mm)	12" (306 mm)	44615K137	40

[1] Part number from the McMaster-Carr catalog (http://www.mcmaster.com/).

Figure 1: Small, Medium and Large ISO

3.2.3 IVS Procedures

Figure 2 illustrates the overall IVS process and the procedures to be followed during the siting, emplacement, and use of the IVS.

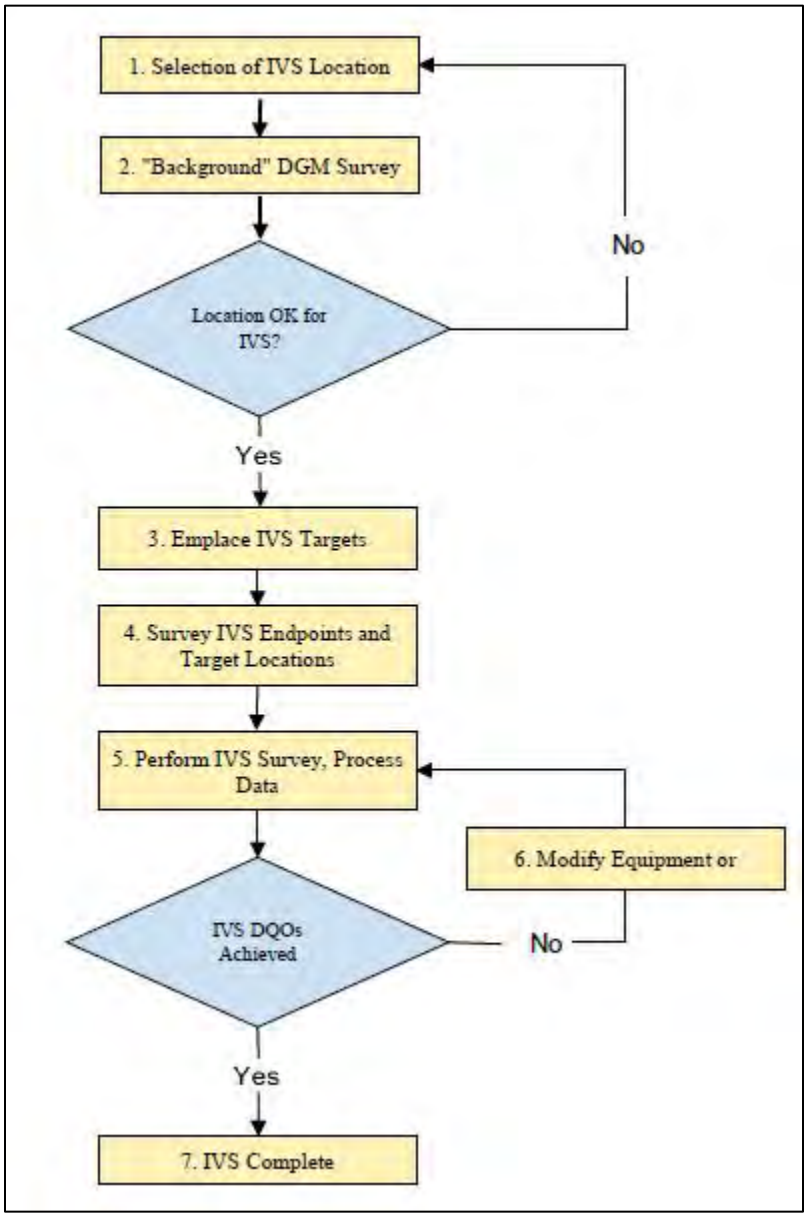

Figure 2: IVS Siting, Emplacement, and Use

3.2.3.1 An IVS/ATS location will be selected with preference for the following (although none of the conditions are vital for IVS success):

- Terrain, geology, and vegetation similar to that of a majority of the DGM survey area.
- Geophysical noise conditions similar to those expected across the survey area.

- Large enough site to accommodate all necessary IVS/ATS tests and equipment and for adequate spacing (at least 3-m separation and preferably greater) of the ISO items to avoid ambiguities in detection evaluation.
- Readily accessible to project personnel.
- Close proximity to the actual survey site (if not within the site).

3.2.3.2 A background survey will be performed with the EM61-MK2 using RTK GPS/Minelab E-Trac. The purpose of this step is to document the appropriateness of the location (e.g. few existing anomalies), and will verify that IVS/ATS targets are not seeded near existing anomalies. The data from this IVS background survey will be processed and provided to the Project and QC Geophysicists for evaluation. The UXOQCS evaluates the ATS background survey results.

3.2.3.3 Once the IVS/ATS area is deemed suitable for use, (i.e. free of significant subsurface anomalies or containing anomalies that are clearly identified so that they can be avoided during seeding), DGM targets will be buried horizontally at depths below ground surface at depths between 3 and 7 times their diameter. These depths are intended to provide adequate signal to noise ratio for detecting the targets. ATS seed items will be buried at their deepest reliable detection depth. The generalized diagram of the seeded IVS/ATS transect is presented as Figure 3. In this example, only one target is shown. This is the minimum requirement for an IVS/ATS. An example IVS/ATS seed and survey are provided in Tables 1 and 2 below. The IVS in Table 1 is an existing IVS on the island of Culebra, which contains 2 small ISOs, and is intended for use on this project.

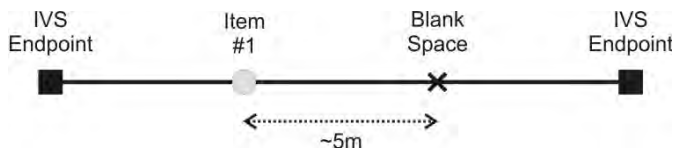

Figure 3: Example Layout of the IVS

Table 1: IVS

IVS ID	Seed Type	Local X (m)	Local Y (m)	Burial Depth DGM/ (cm)	Inclination/Orientation
Start	Stake	0	0	0	Vertical
IVS-01	Small ISO	3.04	0	9	Horizontal Across-Track
IVS-02	Small ISO	9.14	0	21	Horizontal Across-Track
End	Stake	13	0	0	Vertical

Table 2: ATS

IVS ID	Seed Type	Local X (m)	Local Y (m)	Burial Depth DGM/Analog (cm)	Inclination/Orientation
Start	Stake	0	0	0	Vertical
ATS-01	Small ISO	3*	0*	23**	Vertical
ATS-02	Small ISO	8*	0*	23**	Horizontal Across-Track
ATS-03	Large ISO	13*	0*	80**	Vertical
ATS-03	Large ISO	18*	0*	80**	Horizontal Across-Track

End	Stake	21	0	0	Vertical

* If ATS is used more than 2 weeks, vary the ATS and update the ATS record.

** Adjust ATS seed item depth, measured from ground surface to object center, for maximum reliable detection. Record final maximum reliable detection depth.

Table 3 Generic Initial IVS Survey Lines

Initial IVS Survey Line	Description	Purpose
1	Offset by - line spacing	Simulated grid line
2	Offset by – ½ line spacing	Offset response value
3	IVS Centerline	Simulated grid, IVS centerline
4	Offset + ½ line spacing	Offset response value
5	Offset by +line spacing	Simulated grid line
6	Offset by ~3m from IVS	Dynamic background noise line
–7 - 10	IVS Centerline	Initial IVS Response Average

Measurements of the item depths will be to the center of mass of each item. On-site personnel will bury the IVS targets using shovels to dig the holes to the appropriate depths for burial of the seed items in coordination with the Project Geophysicist. UXO personnel will implement MEC avoidance procedures using analog instruments during installation. The background survey data and anomaly avoidance techniques will be reviewed so that transect start and end stakes and the seed items are not placed on top of or near existing anomalies. IVS construction personnel will bury the ISOs and record the following information:

- The transect endpoints;
- Target type;
- Target emplacement location (tape measure and RTK DGPS);
- Target emplacement depth;
- Target emplacement inclination and orientation (horizontal across-track);
- Target Photograph ID

3.2.3.4 The holes will then be filled with soil and a suitable non-metallic marker will be placed at each buried item location as well as the start and end location of the IVS.

3.2.3.5 Prior to collecting production data and each morning before beginning field operations, EM61-MK2 data will be collected over each of the item locations in the IVS and background noise line. The raw files collected will be passed to the data processor who will perform the following steps:

- Import and level data as described in detail in SOP 05_OPS_05B.
- Examine the response profile(s) to verify that all data is valid.
- Manually select the peak z-component response measured over each of the IVS seed items.
- Verify that the measured IVS seed item response values and location accuracies are within the MQOs specified in the MEC QAPP Worksheet #12. The expected response for each IVS item is typically determined by collecting the IVS strip 5 times at the beginning of the project and averaging the resulting responses for each seed.

- Establish initial anomaly selection thresholds for transects and grids in accordance with the MEC QAPP Worksheet #12, typically 5 to 6 times the background noise statistic.

3.2.3.6 If the initial measurement performance criteria (MPCs) have not been met, the Project or QC Geophysicist will initiate a root cause analysis to determine the source of the discrepancies. If modifications to the instrument or procedures can be made so that the MPCs can be met, these modifications will be made. If the MPCs cannot be met the Project and QC Geophysicists will discuss potential resolutions with the project team.

3.2.3.7 Once the initial (or modified) MPCs have been met, the IVS/ATS survey will be complete and the system and operators verified for field data collection.

Note: A single small ISO, buried horizontal, at a depth of 23 cm, or as finalized at the ATS, may be used for a Function Check Area (FCA) at each work area. The FCA may be used to document that the analog systems remained operational through transport to each work site. The ATS, and if established, the FCA, will be used daily for instrument checks.

4.0 DATA MANAGEMENT

4.1 INPUT DATA REQUIRED

Input data required for this SOP are the locations and identities of the IVS/ATS items and the expected response for each (published DGM response tables/audible analog sensor response).

4.2 OUTPUT DATA

The test measurements over the IVS items described in Section 3.2.3, Step 5 will be saved in the project database. Also, the QC checklist in Attachment 1 of this SOP will be completed, signed, and filed as proof of performance. The analog checks are recorded in each team leader's log book, as well as the Analog QC database.

5.0 QUALITY CONTROL

5.1 IVS/ATS QUALITY CONTROL

This DFW is performed throughout the project and, therefore, has Preparatory, Initial and Follow-on QC checks. Performance of the required QC checks will be documented by the Field or Project Geophysicist on the Preparatory, Initial and Follow-on QC checklist in Attachment 1 to this SOP. Successful completion of these procedures will be verified by the UXOQCS on the Daily QC Report.

- The Preparatory QC Checklist covers the construction of the IVS/ATS. This checklist is completed once per project.
- The Initial QC Checklist covers the initial IVS/ATS tests to demonstrate proper function of the EM61-MK2 and Minelab E-TRAC systems prior to performing production work.
- The Follow-on QC Checklist will be filled out weekly to document that IVS/ATS tests are performed according to this SOP throughout the project.
- Achievement of the IVS/ATS MQOs will be verified by the QC Geophysicist in the appropriate Microsoft Access QC database and the UXOQCS on the Daily QC Report and Analog QC database.

5.2 MEASUREMENT QUALITY OBJECTIVE (MQOS)

The MQOs for the IVS/ATS are presented in Worksheet 12 of the QAPP. The EM61-MK2 or Minelab E-TRAC will not be used for field work until it is able to meet these MQOs or until the project team agrees on modifications to these MQOs.

5.3 REPORTING

The IVS/ATS data collection DFW will be documented through the completion of the Preparatory, Initial and Follow-on QC Surveillance Checklist in Attachment 1, in addition to the initial IVS/ATS Technical Memorandum. The IVS/ATS construction and implementation will be documented in an IVS/ATS Memorandum and a copy of the completed QC Checklist from this SOP will be included as an attachment to that report. Daily results with regard to the IVS/ATS MQOs will be tracked in the QC databases and will be considered acceptable documentation that collection and processing are being performed as required as long as the MQOs are achieved. A Follow-on QC Inspection will be completed by the Field Geophysicist/UXOQCS weekly during the production work as part of the 3-phase inspection process. A copy of all completed checklists will be included with the RI Report at the end of the project.

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ATTACHMENT 1
SOP DGM-01 IVS/ATS CONSTRUCTION AND PERFORMANCE QC SURVEILLANCE CHECKLIST

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TEAM INFORMATION		
Team:	Location:	Date:
Team Leader:		
Personnel Present:		
Phase of Inspection (check one): Preparatory ☐ Initial ☐ Follow-Up ☐		

CHECKLIST

ITEM	REF.	Inspection Point	Yes	No	N/A	Comments
IVS Construction	Section 3.2.1	Has an appropriate location for the IVS/ATS been selected?	☐	☐	☐	
	Section 3.2.2	Have appropriate IVS/ATS seed targets been selected and procured?	☐	☐	☐	
	Section 3.2.3 2	Has the background geophysical survey been performed?	☐	☐	☐	
	Sections 3.2.3.3 and 3.2.3.4	Were the target seeds buried appropriately, measured, photographed, backfilled, and marked?	☐	☐	☐	
	Section 5.3	Is the required data on the IVS/ATS construction from Section 3.2.3 recorded for inclusion in the IVS/ATS Technical Memorandum?	☐	☐	☐	
Data Collection	Section 3.2.3 5	Is the IVS/ATS data collected in accordance with the SOP?	☐	☐	☐	
Data Processing	Section 3.2.3.5	Did the Data Processor process the IVS data in accordance with the SOP?	☐	☐	☐	
MPC Documen-tation	Section 3.2.3.6	Have the MPCs for IVS/ATS data collection from Worksheet 12 been achieved and documented in the QC database?	☐	☐	☐	

FINDINGS	
Item	Comments

QC Geophysicist/UXOQCS: Date:

STANDARD OPERATING PROCEDURE – OPS-07
EXPLOSIVES STORAGE AND ACCOUNTABILITY

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide the minimum procedures and safety and health requirements applicable to the acquisition, storage, and accountability of explosives and unexploded ordnance (UXO) or munitions and explosives of concern (MEC).

The following USA Environmental, Inc. (USA) policies are not all inclusive nor are they applicable in all situations. This SOP is not a stand-alone document and is to be used together with the Work Plan, Site Safety and Health Plan, applicable Federal, State, and local regulations, and contract restrictions and guidance.

2.0 SCOPE

This SOP applies to all site personnel, including contractor and subcontractor personnel, involved in the conduct of operations on a site with UXO/MEC contamination. This SOP is not intended to contain all of the requirements needed to ensure compliance. Consult the documents listed in Section 8.0 of this SOP for additional compliance issues.

3.0 RESPONSIBILITIES

3.1 PROJECT MANAGER

The Project Manager (PM), in conjunction with the Senior UXO Supervisor (SUXOS), is responsible for the initial quantity and type of demolition material ordered. The initial requisition should be of sufficient quantity to support the project for a 90-day period. In the event that the project is scheduled to run for less than 90 days, only one requisition will be made, if possible.

3.2 SENIOR UXO SUPERVISOR

The Senior UXO Supervisor (SUXOS) will be responsible for all subsequent requisitions for demolition materials. He will accomplish this by submitting a purchase order (PO) request through the PM, who approves it and forwards it to Accounting for the preparation of a PO. Accounting then forwards the PO to the Program Manager for action.

4.0 REQUISITION PROCEDURES

The requisition of explosives will be in accordance with USA's policy, which requires that whenever possible three quotes be obtained to ensure the best possible price for the task. Of paramount importance in this process is the determination of the location of the supplier(s). Generally, response time to requisitions is better for those suppliers closest to the site. Additionally, there is the possibility of leasing explosives magazines from the supplier.

5.0 LICENSES/PERMITS

5.1 FEDERAL LICENSE

In order to requisition explosives, USA will maintain a valid Bureau of Alcohol, Tobacco, and Firearms (BATF) license/permit on hand, to include an Explosives Purchase/Receipt Authorization List for the receipt of explosives. These two documents must be on file at the USA Corporate Office, and at the project site, and each explosives supplier must also have a copy of each in order to sell to USA.

5.2 PUERTO RICO EXPLOSIVE PERMIT

Puerto Rico Explosive Permit is required under Commonwealth PR Law 134. USA personnel that will be performing the handling and use of explosives will maintain a current Explosive Permit. Only those individuals permitted by the Commonwealth may actually shoot the shot. The PM and SUXOS will be responsible for identifying the need to obtain an PR Explosive Permit for a given project and for scheduling the personnel resources needed to obtain the requisite license.

6.0 EXPLOSIVES RECEIPT

Only those individuals named on the authorization list may sign for explosives from the shipper. In order to ensure that the quantity shipped is the same as the quantity listed on the shipping documents, two USA personnel will inventory the shipment prior to signing receipts.

6.1 SHIPPING DOCUMENTS

Explosive shipments generally are accompanied by the explosive supplier's Bill of Lading (B/L) and the freight company's shipping document. The initial inventory will include reconciling the two documents with the actual shipment and creating an on-site record that includes these documents and the inventory records. Regardless of the outcome of the initial inventory, one copy of the B/L and the freight company's shipping document will be attached to a copy of the PO request and the PO. One copy of each of the four documents will be filed on site, and one complete set will be forwarded to the Corporate Office.

6.2 RECEIPT DISCREPANCIES

In the event that there is a discrepancy between the amount shipped and the amount received, the SUXOS will immediately contact the PM and explosives supplier and inform the supplier of the discrepancy. It is then the responsibility of the supplier and shipper to rectify the situation and inform USA of the results. The supplier and/or shipper must then correct their documents and forward the corrected documents to the site. In all cases, only the amount received will be entered on the Explosives Accountability Record/Magazine Data Card, as shown in Figure 1.

7.0 STORAGE AND ACCOUNTABILITY

Demolition operations require the availability and storage of explosive materials. To the maximum extent possible, local government facilities will be used.

7.1 STORAGE

Demolition operations require the availability and storage of explosive demolition materials. To the maximum extent possible, local government or existing facilities will be used. Existing facilities are desirable because of their low cost and pre-approval, negating transport and set up. USA will comply with local storage criteria and procedures when using Government facilities. When required to provide explosives storage, USA will:

- Use portable approved BATF Type 2 structures or existing Government-furnished magazines.
- Locate, install, and maintain the magazines to comply with the magazine criteria and quantity distance requirements established in DOD 6055.9-STD, DoD Ammunition and Explosives Safety Standards.
- Install sufficient magazines to comply with explosive compatibility requirements, (i.e., bulk explosives, initiating explosives, and MEC).
- Establish security, such as fencing and/or guards, to prevent unauthorized access and/or theft.

7.1.1 Type 2 Outdoor Magazines

A Type 2 magazine is a box, trailer, semi-trailer, or other mobile facility.

7.1.1.1 General

Outdoor magazines will be bullet-resistant, fire-resistant, weather-resistant, theft-resistant, and ventilated. They will be supported to prevent direct contact with the ground and, if less than 1 cubic yard in size, will be securely fastened to a fixed object. The ground around outdoor magazines must slope away for drainage or other adequate drainage provided. When unattended, vehicular magazines must have wheels removed or otherwise effectively immobilized by kingpin locking devices or other methods.

7.1.1.2 Exterior Construction

The exterior and doors are to be of not less than ¼-inch steel and lined with at least 2 inches of hardwood. Magazines with top openings will have lids with water-resistant seals or which overlap the sides by at least one inch when in a closed position.

7.1.1.3 Hinges and Hasps

Hinges and hasps will be attached to doors by welding, riveting, or bolting (nuts on inside of door). Hinges and hasps will be installed so they cannot be removed when the doors are closed and locked.

7.1.1.4 Locks

Each door will be equipped with two padlocks fastened in separate hasps and staples. Padlocks must have at least five tumblers and a case-hardened shackle of at least 3/8-inch diameter. Padlocks will be protected with not less than ¼-inch steel hoods constructed so as to prevent sawing or lever action on the locks, hasps, and staples.

7.1.2 Signs and Placards

The BATF and the DoD require that all magazines be appropriately posted to indicate the hazard class of the contents, the fire fighting hazards, and the emergency notification list. Magazines will be placarded in accordance with DOD 6055.9-STD. This will require that the magazine area be posted for the most hazardous items stored in the magazine area. For example, a Fire Division Class 1 is needed for recovered UXO, and a Fire Division Class 3 for the demolition material, excluding detonators, which are Fire Division Class 4. In the event that there are two fire division or hazard class items in the same magazine, use the higher hazard division/class placard.

7.1.3 Lightning Protection

Appropriate lightning protection will be installed in accordance with Chapter 7 of DOD 6055.9 and/or the National Fire Protection Association (NFPA) requirements. For sites where existing storage facilities are typically not available, lightning protection is not required if the following criteria are met:

- The magazine is constructed of metal that is 3/16-inch steel or larger (reference Appendix L of NFPA 780).
- The magazine is grounded in accordance with NFPA requirements.
- All parts of the magazine are located at least 6.5 feet from the nearest fence.

7.1.4 Emergency Notification List

An emergency notification list containing the names, telephone numbers, and local addresses of the individuals to be notified in the event of an emergency, will be posted on the outside and inside of the magazine door. These individuals should be the same individuals authorized to sign for explosives.

7.1.5 Compatibility

Explosive compatibility will be maintained. Table 1 lists the various storage compatibility groups and Table 2 is the compatibility chart. In certain instances, it may be necessary to store incompatible items in the same magazine. If this should occur, a barricade, such as sandbags, within the magazine will physically separate the incompatible items. This situation should be an interim occurrence to be avoided and, if needed, approved by the client prior to implementation.

7.1.6 Key Control

Magazines will remain locked except when receipts and issues are being made. The two locks on the magazines will require two different keys to unlock. One key will be kept by the SUXOS and the second key by the UXO Quality Control Specialist (UXOQCS). This procedure ensures that access to the magazines cannot be made without obtaining the two keys and no one individual can gain access to the magazines.

7.2 ACCOUNTABILITY

USA will employ the following procedures to account for explosive materials:

- Control of and access to explosive magazines will be strictly controlled by the SUXOS. All issues and turn-ins of explosives will be properly documented and verified, though physical count, by a UXOQCS.
- On receipt, the type, quantity, and lot number of each explosive item is recorded in the magazine data card and the original receipt documents will be maintained on file by the SUXOS or Site Manager.
- All requests for explosives, from the individual operating sites, will be reviewed by the SUXOS. Only sufficient explosives for the day's operations are issued.
- Issues of explosives are recorded on explosives usage records (Figure 2) and deducted from the magazine data card(s) (Figure 1). This procedure will ensure that the quantities of explosives on-the-floor in the magazine reflect the quantities listed on the magazine data card, and that issued explosives are accounted for while they are in the possession of individual users.
- Entries made on the explosive usage records and magazine data cards will be verified through physical count by the UXO Team Leader drawing or turning-in the explosives and the UXOQCS.
- All unused explosives are turned in at the end of each day, re-entered on the magazine data card, and recorded on the explosives usage record.
- At the end of each day the SUXOS and the UXO Team Leader reconcile the entries on each explosives usage record, and will turn these records over to the Project Manager.
- Weekly, the Site Manager will direct that the SUXOS (or approved designee), the UXOQCS, and a Team Leader will perform a 100 percent inventory of all explosives on hand. These inspections will include a physical count of the explosives and a comparison of this amount with the amount listed on the individual magazine data cards. Discrepancies and the results of these inventories will be recorded and reported to the Site Manager.

7.2.1 USAGE INVENTORY

Following each occurrence of a receipt or issue of explosive material, the UXOQCS will conduct a joint inventory in conjunction with the demolition team leader, drawing out or returning the explosives. Only those items issued/returned will be inventoried. The UXOQCS will appropriately annotate the two sets of magazine data cards and the explosives usage record (Figure 2).

7.2.2 WEEKLY INVENTORY

The last day of each work week, the SUXOS, the UXOQCS, and a third individual (who will be changed each week) will conduct an inventory and record results on the two sets of magazine data cards.

7.2.3 DISCREPANCIES

In the event that there is a discrepancy during any inventory, the item will be recounted a minimum of two additional times. If a discrepancy still exists, the PM, the Customer's Contracting Officer (or the Contracting Officer's Representative) and the BATF will be notified. All actions from this point will be dictated by the BATF.

7.3 SUMMARY

The procedures contained in this SOP ensure that explosive materials are properly stored, accounted for, and issued. These procedures will be strictly followed and violations of these policies may result in an employee's immediate dismissal.

8.0 REFERENCES

Procedures and information contained in this document were obtained from the below listed references:

- USA Safety and Health Program (SHP)
- DOD 4145.26-M, Contractors' Safety Manual for Ammunition and Explosives
- DOD 6055.9-STD, Department of Defense (DoD) Ammunition and Explosives Safety Standards
- DOD 4160.21-M, Defense Reutilization and Marketing Manual
- DA PAM 385-64, Ammunition and Explosives Safety Standards
- AR 385-64, Ammunition and Explosives Safety Standards
- AR 200-1, Environmental Protection and Enhancement
- AR 385-10, The Army Safety Program
- AR 385-16, System Safety Engineering and Management
- AR 385-40 w/USACE supplement, Accident Reporting and Records
- TM 9-1300-200, Ammunition General
- TM 9-1300-214, Military Explosives
- TM 60 Series Publications
- OSHA, 29 CFR 1910, Occupational Safety and Health Standards
- OSHA, 29 CFR 1926, Construction Standards
- EPA, 40 CFR Parts 260 to 299, Protection of Environment (applicable sections)
- DOT, 49 CFR Parts 100 to 199, Transportation (applicable sections)
- BATF P 5400.7, BATF-Explosives Law and Regulations
- USACE EM 385-1-1, Safety and Health Requirements Manual
- USACE ER 385-1-92, Safety and Occupational Health Document Requirements for Hazardous Waste Remedial Actions

- EP 385-1-95a Basic Safety Concepts and Considerations for Ordnance and Explosives Operations

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Table 1: Storage Compatibility Groups for Explosives and Ammunition

GROUP A	
Cyclonite (RDX), dry	Mercury fulminate, wet
HMX, dry	PETN, dry
Lead azide, wet	RDX (cyclonite), dry
Lead styphnate, wet	Tetracene, wet
GROUP B	
Fuses (except chemically actuated fuses containing ampules which may initiate, directly or indirectly, explosives and explosives-loaded components which are assembled in the conventional manner to form the finished explosive fuse).	Detonators
	Mines, practice, AP, M17
	Percussion elements
	Primer detonators
GROUP C	
Ammunition, blank and saluting, cannon	Cartridge, 90mm, canister, AP
Ammunition, .50 caliber, except API/incendiary	Cartridges, practice, over 40mm
Ammunition, 20mm, practice and high pressure test	Catapults, aircraft ejection seat, M3A1, M4A1, M5
Ammunition, 25mm, with inert projectile	Charge, propelling, not assembled to projectiles EC powder
Ammunition, 27mm, caseless	Detonating cord (primacord)
Ammunition, 30mm, ball and high pressure test	Nitrocellulose
Ammunition, 30mm, practice and training	Fuel (solid), emergency power unit
Ammunition, 37mm and 40mm, TP and AP	Propellant
Ammunition, 40mm, practice, M407A1, M382, and M385	Rockets, practice, 3.5-inch
Benite	Rocket motors, M3, M5, M6, M10, M13, M26, M30, M37, M42, M53, M66; Pershing 1st and 2nd stages; Spartan 1st, 2nd, and 3rd stages
Boron potassium nitrate	
GROUP D	
Adapter booster	Explosive D
Ammonium nitrate, except in original shipping container or equivalent	Explosives, cratering
Ammonium perchlorate, except when particle size is over 15 microns and in original shipping container or equivalent	Grenades, rifle, AT (except pentolite loaded)
Ammonium picrate (Explosive D)	HMX, wet
Bangalore torpedoes	Mine, APERS, MN, M14 (w/integral fuse)
Baratol	Mines, antipersonnel (bounding type
Black powder, bulk	Mines, antipersonnel (cast iron block)
Bombs, demolition	Mines, HEAT Nitrocellulose wet 8-30% water exposed to detonation hazards at less than intra line distance
Bombs, fragmentation	Nitroguanidine

Bombs, general purpose	Nitrostarch Octol
Boosters	PBX
Boosters, auxiliary	pentolite
Bursters	PETN, wet
Charge, demolition, snake	Picratol
Charge, springing earth rod, blast driven	Picric acid
Charge, supplementary, HE	Projectiles, HE, fuzed or unfuzed
Compositions A, A-2, A-3, A-4, B, B-3, C, C-2, C-3, and C-4	RDX (Cyclonite), wet
Cutter, cable M1	Rocket heads, HE and HEAT (except pentolite loaded) w/o motors
Cyclonite (RDX), wet	Shaped charges
Cyclotol	Tetranitrocarbazole (TNC)
Demolition Blocks	Tetryl
Destructor, HE, M10	Tetrytol
Detonating cord (primacord) exposed to detonation hazard at less than intra line distance	TNT
Dynamite	Tritonal
Ednatol	Torpex
GROUP E	
Ammunition, HEP	Ammunition, fixed and semi-fixed, 90mm through 106mm, loaded with ammonal, amatol, Explosive D, composition B or TNT
Ammunition, 20mm, HE, HEI and functional packs containing HE and HEI	Cartridge, heavy mortar, over 81mm (including 81mm M56), except chemical loaded
Ammunition, 30mm, HEDP	Cartridge, light mortar, 81mm or less (excluding 81mm M56), except chemical loaded
Ammunition, 37mm, HE	Redeye guided missiles, packaged 3 complete rounds w/launcher
Ammunition, 40mm, HE, RDX loaded	
Ammunition, 40mm, HE, M406, M386, M441, and M463	Rockets, HEAT, 3.5-inch, complete round
Ammunition, 57mm through 81mm, except White Phosphorous smoke, HEP and blank	Rockets, HE, 2.75-inch (in LAU-3/A rocket launcher)
GROUP F	
Grenades, hand offensive	Grenades, fragmentation
GROUP G	
Ammunition, .50 caliber API and incendiary	Grenades, hand, CN1, ABC, M25A1, w/fuse C12
Ammunition, 20mm, API	Grenades, hand, CM1, ABC, M25A2, w/fuse C12
Ammunition, 20mm, incendiary and functional packs containing incendiary, except those containing HE or HEI	Grenades, illuminating and incendiary

Ammunition, 40mm, riot control and pyrotechnic loaded, except White Phosphorous smoke	Grenades, practice, w/spotting charge
Bombs, photoflash	Grenades, rifle, smoke, XM48E1 and M22 and M23
Cartridge, igniter, M2	Grenades, smoke (except White Phosphorous and PWP)
Cartridge, illuminating	Grenades, riot control, CS1, M25A2
Cartridge, photoflash	Igniter, spotting charge
Cartridge cases, primer (w/o propellant)	Igniters for rocket motors (e.g., M12, M18, M20 and M29)
Charge, igniter assembly, for practice hand grenades	Ignition cartridge for trench mortar ammunition
Charge, spotting, APR practice, M8	Illuminating compositions (consolidated in final press operations)
Chemical ammunition, Group B, tear or smoke producing, w/explosive components, over 40mm	Mines, practice, w/spotting charge and/or fuse
Chemical ammunition, Group B, tear or smoke producing, w/o explosive components	Nuclear fire marker device 11-F2
Chemical ammunition, Group D, containing flammable solids, except for TEA or TPA, w/o explosive components	Photoflash powder
Chemical ammunition, Group D, fixed or semi-fixed rounds, containing flammable solids, except for TEA or TPA	Primers, artillery and cannon, percussion and electric
Clusters, incendiary bomb, M31 and M32 (w/o fuzing components)	Projectiles, illuminating
Destroyer, file, M4	Rocket, riot control agent, CS, 2.75-inch FFAR, MX99
Detonation, simulator, explosive M80	Simulators, M110, M115, M116, M117, M118, M119 and XM142
Grenade, hand, smoke, HC, M8	Smoke pots
Grenades, hand, CN, M7A1, w/fuse M201A1	Spotting charges (cartridge for miniature practice bombs)
Grenades, hand, CS, M7A3, w/fuse M210A1	
GROUP H	
Chemical ammunition, Group C	Grenade rifle, White Phosphorous, M19
Grenades, White Phosphorous	
GROUP J	
Chemical ammunition, Group D, containing flammable liquids or gels, with or w/o explosive components	Chemical ammunition, Group D, fixed and semi-fixed rounds, containing flammable liquids or gels with or without explosive components
GROUP K	
Chemical ammunition, Group A, with or without explosive components	Chemical ammunition, Group B, with or without explosive components, designed for toxic or incapacitating effects greater than lachrymation
Rockets, toxic chemical agents, complete rounds	

GROUP L	
Aluminum powder	Fuzes, chemically actuated, containing ampoules which may initiate directly or indirectly, explosives and explosives loaded components which are assembled in the conventional manner to form the finished explosive fuse
Ammonium nitrate	Magnesium powder
Ammonium perchlorate	Grenades, rifle, AT (pentolite loaded)
Ammunition, pentolite loaded	Nitrates (inorganic), except ammonium nitrate (in original shipping container or equivalent)
Chemical Ammunition, Group A, without explosive components	Perchlorates
Chemical ammunition, Group B, without explosive components, designed for toxic or incapacitating effects more severe than lachrymation	Peroxides, solid
Chemical ammunition, Group D, TEA or TPA components	Rocket heads, pentolite loaded, w/o motors
Chlorates	Zirconium (types I and II, spec. FED 1665)
DNT	
GROUP S	
Ammunition, 40mm, canister and multiple projectile	Fuse lighters
Ammunition, small arms, less than .50 caliber	Fuse safety
Explosive bellows	Squibs commercial
Firing devices	

Table 2: Storage Compatibility Chart

GROUPS	A	B	C	D	E	F	G	H	J	K	L	S
A	X	Z										Z
B	Z	X										X
C			X	Z	Z		Z					X
D			Z	X	X							X
E			Z	X	X							X
F						X						X
G			Z				X					X
H								X				X
J									X			X
K										X	U	
L										U		
S	Z	X	X	X	X	X	X	X	X			X

Notes:

1. The marking AX@ at an intersection of the above chart indicates that these groups may be combined in storage. Otherwise, mixing is either prohibited or restricted per Note 2 below.
2. The marking AZ@ at an intersection of the above chart indicates that, when warranted by operational considerations or magazine non-availability, and when safety is not sacrificed, these groups may be combined in storage.
3. Equal numbers of separately packaged components of complete rounds of any single type of ammunition may be stored together. When so stored, compatibility is that of the assembled rounds; i.e., White Phosphorous Filler in Group H, HE Filler in Groups D, E, or F, as appropriate.
4. Group K required not only separate storage from other groups, but also requires that munitions having different toxic chemical agent fillers be stored separately from each other.
5. The marking AU@ on above chart indicates that leaking toxic chemical munitions of one agent type, i.e., GB, with or without explosive components, may be stored together in one magazine specifically designated for storage of leakers of that agent type.
6. Ammunition designated APRACTICE@ by NSN and nomenclature may be stored with the fully loaded ammunition it simulates.

Magazine Data Card

Nomenclature:

Lot Number: Unit Of Issue:

Date	Name	Received	Issued	Balance	Checkers Initials

Figure 1: Magazine Data Card

Explosives Usage Record

Contract Number:

Team Number: Date: Project Name:

Team Leader: Work Areas & Grid Numbers:

Explosives Issued Signature Of Team Leader:

Item	Quantity	Lot Number	Checkers Initials

Explosives Expended Signature Of Team Leader

Item	Quantity	Lot Number	Checkers Initials

Explosives Returned Signature Of QC Officer:

Item	Quantity	Lot Number	Checkers Initials

The signatures in each section of this document indicate that the items listed in that section were in fact issued, expended, or returned to storage and that the quantities listed were verified through a physical count.

Figure 2: Explosives Usage Record

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STANDARD OPERATING PROCEDURE
OPS-08 – EXPLOSIVES AND AMMUNITION TRANSPORTATION

1.0 PURPOSE

The purpose of this Explosives and Ammunition Transportation Standard Operating Procedure (SOP) is to provide the minimum procedures and safety and health requirements applicable to the transportation of explosives and unexploded ordnance (UXO) or munitions and explosives of concern (MEC).

The following USA Environmental, Inc. (USA) policies are not all inclusive nor are they applicable in all situations. This SOP is not a stand-alone document and is to be used together with the Work Plan, Site Safety and Health Plan, applicable Federal, State, and local regulations, and contract restrictions and guidance.

2.0 SCOPE

This SOP applies to all site personnel, including contractor and subcontractor personnel, involved in the conduct of operations on a site with UXO/MEC contamination. This SOP is not intended to contain all of the requirements needed to ensure compliance. Consult the documents listed in Section 6.0 of this SOP for additional compliance issues.

3.0 TRANSPORTATION REQUIREMENTS FOR EXPLOSIVES AND MEC

Transportation of munitions and explosives of concern (MEC) and explosives will comply with all Federal, State, and local regulations. Permits are not required under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) for on-site or on Federal Installation transportation of explosives or MEC. Off-site shipment of MEC will be made using commercial carriers approved to transport ammunition and explosives (Hazard Class A and B). For off-site shipment:

- MEC will be packaged in accordance with 49 CFR part 173.
- Drivers will be provided with DD Form 836 (Special Instructions for Motor Vehicle Drivers).
- Vehicles will be inspected using DD Form 626, Motor Vehicle Inspection, and be properly placarded.
- Compatibility requirements will be observed.
- The load will be well braced and, except when in closed vans, covered with a fire-resistant tarpaulin.

USA uses a Puerto Rico Explosive Vendor for the delivery of the explosives when on Puerto Rico roadways. The vendor delivering the explosives must adhere to PR Law 134, have a current PR Explosive Permit and coordinate the delivery with San Juan Police Department. The San Juan Police Department will provide a police escort for the delivery.

4.0 SUMMARY

Transportation of explosives presents risks to both the vehicle operator and the surrounding populace. The procedures contained in this SOP are designed to eliminate and/or mitigate these risks. Personnel engaged in these activities will strictly comply with these procedures and those contained in the referenced documents.

5.0 REFERENCES

Procedures and information contained in this document were obtained from the references listed below:

- USA Corporate Safety and Health Program (CSHP)
- DOD 4145.26-M, Contractors' Safety Manual for Ammunition and Explosives
- DOD 6055.9-STD, Department of Defense (DoD) Ammunition and Explosives Safety Standards
- DOD 4160.21-M, Defense Reutilization and Marketing Manual
- DOT, 49 CFR Parts 100 to 199, Transportation (applicable sections)
- 27 CFR Part 55, Commerce in Explosives
- 29 CFR 1910, Occupational Safety and Health Standards
- 29 CFR 1926, Construction Standards
- EPA, 40 CFR Parts 260 to 299, Protection of Environment (applicable sections)
- BATF 5400.7, Bureau of Alcohol, Tobacco, and Firearms Explosives Laws and Regulations
- USACE EM 385-1-1, Safety and Health Requirements Manual
- TM 9-1300-200, Ammunition General
- TM 9-1300-214, Military Explosives
- TM 60 Series Publications

ATTACHMENT 1

Explosive Vehicle Inspection, ON-SITE

This form must be filled out for any vehicle carrying explosives, prior to loading.
This form is for use on site only, if traveling on public highways use DD Form 626

DRIVERS NAME _____ LICENSE NUMBER _____
COMPANY _____
TYPE OF VEHICLE _____ VEHICLE NUMBER _____
INSPECTION DATE/TIME _____ INSPECTOR _____

PART INSPECTED	SAT.	UNSAT.	COMMENT
HORN			
STEERING SYSTEM			
WIPERS			
MIRRORS			
FIRE EXTINGUISHERS (10 ABC, 2 EACH)			
REFLECTORS			
EMERGENCY FLASHERS			
LIGHTS			
ELECTRIC WIRING			
FUEL SYSTEM			
EXHAUST SYSTEM			
BRAKE SYSTEM			
SUSPENSION			
CARGO SPACE			
TIRES, WHEELS, RIMS			
TAILGATE			
TARPAULIN			

INSPECTION RESULTS (INSPECTOR INITIAL) ACCEPTED _____

REJECTED _____

REMARKS _____

DRIVERS SIGNATURE/DATE _____ INSPECTORS SIGNATURE/DATE _____

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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-12 – HEAVY EQUIPMENT OPERATION

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide all USA Environmental, Inc. (USA) employees and subcontractors with the minimum safety and health requirements and procedures applicable to the conduct of operations involving the use of heavy equipment.

2.0 SCOPE

This SOP applies to all site personnel, to include contractor and subcontractor personnel, and operations involved in the conduct of heavy equipment operations. This SOP is not intended to contain all 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) 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.

3.2 SENIOR UXO SUPERVISOR

The Senior Unexploded Ordnance Supervisor (SUXOS) will ensure that this SOP is implemented for heavy equipment 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.

3.3 UXO TECHNICIAN III

The UXO Technician III (UXOTIII) will 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 will be responsible for implementing the SUXOS's responsibilities outlined in Paragraph 3.2.

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 heavy equipment operations will be familiar with the potential safety and health hazards associated with the conduct of this operation, and with the work practices and control techniques to be used to reduce or eliminate these hazards. In

the event that ordnance and explosives are present at the work site, the procedures for anomaly avoidance and soil excavation will be presented in the Work Plan and Site Safety and Health Plan (SSHP).

4.1 SAFETY HAZARDS AND OPERATIONAL CONTROL TECHNIQUES

The operational control techniques to be used during conduct of heavy equipment operations are discussed below:

- The operation of heavy equipment will be limited to authorized personnel specifically trained in its operation.
- A competent person will visually inspect heavy equipment daily prior to operation, and report any abnormalities/deficiencies to the UXOSO.
- The operator will use the safety devices provided with the equipment, including seat belts and backup warning indicators, and horns will be operable at all times.
- While in operation, all personnel not directly required in the area will keep a safe distance from the equipment.
- The operator's cab will be kept free of all non-essential items, and all loose items will be secured.
- Personnel will avoid moving into the path of operating equipment, and areas blinded from the operator's vision will be avoided.
- Heavy equipment requiring an operator will not be permitted to run unattended.
- Except for equipment designed to be serviced while in operation, all equipment will be shut down and positive means taken to prevent its operation while repair or servicing is being conducted.
- All equipment will be secured at the end of the day, or when not in operation, with the blades/buckets of earth-moving equipment placed on the ground.
- Equipment operated on the highway will be equipped with turn signals visible from the front and rear.
- Stationary machinery and equipment will be placed on a firm foundation and secured before being operated.
- All points requiring lubrication during operation will have fittings so located or guarded as to be accessible without hazardous exposure.
- Mobile-type equipment operating within an off-highway job site not open to public traffic will have a service brake system and a parking brake system capable of stopping and holding the equipment fully loaded on the grade of operation.
- Heavy equipment will be shut down prior to and during fueling operations.
- All equipment with windshields will be equipped with powered wipers and equipment that operates under conditions that cause fogging or frosting of windshields will be equipped with operable defogging or defrosting devices.
- Whenever the equipment is parked, the parking brake will be set, and equipment parked on inclines will have the wheels chocked or track mechanism blocked and the parking brake set.
- Personnel will not work or pass under the buckets or booms of loaders in operation.
- Each bulldozer, scraper, drag-line, crane, motor grader, front-end loader, mechanical shovel, backhoe, dump truck, and other similar equipment will be equipped with at least one dry chemical fire extinguisher having a minimum Underwriters Laboratories (UL) rating of 5-B:C.
- When heavy equipment must negotiate in tight quarters, or if operators of earth-moving equipment cannot see the bucket, a secondary person will be stationed to guide the operator.
- Additional riders will not be allowed on equipment, unless it is specifically designed for that purpose (i.e., there is an additional seat with a seat belt).

4.2 SAFETY AND PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS

The following safety measures and personal protective equipment (PPE) will be used in preventing or reducing exposures associated with heavy equipment operations. These requirements will be implemented, unless superseded by site-specific requirements stated in the SSHP.

- Heavy equipment operators will have received training which addresses the safe operation of the equipment to be used.
- Heavy equipment operators will wear the level of PPE as specified in the SSHP.

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 the 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, Subpart O (applicable parts)
- OSHA General Industry Standard 29 CFR, Part 191, Subpart N (applicable parts)
- USACE Engineer Manual 385-1-1, Section 16.

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STANDARD OPERATING PROCEDURE
OPS 13- MPPEH MANAGEMENT

1. PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide procedures that ensure that interior and exterior of all recovered MPPEH is inspected to determine what explosive hazard, if any exist, requiring further treatment before shipping off site for final treatment. These procedures are general in nature and may be refined with the concurrence of the Senior UXO Supervisor (SUXOS) to adapt to specific site conditions and circumstances.

2. SCOPE

These procedures will be conducted in accordance with the Quality Assurance Project Plan (QAPP), the Site Health and Safety Plan (SHSP) and the Explosives Safety Submission (ESS). This SOP provides the MPPEH management process that describes the inspection, storage, certification/verification procedures, and the chain of custody requirements for materials documented as safe (MDAS) slated for shipment to an authorized recycler. Specific requirements for personnel, training, equipment/material, surface search, and documentation are found in the QAPP.

3. INSPECTION PROCESS

All recovered MPPEH items will undergo a 100% inspection and an independent 100% re-inspection to determine and document whether it is safe (MDAS) or whether it is known to have or is suspected of having an explosive hazard [material documented as an explosive hazard (MDEH)]. The sequence of events in the inspection process is summarized in Figure 1. A Material Inspection and Release Form (Attachment 2) will be completed to document the two 100% inspections performed on all recovered materials.

A UXOTII (a UXOTI can tentatively identify items, however, a UXOTII or UXOTIII must confirm the identification) will perform a 100% inspection of each item as it is recovered and determine:

- If the item is MDAS, requiring no additional treatment prior to containerizing for off-site shipment
- If the item is MDEH that requires additional treatment (demilitarization, i.e. detonation or venting to expose a dangerous filler)
- If item is range related debris that may require draining fluids or removal of visible liquid hazardous, toxic or radiological waste (HTRW) materials.

A UXOTIII will:

- Conduct a 100% re-inspection of all recovered items to determine the proper classification as MDAS, MDEH or an item containing other dangerous fillers or HTRW constituents.
- Supervise the segregation of items by category to ensure no co-mingling of MDAS and MDEH or HTRW items.

The UXOQCS will:

- Conduct daily audits of UXO Teams performing the MPPEH inspection process and will conduct and document random sampling of all processed MDAS, MDEH and HTRW items to ensure no co-mingling occurs.

The UXOSO will:

- Ensure specific procedures and responsibilities for processing MPPEH for certification as MDAS MDEH or range-related debris outlined in the WP and this SOP are being followed
- Ensure all procedures for processing are being performed safely and consistent with applicable regulations.

The SUXOS will:

- Perform random checks to determine that the munitions debris and range-related debris are free from explosive hazards necessary to complete the appropriate Requisition and Turn-in Document, DD Form 1348-1A (see Attachment 1)
- Ensure that a DD Form 1348-1A is completed for all MDAS and range-related debris to be transferred for final disposition
- Ensure the WP, QC Plan and this SOP outline the procedures and responsibilities for processing MPPEH for final disposition as MDAS or range-related debris
- Certify all MDAS and range-related debris with one of the following statements as applicable –

  > "This certifies that the material listed has been 100 percent properly inspected and, to the best of our knowledge and belief, are free of explosive hazards, engine fluid, illuminating dials and other visible liquid HTRW materials."[1]
  >
  > "This certifies and verifies that the material listed has been 100 percent inspected and to the best of our knowledge and belief, are inert and/or free of explosives or related materials."[2]

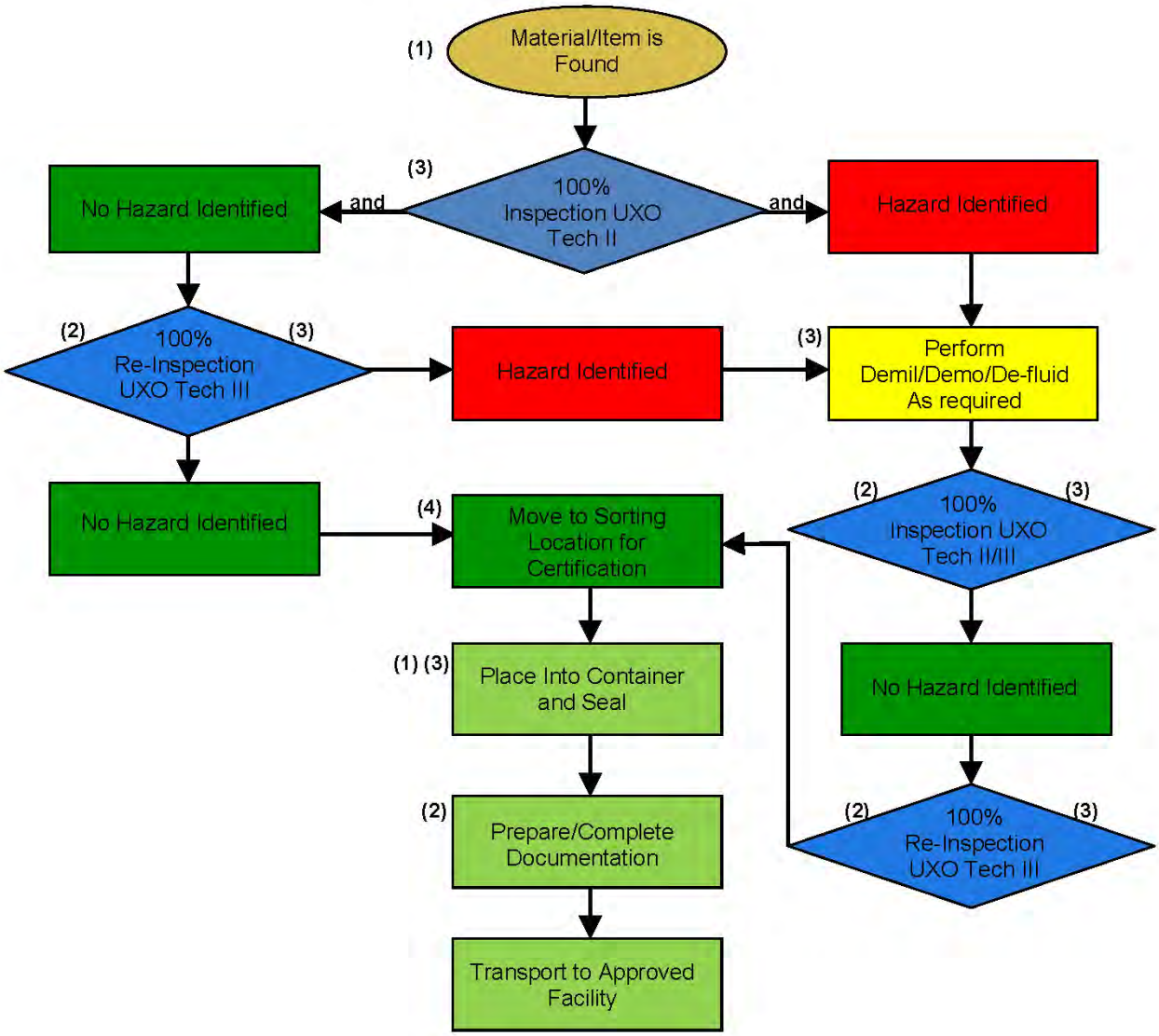
- Ensure that inspected debris is secured in sealed and labeled containers.

This space is intentionally left blank.

[1] This statement will be used on any ranges where range-related debris is being processed along with munitions debris

[2] This statement will be used for properties where only munitions debris is being processed

Figure 1: MPPEH Inspection Process



Notes:

During performance of the steps within the MPPEH Inspection Process, Notes 1 – 4 below are utilized to ensure supervision and compliance requirements are met.

(1) The UXOQCS will conduct daily audits of procedures used by UXO teams for MPPEH processing.
(2) The UXOQCS will perform random sampling of recovered material/items and documents for accuracy/completeness.
(3) The UXOSO will observe procedures to ensure compliance with the approved plans and safety measures.
(4) The SUXOS will perform random checks to satisfy that the munitions debris and range-related debris is free from explosive hazards necessary to complete DD Form 1348-1A.

4. MDAS CONTAINERIZATION

MDAS is placed in closed containers that will be sequentially number and:

- Closed in such a manner that the applied seal will be broken if the container is opened
- Clearly labeled with USA Environmental, Inc., the installation/project name, the sequence number (e.g. 0001), and the container's unique seal identification, see Attachment 3 for detailed requirements for completing the label

5. MDAS CERTIFICATION AND VERIFICATION

The SUXOS will certify the MDAS by preparing and signing the DD Form 1348-1A for all shipments of recovered materials as discussed in Section 3 above. The designated government representative will verify the shipments if available, otherwise the shipment verification is delegated to the UXOQCS.

The 1348-1A will contain the appropriate statement as mentioned in Section 3 and prepared to provide the required information as shown in Attachment 1.

6. MAINTAINING THE CHAIN OF CUSTODY

The chain of custody must remain intact until the MDAS is released from DOD control that is received and signed for by the qualified receiver to further manage and process the material in accordance with DOD Instruction 4140.62. The qualified receiver will:

- Receive the unopened labeled containers
- Review and concur with the supporting documents
- Sign the 1348-1A and provide on company letterhead stating the contents of the sealed containers will not be sold, traded or otherwise given to another party prior to smelting and are only identifiable by their basic contents
- Send the supporting documentation and notification to USA that the MDAS in the sealed containers has been smelted and is only identifiable by its basic content.

If the chain of custody is broken at any time during shipment, the contents of the affected container will revert to MPPEH and will require a second 100% inspection and a 100% re-inspection, be documented as certified and verified as MDAS by qualified USA personnel.

ATTACHMENT 1.
DD FORM 1348-1A EXAMPLES

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DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

1 2 3 4 5 6 7 23 24 25 26 27 28 29 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

DOCUMENT | RI FROM | M&S | UNIT | QUANTITY | SER | SUPPLEMENTARY ADDRESS | SIG | FUND | DISTRIBUTION | PROJECT | PRI | REQD | DEAD | ADV | RI | O/P | COND | MGT

UNIT PRICE DOLLARS CTS | DOLLARS CTS | 1. TOTAL PRICE | 2. SHIP FROM | 3. SHIP TO | 4. MARK FOR

5. DOC DATE | 6. NMFC | 7. FRT RATE | 8. TYPE CARGO | 9. PS

10. QTY. REC'D | 11. UP | 12. UNIT WEIGHT | 13. UNIT CUBE | 14. UFC | 15. SL

16. FREIGHT CLASSIFICATION NOMENCLATURE

17. ITEM NOMENCLATURE

18. TY CONT | 19. NO CONT | 20. TOTAL WEIGHT | 21. TOTAL CUBE

22. RECEIVED BY | 23. DATE RECEIVED

24. DOCUMENT NUMBER & SUFFIX (30-44)

Basic Material Content: _____

Estimate Weight (lbs): _____

Container ID No.: _____ Seal ID No.: _____

25. NATIONAL STOCK NO. & ADD (8-22)

Site Address: _____

_____

Site Telephone No.: _____

26. RIC (4-6) UI (23-24) QTY (25-29) CON CODE (71) DIST (55-56) UP (74-80)

This certifies and verifies that the material listed has been100 percent inspected and to the best of our knowledge and belief, are inert and/or free of explosives or related materials.

27. ADDITIONAL DATA

Certify By:

_____ Date: _____
Senior UXO Supervisor / Team Leader

Verify By:

_____ Date: _____
USACE OE Safety Specialist

USA Environmental, Inc., 720 Brooker Creek Boulevard, Suite 204, Oldsmar, Florida 34677, Telephone: 813.343.6336, Fax: 813.343.637

PREVIOUS EDITION MAY BE USED

PerFORM (DLA)

Reset

DD Form 1348-1A: FOR USE FOR PROPERTIES WHERE ONLY MUNITIONS DEBRIS IS BEING PROCESSED

DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

1 2 3 4 5 6 7 23 24 25 26 27 28 29 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

DOCUMENT | FROM | M&S | UNIT | QUANTITY | SER | SUPPLEMENTARY ADDRESS | SIG | FUND | DISTRIBUTION | PROJECT | PRI | REQD | DDATE | ADV | RI | O/P | COND | MGT

1. TOTAL PRICE | 2. SHIP FROM | 3. SHIP TO

UNIT PRICE: DOLLARS | CTS | DOLLARS | CTS

4. MARK FOR

5. DOC DATE | 6. NMFC | 7. FRT RATE | 8. TYPE CARGO | 9. PS

10. QTY. REC'D | 11.UP | 12. UNIT WEIGHT | 13. UNIT CUBE | 14. UFC | 15. SL

16. FREIGHT CLASSIFICATION NOMENCLATURE

17. ITEM NOMENCLATURE

18. TY CONT | 19. NO CONT | 20. TOTAL WEIGHT | 21. TOTAL CUBE

22. RECEIVED BY | 23. DATE RECEIVED

24. DOCUMENT NUMBER & SUFFIX (30-44)

Basic Material Content: _____

Estimate Weight (lbs): _____

Container ID No.: _____ Seal ID No.: _____

25. NATIONAL STOCK NO. & ADD (8-22)

Site Address: _____

_____

Site Telephone No.: _____

26. RIC (4-6) UI (23-24) QTY (25-29) CON CODE (71) DIST (55-58) UP (74-80)

This certifies that the material listed has been 100 percent properly inspected and, to the best of our knowledge and belief, are free of explosive hazards, engine fluids, illuminating dials and other visible liquid HTWR materials.

27. ADDITIONAL DATA

Certify By: _____ Date: _____
Senior UXO Supervisor / Team Leader

Verify By: _____ Date: _____
USACE OE Safety Specialist

USA Environmental, Inc., 720 Brooker Creek Boulevard, Suite 204, Oldsmar, Florida 34677, Telephone: 813.343.6336, Fax: 813.343.637

PREVIOUS EDITION MAY BE USED

PerFORM (DLA)

Reset

DD Form 1348-1A: FOR USE WHERE RANGE-RELATED DEBRIS IS PROCESSED WITH MUNITIONS DEBRIS

ATTACHMENT 2.
MATERIAL INSPECTION AND RELEASE FORM

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USA 100% MATERIAL INSPECTION AND RELEASE FORM

Project:							Document Date:
Location:							Document Number:
Container Number:	Seal #:	Initials 1st:	Initials 2nd:	Reseal #:	Initials 1st:	Initials 2nd:	Comments:

The above listed containers have received two separate 100% inspections to ensure proper classification of material.
A copy of this form is to accompany the listed containers to final disposition and be retained for a period of 3 years.
This form is used to document the inspections performed by two UXO qualified personnel, one of whom must be a Technician III or higher.
This form is not to be used in place of other required documents for the transportation and/or accountibilty of material.

Name of First 100% Inspector:	Title:	Date:
Name of Second 100% Re-Inspector:	Title:	Date:

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ATTACHMENT 3.
NON-HAZARDOUS WASTE (CONTAINER LABEL)

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NON-HAZARDOUS WASTE

Solid Waste Excluded From Regulation Under 40 CFR 261.4 (b)

SHIPPER: USA Environmental, Inc.

PROJECT ADDRESS / LOCATION:

CITY, STATE, ZIP:

PROJECT CONTACT AND TELEPHONE NUMBER:

USACE IDENTIFIER / INSTALLATION NAME OR CONTRACT #:

UNIQUE CONTAINER # (i.e., 0001 of 0001): of

UNIQUE SEAL IDENTIFICATION #:

Date:	Seal Number:	1st Initials:	2nd Initials:	Comments:

☐ **DD Form 1348-1A** ☐ **100% Material Inspection and Release Form**

NOTE: See DD Form 1348-1A For Additional Information.
Check box(s) if DD Form 1348-1A and/or the 100% Inspection Form will accompany this shipment.

CONTACT INFORMATION: **USA Environmental, Inc.**
720 Brooker Creek Blvd., Suite 204
Oldsmar, FL. 34677
(813) 343-6336

CONTAINER LABEL

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STANDARD OPERATING PROCEDURE – OPS-14
MEC ANALOG DETECTION AND REMOVAL ACTIONS

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide all USA Environmental, Inc. (USA) employees and subcontractors with the minimum procedures and safety and health requirements applicable to the conduct of analog detection and removal actions (analog and dig) at sites potentially containing unexploded ordnance (UXO) and/or munitions and explosives of concern (MEC).

2.0 SCOPE

This SOP applies to all USA site personnel, including contractor and subcontractor personnel, involved in the conduct of analog detection and removal actions (analog and dig) on a UXO/MEC contaminated site. The following USA policies and procedures are not all inclusive nor are they applicable in all situations. This SOP is not a stand-alone document and is to be used together with Work Plans, other USA SOPs, the USA Site Safety and Health Plan (SSHP), applicable Federal, State, and local regulations, and contract restrictions and guidance. Consult the documents listed in Section 7.0 of this SOP for additional compliance issues.

3.0 RESPONSIBILITIES

3.1 PROJECT MANAGER

The Project Manager is responsible for ensuring availability of resources to safely and effectively implement this SOP.

3.2 SITE MANAGER

The Site Manager is responsible for incorporating this SOP in plans, procedures, and training. In addition, he is responsible for oversight and supervision of field personnel, and ensuring compliance with this SOP.

3.3 UXO SAFETY OFFICER

The UXO Safety Officer (UXOSO) ensures that all analog and dig activities are conducted in a safe manner, in accordance with the approved Work Plan, the SSHP, this SOP, and all applicable regulatory guidance. The UXOSO's duties shall include, but are not limited to: analyzing UXO explosives operational risk, hazards, and safety requirements; establishing and ensuring compliance with all site-specific safety requirements for UXO and explosives operations; enforcing personnel limits and safety exclusion zones (EZ) for UXO clearance operations; and all activities associated with UXO and explosives transportation, storage, and destruction.

3.4 UXO QUALITY CONTROL SPECIALIST

The UXO Quality Control Specialist (UXOQCS) ensures compliance with the project Quality Control (QC) Plan and performs analog QC checks of completed grids in accordance with the Work Plan.

4.0 OPERATIONS

4.1 ANALOG DETECTION AND REMOVAL ACTIONS

All analog detection and removal (analog and dig) activities at MEC sites will be under the supervision of UXO qualified personnel. Non-UXO qualified personnel will not be allowed in the EZ during intrusive operations. If access is required by non-UXO qualified personnel, all work will stop while they are in the EZ. During operations, USA personnel will strictly adhere to the SSHP and the following general safety practices:

- Operations will be conducted during daylight hours only.
- Access to operating areas will be limited to only those personnel necessary to accomplish the specific operation.
- UXO will only be handled by qualified UXO Technicians.
- During UXO operations the minimum separation distance (MSD) between UXO and non-UXO operations is fragmentation distance of the munition with the greatest fragmentation distance (MGFD), as stated in the Work Plan.
- MEC Teams will adhere to the team separation distance as established in the ESS.
- During demolition operations personnel remaining on site will be limited to those personnel needed to safely and efficiently prepare the item/s for destruction.).
- All personnel will attend the daily safety briefing (tailgate safety briefing) prior to entering the operating area.
- Anyone can stop operations for an unsafe act or situation.
- Safety violations and/or unsafe acts will be immediately reported to the UXOSO.
- Failure to comply with safety rules/procedures may result in termination of employment.

4.2 GRID LAYOUT

Depending on the method selected and approved by the customer, the site layout and search grids will be established using a Global Positioning System (GPS), licensed surveyor, or compass and measuring tape. UXO avoidance methods will be employed including checking the intended survey stake locations with a magnetometer prior to driving stakes into the ground. This will prevent driving stakes into buried MEC.

4.3 ANALOG SWEEP PROCEDURES

Intrusive investigation team(s) will consist of a Team Leader (UXO Technician III) and UXO Technicians II/I. During intrusive operations UXO Technicians I will operate under the supervision of UXO Technicians II or III. UXO operations will only be performed by qualified UXO Technicians, which are defined as:

- MEC identification
- Access procedures such as excavation, either by hand or using heavy equipment
- Handling of MEC/UXO, explosives, or explosive items
- Disposal, including movement, transportation, and final disposal of MEC

Analog detector sweeps (i.e., analog and dig) are particularly effective in areas where vegetation and terrain limit the use of larger digital systems. Also, analog and dig approaches should be used when there is insufficient difference between UXO at the site and other metallic fragments and debris, such that digital discrimination is ineffective or cost prohibitive.

Initially, individual search lanes will be established approximately 5 feet (ft) wide. Each lane will be surveyed using a Minelab ETRAC or other equivalent all-metals detector. The operation will begin at one end of each lane and move in a forward direction toward the opposing baseline. During the forward movement the technician moves the all-metals detector back and forth from one side of the lane to the other. Both forward movement and the swing of the magnetometer are performed at a pace that ensures the entire lane is searched and that the instrument is able to appropriately respond to subsurface anomalies. When a subsurface anomaly or metallic surface object is encountered, the UXO Technician halts and investigates the anomaly at that time. To ensure QC Metrics can be maintained a flag will be placed at the point of the investigation after complete to allow the UXOQCS to perform QC Surveillance. Throughout this operation the team leader closely monitors the team's individual performance to ensure these procedures are being performed correctly.

4.4 SURFACE UXO

Upon encountering a surface MEC it will be identified by two UXO Technicians and marked in accordance with the approved QAPP for future disposition. Due to the remote location of the Cay no guard will be used.

4.5 SUBSURFACE ANOMALIES

4.5.1 Manual Excavations

Subsurface anomalies will be investigated by UXO-qualified personnel as they are identified during the sweep. All identified anomalies within the grid will be intrusively investigated. Excavations for individual anomalies will be conducted using the Minelab ETRAC or other equivalent all-metals detector to assist the team in determining the location and orientation of the target item. The UXO Technicians excavating anomalies shall initially remove no more than a 6-inch layer of soil along side the location of the anomaly, being careful not to impact the anomalous feature. The UXO Technician will conduct a visual and electronic search of the excavation to further pin point the anomaly source as needed. This process shall be repeated until the audible signal from the magnetometer indicates the object is close to the surface. Once this determination has been made, soil will be removed by hand until the source of the anomaly is located. Once an anomaly is removed, the UXO Technician will check to ensure that no additional sources of the audible remain. Excavations on individual anomalies greater than 4 ft below the ground surface (bgs) will not be made without prior approval of the U.S. Army Corps of Engineers (USACE) OE Safety Specialist.

5.0 RECORD KEEPING

The team leader will maintain a field logbook, which at a minimum will contain a record of the following:

- Weather
- Instrument details and serial number
- Team Personnel
- Grids worked
- Start and stop times
- MEC/UXO/Seed items encountered
- Total pounds of MD
- Total pounds of CD
- Total number of Digs

The data to be recorded for each item discovered during anomaly excavation will include the following (as applicable):

- Type (e.g., MD, MPPEH, UXO, and non-MEC Scrap)
- Description (e.g., “projo, 20-mm, practice, MK105” and “base, coupling, firing device”)
- Initial Condition (e.g., expended, inert, live, and to be determined [TBD])
- Approximate length
- Approximate width
- Depth
- Approximate weight
- Found in a pit?
- Piece of frag?
- Initial disposition (e.g., left in place and removed to scrap pile)
- Requires demolition?

All data will be turned into the Site Geophysicist at the end of the day.

6.0 DISPOSAL OPERATIONS

Fuzed UXO/MEC items will be blown in place (BIP), and un-fuzed UXO/MEC items and Bomb Dummy Units (BDU) will be consolidated whenever possible in accordance with USACE Engineer Pamphlet 1110-1-17, Establishing a Temporary Open Burn and Open Detonation Site for Conventional Ordnance and Explosives Projects, dated 16 July 1999, Appendix D. In no case shall the SUXOS authorize or undertake destruction of UXO/MEC when there is sufficient reason to believe that the disposal action will result in personnel casualties or property damage. The USACE OE Safety Specialist will be consulted for guidance in the event that there is sufficient reason to believe that the disposal action will result in personnel casualties or property damage.

7.0 REFERENCES

- USACE Safety Considerations for UXO
- USAE Corporate Safety and Health Program (CSHP)
- OSHA, 29 CFR 1910, Occupational Safety and Health Standards
- OSHA, 29 CFR 1926, Construction Standards
- Applicable sections of EPA, 40 CFR Parts 260 to 299, Protection of Environment
- Applicable sections of DOT, 49 CFR Parts 100 to 199, Transportation
- USACE EM 385-1-1, Safety and Health Requirements Manual
- USACE ER 385-1-92, Safety and Occupational Health Document Requirements for Hazardous Waste Remedial Actions
- DOD 4145.26-M, Contractors' Safety Manual for Ammunition and Explosives
- DOD 6055.9-STD, DOD Ammunition and Explosives Safety Standards
- DOD 4160.21-M, Defense Reutilization and Marketing Manual

- DA PAM 385-64, Ammunition and Explosives Safety Standards
- AR 385-64, Ammunition and Explosives Safety Standards
- AR 200-1, Environmental Protection and Enhancement
- AR 385-10, The Army Safety Program
- AR 385-16, System Safety Engineering and Management
- AR 385-40 w/USACE supplement, Accident Reporting and Records
- TM 9-1300-200, Ammunition General
- TM 9-1300-214, Military Explosives
- TM 60 Series Publications.

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STANDARD OPERATING PROCEDURE – OPS-15
UXO/MEC AVOIDANCE

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide all USA Environmental, Inc. (USA) employees and subcontractors with the minimum procedures and safety and health requirements applicable to perform avoidance operations at sites potentially containing unexploded ordnance (UXO) and/or munitions and explosives of concern (MEC).

2.0 SCOPE

This SOP applies to all USA site personnel, including contractor and subcontractor personnel, involved in the conduct avoidance operations on a UXO/MEC contaminated site. The following USA policies and procedures are not all inclusive nor are they applicable in all situations. This SOP is not a stand-alone document and is to be used together with the Quality Assurance Project Plan (QAPP), other USA SOPs, the USA Site Safety and Health Plan (SSHP), applicable Federal, State, and local regulations, and contract restrictions and guidance. Consult the documents listed in Section 8.0 of this SOP for additional compliance issues.

3.0 MEC/UXO BASIC AND GENERAL SAFETY PRECAUTIONS

These basic safety precautions are the minimum MEC safety requirements required of all personnel on site. Other precautions and requirements are in other applicable MEC manuals.

3.1 BASIC CONSIDERATIONS

The following should be taken into consideration when planning or conducting MEC avoidance support operations:

- SAFETY IS PARAMOUNT
- Do not move or disturb unidentified items
- Do not collect souvenirs
- Do not smoke except in designated areas
- Do not carry fire or spark producing devices into the site
- All MEC operations will use the "Buddy" system
- Prohibit non-essential personnel from visiting the site

3.2 BASIC SAFETY PRECAUTIONS

The following safety precautions are applicable to all MEC:

- Suspend all operations immediately upon approach of an electrical storm.
- Observe the hazards of electromagnetic radiation (EMR) precautions and grounding procedures when working with, or on, electrically initiated or susceptible MEC.
- Do not unnecessarily dismantle, strip, or handle any MEC.

- Avoid inhalation and skin contact with smoke, fumes, dust, and vapors of detonations and MEC residue.
- Do not attempt to extinguish burning explosives or any fire that might involve explosive materials.
- Do not manipulate external features of ordnance items.
- Incorporate appropriate property and personnel protective measures for shock and fragmentation when conducting MEC operations.
- Do not subject MEC to rough handling or transportation. Sand bag, chock, and block appropriately.
- Hand carry no more than two items (one in each hand) at a time and then only as required by the operation being performed.
- Do not transport damaged white phosphorous munitions unless fully submerged in water.
- Avoid unnecessary movement of armed or damaged UXOs.
- Avoid the forward portions of munitions employing proximity fuzing.
- Assume unknown fuzes contain cocked strikers or anti-disturbance features.

3.3 GENERAL SAFETY PRECAUTIONS

The following sub-paragraphs describe safety precautions for various types of munitions/disposal operations:

3.3.1 BOMBS

- Ensure fuze wells do not contain fuze components.

3.3.2 CLUSTERS, DISPENSERS, LAUNCHERS

- Approach and work from the sides of a dispenser.
- Consider an intact dispenser as fully or partially loaded.
- Consider any payloads outside the container or dislodged inside as armed.
- Take precautions for the most hazardous payloads until positively identified.

3.3.3 PROJECTILES

- Determine if the projectile has been fired and if so consider it armed.
- Check for the presence of unburned tracers.
- Avoid the rear and front of rocket assisted projectiles,
- Handle projectile components such as powder increments, cartridges, and primers with caution.

- Seal the open ends of projectiles or sheared projectile components with tape or other suitable material before transporting.

3.3.4 GRENADES

- Do not attempt to re-install safety pins on a dud-fired grenade.
- Do not attempt to withdraw impinged firing pins from the fuze of a dud-fired grenade.
- Do not dispose of grenades by functioning them as designed.

3.3.5 ROCKETS

- Approach and work on rockets from the side.
- Do not dismantle or strip dud fired rockets or rocket motors.
- Do not expose electrically fired munitions to radio transmissions within 25 feet.
- Do not transport an unfired rocket motor until having shielded the motor igniter from EMR.

3.3.6 GUIDED MISSILES

- When found, restrict vehicular movement in the area of a guided missile.
- Avoid entanglement with guidance wires of wire guided missiles.
- Restrict radio communications in the vicinity of a dud-fired missile.
- Approach and work on missiles from the side and rear quarter.
- Do not dismantle or strip dud-fired missiles or missile motors.
- Do not transport an unfired missile motor until having shielded the motor igniter from EMR.

4.0 MEC AVOIDANCE FOR SAMPLING AND DRILLING OPERATIONS

MEC avoidance operations may be required in support of soil sampling operations and the drilling of monitoring wells on some contracts. Avoidance operations will consist of a team composed of two UXO qualified personnel. The team will consist of a UXO Technician III and a UXO Technician II or UXO Technician I. The team will not destroy any MEC encountered. All MEC contacts and suspected MEC anomalies will be reported to the Site Manager who will in turn notify the On-site Safety Representative or local Explosive Ordnance Disposal (EOD) unit.

4.1 ACCESS ROUTES TO SAMPLING LOCATIONS

Prior to sampling or well drilling crews going on site, the MEC team will conduct a reconnaissance of the sampling area. The reconnaissance will include locating the designated sampling or drilling location and insuring that it is free of anomalies. If anomalies are detected the point will be relocated as directed in the Work Plan. Once the designated point has been cleared, an access route for the sampling crews, vehicles and equipment will be cleared. The access route, at a minimum, will be twice the width of the widest vehicle and the boundaries will be clearly marked to prevent personnel from straying into un-cleared areas. If surface MEC is encountered, the MEC team will mark and report the item, and divert the approach path around the MEC. A magnetometer will be used to ensure there are no subsurface MEC

within the approach path. If a subsurface magnetic anomaly is encountered, it will be assumed to be a possible MEC and the path diverted to avoid it.

4.2 SOIL SAMPLING AND WELL DRILLING SITES

The MEC team will clear a work site for soil samples and well drilling and clearly mark the boundaries. The area will be large enough to accommodate the drilling equipment and provide a work area for the crews. As a minimum, the cleared area will be a square, with a side dimension equal to twice the length of the largest vehicle or piece of equipment for use on site. If a pre-selected area indicates magnetic anomalies, a new sampling/drilling site will be chosen.

4.3 AVOIDANCE PROCEDURES FOR BOREHOLE SAMPLING

If surface samples are required they will be obtained prior to the start of boring. The borehole procedures will be completed using a hand auger, powered auger, or Direct Push Technology (DPT) equipment. The MEC Team will check the borehole with a down-hole magnetometer, a minimum of every 2 feet, to the deepest sampling depth, or a minimum of 6 feet, to ensure that smaller items of MEC, undetectable from the surface, will be detected.

- **Hand Auger Procedures:** The hand auger will be advanced to the first sampling depth and the auger will be withdrawn. A clean auger bucket will be attached to the handle, returned to the borehole and a sample will be collected. At this point the MEC Team will check the borehole with a magnetometer and if no magnetic anomalies are found, the procedure repeated to obtain the required samples.

- **Power Auger Procedures:** The power auger will be advanced to the first sampling depth and the auger will be withdrawn. A clean hand auger will then be used to collect the sample. The MEC Team will check the borehole with a magnetometer and if no magnetic anomalies are found, the procedure will be repeated to collect the required samples.

- **DPT Procedures:** The DPT rig will be positioned over the sampling point and the rod will be advanced to a maximum depth of 2 feet. The DPT rig will then move a minimum of 20 feet away from the sampling point to prevent the rig from influencing the magnetometer. The MEC Team will then check the borehole with a magnetometer and if no magnetic anomalies are found, the procedure will be repeated to collect the required samples.

4.4 AVOIDANCE PROCEDURES FOR MONITORING WELL INSTALLATION

Prior to drilling equipment being moved to the proposed site, the MEC Team will have checked the designated site, using a magnetometer; to assure that the well location is anomaly free to a depth of 2 feet. If surface samples are required they will be collected prior to the start of drilling. To complete the subsurface magnetometer checks, one of two methods may be used:

- Monitoring, at 2-foot increments, during the actual well drilling operation. This will require the withdrawal of the drill rod or augers from the well and moving the drill rig a minimum of 20 feet away from the well location to prevent the rig from influencing the magnetometer, or

- Installing an offset monitoring hole within 2 feet of the well location. This monitoring hole can be installed by the MEC Team, with a hand or power auger, and monitored at 2-foot increments to the desired well depth or a minimum of 6 feet. This will then allow uninterrupted well installation and/or sampling to continue.

5.0 MEC AVOIDANCE AND CONSTRUCTION SUPPORT

MEC avoidance support is normally comprised of a two-man team consisting of a UXO Technician III

(Team Leader) and a UXO Technician II. At sites where the expectation of encountering MEC is low, the MEC support may only consist of the UXO Technician III as MEC safety escort. The intent of MEC avoidance is to detect and avoid MEC and UXO. The following paragraphs outline minimum procedures for the designated operations.

5.1 LOCATION SURVEYS AND GEOPHYSICAL ESCORT

MEC escort for survey and geophysical operations consists of a visual surface search for MEC. Any UXO or MEC encountered will be marked, avoided, and reported to the appropriate authorities. Prior to driving stakes for grid corners or installing monuments, the UXO Technician will search the location with a magnetometer. Any subsurface anomaly will be assumed to be MEC and an alternate anomaly-free location will be chosen.

5.2 TRENCHING AND PIT EXCAVATIONS

Prior to trenching or excavation crews going on site, the MEC Team will conduct a reconnaissance of the approach route to the site. The reconnaissance will include locating a clear path for the crews, vehicles, and equipment. The approach path, at a minimum, will be twice the width of the widest vehicle. The boundaries of the approach path will be clearly marked to prevent personnel from straying into un-cleared areas. If MEC is encountered, the MEC team will mark and report the item, and divert the approach path around the MEC. Personnel will be instructed to remain within the marked boundary limits. A magnetometer will be used to search for near surface anomalies within the approach path. If a magnetic anomaly is encountered, it will be assumed to be a possible MEC, it will be marked, the approach path diverted, and reported.

5.2.1 EXCAVATION

During excavation operations the UXO Technician(s) will position themselves near (outside the reach of the swing) the earth moving machinery (EMM) (backhoe) where they can observe the excavation. If UXO or MEC is spotted the UXO Technician will signal the EMM operator to stop digging, move the bucket and place it on the ground outside the trench, and remove his hands from the controls. The UXO Technician will then investigate the MEC, which will be handled in accordance with Section 6.0. If MEC that cannot be moved is encountered the excavation operations will be either relocated to another area of operations or suspended until the item is disposed of or rendered safe to move.

5.2.2 HEAVY EQUIPMENT OPERATION

Heavy equipment safety will be in accordance with the SSHP.

5.2.3 EXCAVATION SAFETY

Excavation safety will be in accordance with the SSHP.

5.2.4 EQUIPMENT

The minimum equipment requirements for this activity include:

- Level D PPE
- EMM, (trenching & excavation)
- Schonstedt GA-52CX Magnetometer
- Marking material listed in Table 1

- Miscellaneous common hand tools (e.g. hammer, shovel, etc.)

Table 1: Color Codes – MEC Avoidance

Color	Description
Red Pin Flag/Caution Tape	Danger, identified suspect MEC/UXO, special precaution required
White Pin Flag	Boundary or temporary marker
Green Paint	Marking MEC-related scrap

6.0 LIVE AND SUSPECT MEC

UXO or MEC items encountered a will be inspected by the UXO Technician(s). Items that are safe to move may be relocated to a bermed or sandbagged area a safe distance from ongoing operations. No items will be moved unless positively identified and determined safe to move. The item(s) will be marked and reported to the Site Manager. MEC encountered that is ***NOT*** safe to move will be marked in place and operations will be moved to another location. MEC will be marked by installing four wooden stakes and encircling the stakes with flagging tape (see Table 1). Prior to installing stakes the location will be checked with a magnetometer to avoid driving the stake into a subsurface anomaly. All live and suspect live items will be inspected and identified by UXO Technicians. If the item cannot be positively identified and determined to be inert and safe to move, it will be marked and reported.

Note: If during identification of UXO or MEC it becomes necessary to move or handle the item, non-UXO qualified personnel will withdraw to a safe distance.

6.1 MEC RELATED MATERIAL

Adjacent to each operating area, the UXO Technicians will establish a MEC-related scrap (munitions debris) collection point. During operations items that are free of explosive contamination (i.e., fragments, parachutes, etc.) will be placed into these collection points and marked (see Table 1). Upon completion of operations the materials in these temporary collection points will be transferred to a central collection point for disposal. As the material is being loaded, the UXO Technician(s) will perform a second inspection of the material to ensure it is free of explosives and other hazardous materials.

7.0 DISPOSAL OPERATIONS

All MEC and Material Potentially Presenting and Explosive Hazard (MPPEH) will be disposed of in accordance with the project scope or the Work Plan. All hazardous material encountered will be reported to the Site Manager for disposition.

8.0 SUMMARY

USA uses proven procedures and methods to provide MEC Support Services. Only qualified UXO personnel will perform tasks associated with MEC location, identification, and item condition determination. The procedures outlined in this SOP are based on industry standards and ensure that operations are safely and efficiently performed.

9.0 REFERENCES

- EP 385-1-95a, Basic Safety Concepts and Considerations for Ordnance and Explosives Operations

- EP 75-1-2, UXO Support during HTRW and Construction Activities

- USA Corporate Safety and Health Program (CSHP)
- OSHA, 29 CFR 1910, Occupational Safety and Health Standards
- OSHA, 29 CFR 1926, Construction Standards
- Applicable sections of EPA, 40 CFR Parts 260 to 299, Protection of Environment
- Applicable sections of DOT, 49 CFR Parts 100 to 199, Transportation
- USACE EM 385-1-1, Safety and Health Requirements Manual
- USACE ER 385-1-92, Safety and Occupational Health Document Requirements for Hazardous Waste Remedial Actions
- DOD 4145.26-M, Contractors' Safety Manual for Ammunition and Explosives
- DOD 6055.9-STD, DoD Ammunition and Explosives Safety Standards
- DOD 4160.21-M, Defense Reutilization and Marketing Manual
- DA PAM 385-64, Ammunition and Explosives Safety Standards
- AR 385-64, Ammunition and Explosives Safety Standards
- AR 200-1, Environmental Protection and Enhancement
- AR 385-10, The Army Safety Program
- AR 385-16, System Safety Engineering and Management
- AR 385-40 w/USACE supplement, Accident Reporting and Records
- TM 9-1300-200, Ammunition General
- TM 9-1300-214, Military Explosives
- TM 60 Series Publications.

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STANDARD OPERATING PROCEDURE
OPS-17 – MEC SURFACE SWEEPS

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide all USA Environmental, Inc. (USA) employees and subcontractors with the minimum procedures and safety and health requirements applicable to perform surface sweep operations at sites potentially containing unexploded ordnance (UXO) and/or munitions and explosives of concern (MEC).

2.0 SCOPE

This SOP applies to all USA site personnel involved in the conduct of surface sweep operations. The following USA policies and procedures are not all inclusive nor are they applicable in all situations. This SOP is not a stand-alone document and is to be used together with Work Plans, other USA SOPs, the USA Site Safety and Health Plan (SSHP), applicable Federal, State, and local regulations, and contract restrictions and guidance. Consult the documents listed in Section 4 of this SOP for additional compliance issues.

3.0 SURFACE SWEEP OPERATIONS

All surface sweep operations will be performed under the direct supervision of qualified UXO personnel. USA personnel will strictly adhere to the SSHP and the following general safety practices:

- Operations will be conducted during daylight hours only.
- Access to operating areas will be limited to only those personnel necessary to accomplish the specific operation.
- UXO will only be handled by qualified UXO Technicians.
- During UXO operations the minimum separation distance (MSD) between UXO and non-UXO operations is the team separation distance (K40) of the munition with the greatest fragmentation distance (MGFD), as stated in the Explosives Site Plan.
- During demolition operations personnel remaining on site will be limited to those personnel needed to safely and efficiently prepare the item/s for destruction.
- All personnel will attend the daily safety briefing prior to entering the operating area.
- Anyone can stop operations for an unsafe act or situation.
- Safety violations and/or unsafe acts will be immediately reported to the UXO Safety Officer (UXOSO).

3.1 PERSONNEL QUALIFICATIONS

All personnel involved in MEC surface sweep operations will meet the training and experience requirement of Department of Defense Explosives Safety Board Technical Paper 18 (DDESB TP 18) for the position assigned.

3.2 SITE LAYOUT PROCEDURES

UXO Technicians will perform UXO avoidance while establishing the site grid layout including checking the intended survey stake locations with an analog detector prior to driving stakes into the ground, which will prevent driving stakes into buried MEC.

3.3 SWEEP PROCEDURES

3.3.1 Surface Sweep

The purpose of a surface sweep of a grid is twofold: first to locate, mark, and record the location of the surface MEC contamination contained in each area; and second to consolidate the scrap metal contamination. The typical span of control for a UXO Technician is three to five sweepers. This ensures positive control and safety.

3.3.2 Flags and Markers

USA uses a system of colored flags/flagging and markers to identify surface MEC, munitions debris and non-MEC metallic debris. Table 1 lists the types of markers used.

Table 1: Marking Material

Type Marker	Flag/Flagging Color	Item/Area Marked
Pin Flag	Red	MEC
Pin Flag	Blue	Munitions Debris
Pin Flag	Yellow	Non-MEC Metallic Debris
Pin Flag	White	Temporary Boundary

3.3.2.1 Sweep Team Structure

The following is an example of the sweep team structure:

- One UXO Technician III, to direct and supervise all team activities, confirm the identification of all MEC encountered, and maintain the sweep team journal.
- One UXO Technician II to assist the UXO Technician III, identify all MEC encountered, and record the location of the items located.
- Up to five UXO Technician I will search the area for MEC. These personnel will perform their duties under the direction and supervision of the UXO Technician III.

In the event the above team structure requires modification based on specific tasks or project circumstances, the adjustment(s) will be made in accordance with EM-385-1-97.

3.3.2.2 Surface Sweep Team Procedures

The UXO Technician III will assemble the sweepers into a sweep line and direct their movement across the survey area.

- Sweepers will be spaced approximately 5 ft apart and, at the direction of the UXO Technician III, move through the area on line.
  - When an item is encountered, the individual will call out "hold the line", and hold up his/her hand. The line will stop and the UXO Technician II will inspect the object to determine if it is MEC or scrap and mark the item with the appropriate colored pin flag. The line will not move again until directed by the UXO Technician III.
  - As the team moves forward the sweeper at the edge of the grid will use the grid stakes as one sweep lane boundary, the sweeper on the opposite end of the line will mark the limit of the sweep lane with white pin flags. These flags become the guide for the return sweep and define the limits of the previously cleared lane.
  - This procedure is continued until the area is completely swept.

- The UXO Technician III will follow behind the sweep line insuring that proper spacing is maintained, inspect and verify the identification of the flagged items, and record data on the type, nomenclature, and location of the contamination.
- Upon completion of the sweep the team will recover and stockpile metal scrap at a central location. Under the direct supervision of the UXO Technician III, the scrap will be stockpiled in a central location in the grid. Items marked with red pin flags will be left in place for the Disposal Team. Demolition and transportation of MEC/MDEH and explosives will be in accordance with USA's Demolition Operations (OPS-03) and Explosive Transportation (OPS-08) SOPs.

4.0 REFERENCES

- USA Corporate Safety and Health Program (CSHP).
- OSHA, 29 CFR 1910, Occupational Safety and Health Standards.
- OSHA, 29 CFR 1926, Construction Standards.
- Applicable sections of EPA, 40 CFR Parts 260 to 299, Protection of Environment.
- Applicable sections of DOT, 49 CFR Parts 100 to 199, Transportation.
- USACE EM 385-1-1, Safety and Health Requirements Manual.
- USACE EM 385-1-97 Explosives Safety and Health Requirements Manual.
- USACE ER 385-1-92, Safety and Occupational Health Document Requirements for Hazardous Waste Remedial Actions.
- DDESB TB 18, Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel.
- DOD 4145.26-M, Contractors' Safety Manual for Ammunition and Explosives.
- DOD 6055.09-M, DOD Ammunition and Explosives Safety Manual.
- DOD 4160.21-M, Defense Reutilization and Marketing Manual.
- DA PAM 385-64, Ammunition and Explosives Safety Standards.
- AR 385-64, Ammunition and Explosives Safety Standards.
- AR 200-1, Environmental Protection and Enhancement.
- AR 385-10, The Army Safety Program.
- AR 385-16, System Safety Engineering and Management.
- AR 385-40, Accident Reporting and Records.
- TM 9-1300-200, Ammunition General.
- TM 9-1300-214, Military Explosives.

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STANDARD OPERATING PROCEDURE
OPS-21 - VEGETATION REMOVAL OPERATIONS

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide USA Environmental, Inc. (USA) employees and subcontractors with the minimum procedures and safety and health requirements applicable to perform vegetation removal operations on sites contaminated with unexploded ordnance (UXO) or munitions and explosives of concern (MEC).

2.0 SCOPE

This SOP applies to all USA site personnel, including contractor and subcontractor personnel, involved in the conduct of vegetation removal operations on a site potentially contaminated with UXO/MEC. This SOP is not a stand-alone document and should be used together with the Quality Assurance Project Plan (QAPP), other USA SOPs, the Site Safety and Health Plan (SSHP), applicable Federal, State, local regulations, and contract restrictions and guidance. Consult the documents listed in Section 10.0 of this SOP for additional compliance issues.

3.0 SELECTION

Only those personnel that meet the requirements set forth by the client and USA will be utilized at the project site to facilitate safe and efficient vegetation removal operations.

4.0 TRAINING

All training on equipment will be either formal or on-the-job (OJT) training. This training will be documented by site personnel and subject to review for accuracy and completeness.

5.0 PERSONNEL PROTECTIVE EQUIPMENT

Level D personal protective equipment (PPE) is required for all personnel engaged in vegetation removal operations. Clothing includes, but is not limited to:

- Coveralls or work clothing as prescribed
- Work gloves, leather or canvas as appropriate
- Safety Glasses
- Hard Hats
- Hearing protection, noise attenuators or ear plugs
- Dust mask, as required by wind conditions and/or the presence of airborne particulate matter
- Other PPE as needed. (e.g., face shield, chainsaw chaps, etc.)

6.0 TEAM COMPOSITION

The Vegetation Removal Team will consist of three qualified personnel, as a minimum. These personnel may include any or all of the following:

- UXO Technician III
- UXO Technician II or I
- Laborers

UXO TECHNICIAN

The UXO Technician is UXO qualified and directs the operation and other team personnel within the context of removal requirements. In addition, the UXO Technician III must be familiar with the equipment being utilized.

OPERATOR

The operator(s) will be qualified and trained on the equipment being utilized (e.g., chainsaw, weed eater, etc.) and operate the equipment in a safe and efficient manner. The operator performs daily inspections and maintenance functions as recommended in the operator's manual. The operator will perform other duties as needed or directed.

7.0 SAFETY

Safety is paramount and all personnel will observe those safety precautions/warnings that apply or may apply to vegetation removal operations. The precautions listed below are general in nature and personnel will need to review applicable publications for more specific safety precautions/warnings. Distances listed are the minimum required.

- Maintain safe separation distance from UXO personnel engaged in intrusive work.
- Distances may be increased by Range Control and/or Navy OE Safety Specialist as determined by site history, UXO items encountered, terrain features, and other factors that may apply.
- Use equipment safety features.
- Safety precautions/warnings found in the operator's manual/manufacture's publications will be observed.
- Maintain 6 inches of ground clearance during removal operations.
- Communications will be maintained between the Team Leader and Operator(s) at all times.
- Maintain site control.
- Observe UXO safety precautions for items encountered or suspected.
- Ensure PPE is appropriate, serviceable, and worn/used in a proper manner.

8.0 OPERATIONAL PROCEDURES

Personnel will not enter within 10 feet of an operating piece of equipment. If at any time personnel enter closer than 10 feet, the Operator will immediately stop, return the engine to idle speed, and cease operations. Prior to operations commencing, a communications check with all team personnel will be conducted. Hand signals will be devised and used as a means of communication. All team personnel must know these hand signals prior to operations commencing. The hand signals will be documented on the tailgate safety-briefing sheet each morning of operations and at each change of team personnel.

The UXO Technician II/III will be responsible for the direction and manner in which the vegetation is to be removed. Prior to removal operations commencing, a visual search/survey is conducted to determine the hazards that may be encountered, which may include UXO, terrain slope, vegetation, wildlife, environmental concerns, and PPE requirements. The UXO Technician III will perform a visual search for

UXO, ordnance scrap, surface debris, and any other obstruction/object that may pose a hazard to team personnel. Hazardous items, impassable terrain, or vegetation that may affect operations will be marked and team personnel notified.

Team personnel are to ensure that a 6-inch ground clearance is maintained during removal operations. Those areas marked as hazards are to be avoided. The manner in which operations are accomplished will follow safe work practices and procedures. Areas of concern will be addressed to the Senior UXO Supervisor (SUXOS) and/or UXO Safety Officer (UXOSO) as needed. All MEC/UXO items encountered are marked and avoided. Notification of these items will be made to the appropriate personnel.

In the cayos USA anticipates more vegetation removal will be required to allow for DGM (vegetation removed to a height of 6 inches from the surface), and less for analog instruments. In areas with protected plant species present, analog detection equipment will be employed, as it can operate in heavier vegetation and site preparation is anticipated to be less destructive. Protected plant species are identified in Supplemental Standard Operating Procedures for Endangered Species Conservation and their Critical Habitat (USACE 2015). Cutting or pruning of any species of cacti shall be avoided in order to prevent impacts to *Leptocereus grantinanus* species unless specific permission is provided by USFWS/PRDNER (e.g. *Leptocereus grantinanus* is determined to not be found on the Cay so removal of the cacti will not impact the species).

Vegetation removal is completed by eight vegetation team members following guidance provided in the Supplemental Standard Operating Procedures for Endangered Species Conservation and their Critical Habitat (USACE 2015). Cut vegetation will be distributed on the cay. The eight vegetation team members are escorted by UXO Technicians II (UXOTIIs). The Team Biologist escorts the vegetation removal team to ensure critical habitat and protected species are identified, avoided, and reported. The Team Biologist completes the "Daily Observer Log Sheet" each day, detailing endangered or threatened species sightings. The Team Biologist also maintains a written log of the daily activities, and notes identified endangered species.

9.0 SUMMARY

USA personnel will conduct vegetation removal operations in a safe, efficient, and productive manner and will use this SOP and references, which include changes and revisions.

10.0 REFERENCES

- USA Corporate Safety and Health Program (CSHP)
- Site-Specific Safety and Health Plan (SSHP)
- Occupational Safety and Health Administration (OSHA) Regulations
- Operator’s Manual(s) and Manufacture’s Publications

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STANDARD OPERATING PROCEDURE OPS - 29
EXPLOSIVES TRANSPORTATION VIA OPEN WATER VESSELS

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide the minimum procedures and safety and health requirements applicable to the transportation, loading, storage, and unloading of explosives (demolition material) by open water vessels.

2.0 SCOPE

This SOP applies to all project personnel, including contractor and subcontractor personnel, involved in the conduct of operations pertaining to the transportation of explosives by open water vessel. This SOP is not intended to contain all of the requirements needed to ensure compliance. Consult the documents listed in Section 3.0 of this SOP for additional compliance issues.

3.0 REFERENCES

Procedures and information contained in this document were obtained from the references below:

- USA Corporate Safety and Health Program (CSHP)
- 29 CFR 1910, Industry Standards
- 33 CFR, Navigation and Navigable Waterways
- 46 CFR, Shipping
- 49 CFR, Department of Transportation, Subtitle B, Subchapter C
- ATF P 5400.7, ATF-Explosives Law and Regulations
- USACE EM 385-1-1, Safety and Health Requirements Manual
- DoD 6055.9-STD, DoD Ammunition and Explosives Safety Standards
- DA PAM 385-64, Ammunition and Explosives Safety Standards
- AR 385-64, Ammunition and Explosives Safety Standards
- AR 190-11, Physical Security
- AR 385-40 w/USACE Supplement, Accident Reporting and Records
- AR 385-10, The Army Safety Program
- TM 9-1300-214, Military Explosives

4.0 RESPONSIBILITIES
4.1 PROJECT MANAGER (PM)

The Project Manager (PM) is responsible for the purchase, delivery, and transportation of explosives ordered through the use of designated or contracted personnel. Personnel will be qualified for the task delegated to them and verification of credentials/qualifications will be documented by the PM.

4.2 SENIOR UXO SUPERVISOR (SUXOS)

The SUXOS will be responsible for the physical movement of explosives for his/her project site. He/she will oversee the loading, storage/stowage, transportation, and unloading of the explosives. The SUXOS

will act as the responsible person for all 1.1 – 1.4 explosives and ensure the vessel has a designated competent person prior to open water movement.

4.3 UXO QUALITY CONTROL SPECIALIST (UXOQCS)

The UXOQCS will be responsible for performing inventories and inspections of explosives with the SUXOS. He/she will accomplish this by reviewing the accountability documentation, and inventories of explosives being transported. Inspection including physical security (locks), placarding, containers, firefighting equipment, and emergency response capabilities will be reviewed prior to movement.

5.0 REQUISITION PROCEDURES

The requisition of explosives will be in accordance with (IAW) USA Environmental, Inc.'s (USA's) policy, which requires that three quotes be obtained (when possible) to ensure the best possible price for the task. Of paramount importance in this process is the determination of the location of the supplier(s). Generally, response time to requisitions is better by those suppliers closest to the site. Delivery of the explosives to the vessel is conducted by the vendor. Upon delivery by the vendor, authorized USA personnel will then inventory and sign for the explosives. See the SOP for Requisition of Explosives for details.

6.0 LICENSES/PERMITS

USA will ensure that proper licenses or permits as required are in place for the following:

- Requisition of explosives (Federal and state requirements).
- Use of explosives (State, Local blasters license).
- Transportation of explosives (Federal, state, and local vessel and vehicle requirements).
- Storage of explosives Federal, state, and local requirements).

6.1 FEDERAL LICENSE

In order to requisition explosives, USA will have a valid Bureau of Alcohol, Tobacco, Firearms and Explosives (BATFE) license/permit on hand, to include an Explosives Purchase/Receipt Authorization List for the receipt of explosives. These two documents must be on file at the USA Corporate office and at the project site; additionally, each explosives supplier must have a copy of the documents on file in order to sell explosives to USA.

6.2 STATE BLASTER'S LICENSE/PERMIT

Puerto Rico Explosive Permit is required under Commonwealth PR Law 134. USA personnel that will be performing the handling and use of explosives will maintain a current Explosive Permit. This can be accomplished by contacting the San Juan Police Department. The PM and SUXOS will be responsible for identifying the need to obtain an explosive permit for a given project and for scheduling personnel, through Human Resources, needed to obtain the requisite license/permit. In some circumstances, permitting may also be required for the use, transportation and storage of explosives. Should this be the case, additional requirements will need to be identified and action taken by the PM and SUXOS. These actions may include securing storage permits and obtaining CDLs, and HAZMAT endorsements.

7.0 EXPLOSIVES RECEIPT

Only those individuals named on the authorization list may sign for explosives from the vendor/shipper. In order to ensure that the quantity shipped is the same as the quantity ordered and listed on the shipping documents, two USA personnel will inventory the shipment prior to signing for it.

7.1 SHIPPING DOCUMENTS

Explosive shipments generally are accompanied by the explosive supplier's Bill of Lading (B/L) and the shipping company's shipping document. The initial inventory will include reconciling the two documents with the actual shipment and creating an on-site record that includes these documents and the inventory records. Regardless of the outcome of the initial inventory, one copy of the B/L and the shipping company's shipping document will be attached to a copy of the Purchase Order (PO) request and the PO. One copy of each of these documents will be kept on file at the project site, and one complete set will be forwarded to the corporate office.

7.2 RECEIPT DISCREPANCIES

In the event that there is a discrepancy between the amount shipped and the amount received, the SUXOS will immediately contact the explosives supplier and inform the supplier of the discrepancy. It is then the responsibility of the supplier and shipper to rectify the situation and inform USA of the results. The supplier and/or shipper must then correct their documents and forward the corrected documents to the site. In all cases, only the amount actually received will be entered on the Explosives Accountability Record/Magazine Data Card.

8.0 EXPLOSIVES STORAGE ON BOARD THE VESSEL

Explosives being prepared for movement by open water vessels require the availability and use of approved storage/shipping containers. USA will comply with regulatory storage/stowage procedures.

8.1 EXPLOSIVES CONTAINERS

For transport of explosives aboard an open water vessel, USA will ensure that IME-22 containers are utilized for the storage during movement. These containers are constructed IAW the requirements contained in IME Publication No. 22 and meeting the requirements of applicable sections of 49 CFR Subtitle B, Chapter 1, Subchapter C, Parts 171, 173, 176, 177, and 178.

IME-22 containers will be inspected at least every 24 hours while on board and after heavy seas. This inspection is not an inventory of explosives but is to determine whether an unauthorized entry, attempted entry or damage to the container, locks, or securing means has occurred.

8.1.1 Locks

Each lid/door will be equipped with a padlock fastened in welded hasps and staples meeting the requirements of ATF Publication 5400.7. Padlocks must have at least five tumblers or five blades and a casehardened shackle of at least 3/8 inch in diameter. ***Locks will not be like or master keyed.***

8.1.2 Signage/Placarding

The BATFE and the Department of Defense (DoD) require that all explosive containers be appropriately posted to indicate the hazard class of the contents, the fire fighting hazards, and the emergency

notification list. Placarding of explosive containers will be IAW applicable sections of DoD 6055.9-STD and 49 CFR Subtitle B, Chapter 1, Subchapter C, Part 172. This will require that the container be posted for the most hazardous items stored in the container. In the event that there are two fire division or hazard class items in the same container, use the higher hazard division/class placard (lower number).

8.1.3 Emergency Notification List

An emergency notification list containing the names, telephone numbers, and addresses of the individuals or agencies to be notified in the event of an emergency will be kept on the vessel and inside of the container door. This list will include company, client, Federal, state, and local points of contact and notification as required.

8.1.4 Compatibility

Explosive compatibility will be maintained. Table 1 lists the various storage compatibility groups and Table 2 is the compatibility chart. Compatibility will be adhered to and any exceptions will be referenced and documented.

8.1.5 Key Control

Containers will remain locked during transport. The lock(s) on the containers will require two different keys to unlock. ***Locks will not be like or master keyed***. One key will be kept by the SUXOS and the second key by the UXOQCS. This procedure ensures that access to the containers cannot be gained without obtaining the two keys and no one individual can gain access to both containers. Keys may also be kept in two separate locked security boxes, provided no one individual has access to both boxes. Keys must be signed for by the responsible individuals.

Table 1: Category of Material (Hazard Class or Division Number)

Category of Material (Hazard class or division number and additional description, as appropriate)	Placard Name	Placard Design Section Ref.(')
1.1	Explosives 1.1	172.522
1.2	Explosives 1.2	172.522
1.3	Explosives 1.3	172.522
1.4	Explosives 1.4	172.523
1.5	Explosives 1.5	172.524
1.6	Explosives 1.6	172.525

Table 2: Storage Compatibility Chart

Groups	A	B	C	D	E	F	G	H	J	K	L	S
A	X	Z										Z
B	Z	X										X
C			X	Z	Z		Z					X
D			Z	X	X							X
E			Z	X	X							X
F						X						X
G			Z				X					X
H								X				X
J									X			X
K										X	U	
L										U		
S	Z	X	X	X	X	X	X	X	X			X

Notes:

1. The marking of an **X** at an intersection of the above chart indicates that these groups may be combined in storage. Otherwise, mixing is either prohibited or restricted per Note 2 below.
2. The marking of a **Z** at an intersection of the above chart indicates that, when warranted by operational considerations or magazine non-availability, and when safety is not sacrificed, these groups may be combined in storage.
3. Equal numbers of separately packaged components of complete rounds of any single type of ammunition may be stored together. When so stored, compatibility is that of the assembled rounds; e.g., WP Filler in Group H, HE Filler in Groups D, E, or F, as appropriate.
4. Group K requires not only separate storage from other groups, but also requires that munitions having different toxic chemical agent fillers be stored separately from each other.
5. The marking of a **U** on above chart indicates that leaking toxic chemical munitions of one agent type, e.g., GB, with or without explosive components, may be stored together in one magazine specifically designated for storage of leakers of that agent type.
6. Ammunition designated as **PRACTICE** by NSN and nomenclature may be stored with the fully loaded ammunition it simulates.

9.0 TRANSPORTATION BY VESSEL

Transportation of explosives by open water vessel will be accomplished in the following manner.

9.1 VESSEL REQUIREMENTS

The vessel used for the transportation of explosives must meet the minimum requirements for operating as prescribed by DOT (49 CFR) and U.S. Coast Guard standards (33 and 46 CFR). The vessel must be manned by competent personnel and be properly licensed, registered, and insured for the operations being conducted. During movement of explosives the vessel is deemed to be in a non-passenger mode of operation. All personnel on-board will be required to have a personal flotation device.

Vessel size is of paramount importance to allow for proper placement and security of the explosives container. No other cargo will be transported while the explosives container is on board and has explosive material stored inside.

9.2 STOWAGE OF EXPLOSIVES CONTAINER(S)

Explosives containers will be placed for stowage in approved locations (by vessel design) only. Containers will be placed so no other stowage is placed on top of or in front of container doors/lids. Containers will be secured in a manner that precludes movement during transportation. The following will also be accomplished prior to vessel movement.

- Containers will be placarded IAW applicable sections of DoD 6055.9-STD and 49 CFR Subtitle B, Chapter 1, Subchapter C, Part 172.
- Loading and unloading of explosives into the container will be accomplished by two qualified UXO Technicians.
- Inner packaging of explosives will be properly labeled/placarded.
- Dry chemical or foam filled fire extinguishers (two each 20B:C) will be identified and located in near proximity to the container for emergency use.
- Emergency response plans and notifications will be briefed to all on-board personnel to include assigned duties.
- Locks will be placed and secured on the containers. Keys will be maintained IAW Section 8.1.5 of this SOP.

9.3 VESSEL MOVEMENT

Vessel movement will be accomplished only by authorized vessel crew members. The vessel Captain is responsible for all actions taken with regards to operations occurring on-board the vessel. The Captain will ensure that movement is conducted IAW DOT (49 CFR), U.S. Coast Guard (33 and 46 CFR), State, and local requirements. A Puerto Rico Explosive Permitted employee will be on the vessel and maintains responsibility for the explosive delivery. He/She will also coordinate the movement of the vessel with San Juan Police Department seeking police escort from the main island of Puerto Rico to Culebra.

10.0 EXPLOSIVES ACCOUNTABILITY

Upon receipt of explosives and prior to movement by vessel, the magazine data card (see Figure 1 in the Attachment) is filled in and kept in the container on top of the listed item. A duplicate copy is maintained by either the SUXOS or UXOQCS. All entries will be verified by two individuals. Following movement, the explosives containers are removed from the vessel and surface transportation, storage, use, and inventories are conducted IAW those SOPs.

10.1.1 Issue of Explosives from Vessel

In the event the vessel is used to move explosives from one location to another for use (i.e., demolition operations on another island not accessible by truck from the Explosive Storage Location) and not for transfer to another storage location then the following will be accomplished:

- Applicable sections above will be adhered to at all times during loading, stowage, and movement.

Upon arrival at the destination only those explosives needed for demolition operations will be issued. Procedures for issuing explosives are found in the Explosive Receipt, Storage, and Issue SOP. In addition, the following will be accomplished:

- Issued explosives will be placed in “day boxes” for movement to the demolition site by a minimum of two UXO qualified personnel (one of whom must be a Technician III or higher).

- Day boxes will be properly placarded.
- Explosives remaining aboard the vessel will be observed and secured by a UXO Technician II or above, without access to IME-22 container keys.
- Loading and unloading from the vessel to boat to beach or dock will be under the supervision of a competent vessel crew member and responsible UXO Technician.
- Communications between the demolition operations personnel and the vessel UXO Technician will be in place prior to explosives leaving the vessel.
- Day boxes will be placed in the bottom of the transport boat or other acceptable location away from fuel, motor(s), and boat electrical equipment. The day boxes will be accompanied from the vessel to the beach or dock by qualified UXO technicians.
- The boat will be manned and operated by authorized crew member(s) from the main vessel. USA personnel will not operate the boat.
- All movement will be IAW the minimum requirements for boating operations as prescribed by U.S. Coast Guard standards. These include the use of personal flotation devices, fire extinguishers, and communication equipment.

Explosives not used for the day's demolition event will be returned to the USA Magazine located at Flamenco Camp Ground. The vessel containing the explosives will return to either the field office dock or to the USFWS/DNER Boat Ramp and pier, located inside Ensenada Bay, to off load the remaining explosives. The explosives will then be transported to the USA magazine following the procedures outlined in SOP-OPS-08.

10.2 INVENTORY DISCREPANCIES

In the event that there is a discrepancy during any inventory after movement by vessel, the item will be recounted a minimum of two additional times utilizing an additional individual if available. If a discrepancy still exists, the PM and the Corporate QC Manager will be notified. Required notifications of law enforcement will be made IAW the Emergency Notifications List. All actions from this point will be dictated by law enforcement or Corporate Management.

11.0 ATTACHMENTS

Figure 1- Magazine Data Card

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USA Environmental, Inc.

Magazine Data Card

Nomenclature:

Lot Number: Unit of Issue:

Date	Name	Received	Issued	Balance	Checker's Initials

020 USA Form
Original: March 2011

Figure 1: Magazine Data Card

STANDARD OPERATING PROCEDURE
OPS-34: SAMPLE PACKING AND SHIPPING FIELD GUIDANCE

1.0 SCOPE AND APPLICATION

This Standard Operating Procedure (SOP) provides guidance for packing, preserving, and shipping samples. Chain of Custody must be preserved through all processes.

2.0 EQUIPMENT/APPARATUS

- Waterproof black-ink pens
- Field logbook
- Nitrile gloves
- Zip-Loc bags
- Coolers
- Ice
- Gallon size Zip-Loc bags
- Heavy-duty packaging tape
- Duct tape
- Garbage bags
- Sample labels
- Sample containers
- Bubble wrap packaging
- Chain of custody forms
- Custody seals
- Carrier shipping forms and pouches for outside of cooler
- Laboratory Permit to receive soil
- Clean contractor-grade garbage bag (to line cooler)
- Temperature blank (small bottle of water usually provided by lab), one per cooler
- Trip blanks (if VOCs are included in analysis of any samples in the shipment, include two VOAs)

3.0 METHODS & PROCEDURES

All samples must be labeled appropriately prior to packing. Sample identification must be logged in the field logbook.

- Give the laboratory advance notice that the samples are coming, a few days prior to sample collection.
- Wear clean gloves at all times to avoid contaminating the samples (even if jars are closed). Change gloves between sample locations.
- Ensure sample labels are covered entirely by tape to protect information during shipment.
- Double check each Chain of Custody form to ensure the contents of the cooler match the Chain of Custody form, and verify sample naming and collection time match.
- Place glass containers in bubble wrap packaging.

- Place bubble wrapped containers and any samples in plastic containers into separate Zip-Loc bags.
- Put clean, empty garbage bag in cooler.
- Place sealed Zip-Loc bags containing the samples into garbage bag in cooler.
- Put temperature blank into container.
- Fill gallon size Zip-Loc bags with ice, double bag each, and pack around samples ensuring all sample bags are touching ice. DO NOT directly pour ice over the samples! When shipping from a tropical environment, this is VERY important! Do not over pack the cooler.
- After placing samples, ice, and temperature blank into the cooler, twist and goose-neck the garbage bag with a knot to avoid leakage.
- Put ***signed*** Chain of Custody paperwork in a Zip-Loc bag. Make sure each Chain of Custody form is specific to each cooler, and includes an indicator associating the cooler to the Chain of Custody Form. If coolers do not have numbering on them, add numbering with a permanent marker; if cooler has multiple markings from other uses, mark out old markings.
- Make note of which coolers are associated with each Chain of Custody Form. Obtain Carrier Forms so you can include the Carrier (FedEx) numbers on the COC.
- Tape Zip-Loc bag containing Chain of Custody forms to top inside of cooler (do not put in the plastic bag with the ice).
- Close cooler.
- Place Custody seal across cooler opening, perpendicular to opening direction, on front and on diagonally opposite other side of cooler (even if hinge is present).
- Tape over custody seal, along the seam where the top closes, and three times around each side to include the cooler top and storage area.
- Use duct tape to seal drain valve, if present.
- Attach appropriate shipping labels to cooler.
- If import documents are required, include where necessary.
- Attach the laboratory USDA Permit to Receive Soil in a pouch on the outside of the cooler.
- The same day on which the samples ship, email the laboratory copies of the Chain of Custody forms to indicate shipment is being made. It is easiest to use a smartphone camera and email. Other option is to scan copies and email from computer. If you do not get an email response immediately, call the laboratory contact number provided in the QAPP.

4.0 HEALTH AND SAFETY

As sample containers may not be entirely devoid of materials, wear appropriate PPE while packaging coolers. Also, full glass containers will be handled, so care should be taken not to drop the containers.

STANDARD OPERATING PROCEDURE
OPS-36A: SOIL SAMPLING FIELD GUIDANCE - DISCRETE AND CRREL 7-PT WHEEL METHODS

1.0 SCOPE AND APPLICATION

The methodologies discussed in this Standard Operating Procedure (SOP) are applicable to sampling soil by discrete and Cold Regions Regional Engineering Laboratory (CRREL) 7-Point Wheel compositing methods.

Discrete or "Grab" samples are defined as one aliquot of soil individually collected from one sample location or from a single depth in one borehole, from which a subsample is typically analyzed individually in the laboratory.

The CRREL 7-Point Wheel method results in a composite sample that physically combines and homogenizes seven individual soil aliquots. The purpose of composite sampling is to reduce sample variability that results from soil heterogeneity.

Typically the term "soil" refers to samples which are not covered with an aqueous layer for more than 30% of the time. The descriptions and procedures are generic in nature and may be modified in whole or part to meet the handling and analytical requirements of the contaminants of concern, as well as the constraints presented by the sampling area and project-specific protocols. However, if modifications occur, they should be documented in the site Quality Assurance Project Plan (QAPP), or if during fieldwork, the site logbook and Daily Quality Control Report (DQCR).

2.0 HEALTH AND SAFETY

All elements of this procedure will be conducted in accordance with the approved Site Safety and Health Plan, including but not limited to specified requirements for training, personal protective equipment (PPE), exposure monitoring and air sampling, etc. The UXOSO or designated representative will review the relevant site-specific activity hazard analyses (AHAs) prior to implementing this SOP.

When working with potentially hazardous materials, follow USEPA, OSHA and specific health and safety procedures as outlined in the site safety and health plan.

UXO avoidance procedures will be practiced according to SOP, OPS 15.

3.0 DOCUMENTATION - FIELD LOGBOOK AND DAILY QUALITY CONTROL REPORT

The Sampling Team Leader or designee will record the description of sample locations, soil type, and any other relevant or notable details in the Field Sampling Logbook. The Sampling Team Leader or designee will also record the sample locations using a global positioning system (GPS) unit (e.g., Trimble® GeoXT™ or similar) and document sample coordinates in the Field Sampling Logbook.

The Sampling Team Leader or designee will complete a Sampling Daily Quality Control Report (S-DQCR) for each day sampling is conducted.

For each day that samples are collected, the following information will be recorded in the Field logbook and reported in the S-DQCR by the Sampling Team Leader or designee:

- A general description of the environmental sampling activities completed, including a description of sampled areas, soil types present, media sampled, methods for collection, and other pertinent information.
- In the DQCR, the data should be summarized in a table listing environmental samples collected, including Sample IDs, and date and time collected. Include duplicate, MS/MSD samples and associate with parent samples (and, if required) QA samples, list analytes, and laboratory methods.
- Personnel present
- Weather conditions
- Equipment calibration required (water samples)
- List of equipment used
- Laboratory performing analysis
- Date shipped to laboratory
- Descriptions of any deviations from the QAPP/ and the reason for the deviation.
- Photo identification of the sample and surrounding area.

The Sampling Team Leader will sign the Sampling Field Logbook at the end of each day's activities.

The Sampling Team Leader will sign the completed S-DQCR to verify its completeness. If a Site Manager Daily Report is being prepared for the project, the Sampling Team Leader will submit the signed S-DQCR to the Site Manager for inclusion with that report (also see Section 5.1 of this SOP). The Project Chemist will review S-DQCR before submission to the client. This review may be performed before or after the S-DQCR is submitted to the Site Manager; note in the latter case the Site Manager must include the Project Chemist on the list of reviewers for the Site Manager Daily Report.

The S-DQCR and its attachments will be distributed electronically. At a minimum, copies of the completed S-DQCR will be submitted to the following Contracting Agency personnel: Project Manager, Technical Manager, and Project Chemist. If the project is being performed under a USACE contract, the S-DQCR will also be submitted to the Geographic District. Copies of final S-DQCRs will be maintained onsite during fieldwork and in the project file. A full set of S-DQCRs will be included with the final report.

4.0 SAMPLE LABELING, PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

4.1 LABELING

Accurate and complete sample labeling is essential to the data quality and credibility. Sample labels should be prepared according to the procedures in QAPP Worksheets #26 and 27 verified to ensure that they contain the following information:

- Name and number of project
- Site
- Sample ID – unique to each sample location, refer to QAPP Worksheet #26 and 27.
- Sample date and time collected – necessary for validation of the sample holding times
- Depth interval of sample, e.g., 0 to 2 in.
- Media
- Required analysis

- Preservative
- Sampler's initials.

Samples will be packaged for shipment according to SOP-OPS 34.

4.2 SAMPLE PRESERVATION

Following collection, all samples are placed in a cooler with ice.

If VOCs are to be analyzed, consult QAPP for further preservation.

4.3 CONTAINERS, HANDLING AND STORAGE

Following collection samples are placed in containers as identified in QAPP WS 19 & 30. The sample volume is a function of the analytical requirements and will be specified by the containers needed in the QAPP/Work Plan.

Prior to transferring soil to container, make sure the label is covered with tape.

Transfer soil from the sample collection device to an appropriate sample container using a stainless steel or plastic scoop or equivalent. If composite samples are collected, place the soil sample in a stainless steel or clean disposable plastic bowl (decontamination will be required for non-disposable equipment per section 7.3 below) or plastic (Teflon) bucket. Mix thoroughly to obtain a homogeneous sample representative of the entire sampling interval. Then aliquot the soil sample into labeled containers.

Samples for volatile organic analysis must be collected directly from the bucket, before mixing the sample to minimize loss due to volatilization of contaminants.

All non-disposable sampling devices will be decontaminated and then wrapped in aluminum foil. The sampling device will remain wrapped until it is needed. Non-disposable sampling equipment will be cleaned in the field using approved decontamination procedures as noted in Section 7.3, below.

5.0 INTERFERENCES AND POTENTIAL PROBLEMS

Interferences and potential problems that can contribute to invalid data range from mislabeled sample jars, sample temperature exceeding 4 °C, to the use of bug spray and sunscreen. Precaution should be taken when filling out the sample labels. Individuals collecting the samples should limit the use of bug sprays and sunscreen. At project locations where the use of these items is essential, care should be taken to not apply near samples. These products should be applied prior to going to the sample site. Hands should be thoroughly washed, and nitrile gloves worn at all times when handling samples. Samples should not come in contact with items that have been treated with these products.

Prior to shipping, melted ice water should be drained and ice should be replaced or put into Zip-Loc bags for shipment to ensure that the samples arrive at the laboratory at the required temperature.

6.0 EQUIPMENT/APPARATUS

The following equipment may be necessary for the collection of soil samples:

- Maps/plot plan/coordinates for sample location
- Safety equipment (nitrile gloves)
- GPS device
- Tape measure
- Camera

- Stainless steel, plastic or other appropriate container
- Laboratory supplied sample containers.
- Zip-Loc bags (gallon and quart size)
- Field Logbook
- Indelible black ink pen
- Sample jar labels
- Chain of Custody forms
- Chain of Custody seals
- Field data sheets or Personal Digital Assistant (PDA)
- Coolers
- Ice
- Decontamination supplies and equipment (if non-disposable equipment is used)
- The following equipment will vary by the needs of the project.
  - Spade or shovel
  - Scoop
  - Bucket auger
  - Hand auger
    - Extension rods
    - T-handle
  - Power auger
  - Backhoe
  - Drill rig.

7.0 PROCEDURES

7.1 PREPARATION

1. Review with subcontractor/sample crew extent of sampling effort, sampling methods, and required equipment and supplies.
2. Ensure that the necessary sampling and monitoring equipment has been obtained.
3. Ensure that equipment is pre-cleaned or decontaminated and is in working order.
4. Coordinate field schedule with the Project PM and coordinate as necessary with laboratory, staff, client, and regulatory agencies. Give the laboratory a week notice if possible. NEVER sent to laboratory without notifying them the samples are coming.
5. Perform general site survey prior to site entry in accordance with site-specific health and safety plans.
6. An unexploded ordnance (UXO) technician will escort the sampler during the collection of soil samples to ensure MEC avoidance for the sample team. The UXO technician will have a handheld magnetometer to scan the sample area or to provide safe access to the sample area.
7. Review QAPP for site-specific information on locating samples.
8. Specific site characteristics should be noted in Field Logbook, to include:
   a. soil characteristics,
   b. a description of the surrounding area

c. photos to document area (specifically evidence of human activity that could have impacted the soil).

9. Review site-specific QAPP to determine if samples can be adjusted based on site specific conditions, and if necessary, fully document in Field Notebook why sample was moved. Record new coordinates of new location.
10. If sample plan calls for collecting samples at munition locations, if the item can be removed, it will be removed in accordance with the MEC QAPP SOPs. Once the sample area is deemed safe by the UXO technician, the soil sample will be collected. If the item cannot be removed [e.g., item is too large, or will require a blow in place (BIP) procedure], the sample location will be moved to the closest nearby area that can be safely sampled and for which the same sampling objectives can be applied at the discretion of the sampling lead. The deviation and rationale will be recorded and documented. The sampler will proceed with collecting a sample, only when the sample location is deemed to be safe for sampling,

7.2 SAMPLING METHODS

7.2.1 Discrete Sampling Method for Soil (or Dry Sediment)

Following the preparatory actions (Section 7.1), the Sampling Team will complete the following steps to collect discrete surface soil samples:

1. Collect the sample using an approved sampling tool (e.g., stainless steel or disposable spoon, trowel, or scoop).
2. Transfer the collected soil from the sample tool directly into the sample container(s).
3. When sample containers are filled, wipe the threads of the jar, and secure the caps tightly. Place on ice as soon as possible (if required by sample preservation method).
4. After sampling is completed, backfill the hole with remaining soil to return the site to as close to original condition as possible.
5. Ensure samples are clearly labeled (including time of collection), label is protected with tape, document in Field Logbook, and capture coordinates.

7.2.2 Seven-point Wheel Method for Soil (or Dry Sediment)

The CRREL 7-point wheel method is used to collect composite soil samples. This method is generally used to characterize the immediate vicinity of a chosen location (e.g., a detonation crater).

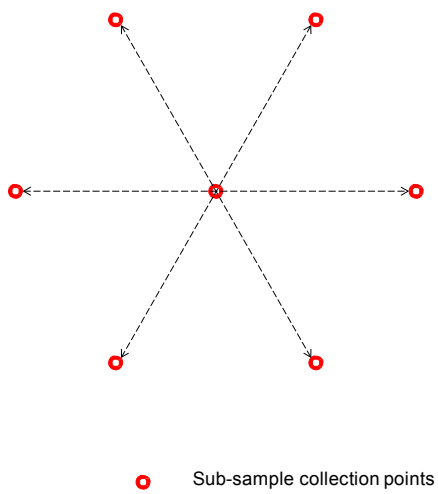
Following the preparatory actions (Section 7.1), the Sampling Team will complete the following steps to collect 7-point wheel surface soil samples:

1. Prepare an approved sampling tool (e.g., stainless steel or disposable spoon, trowel, or scoop).
2. Collect seven sub-samples from a designated location. Collect six of the sub-samples at evenly spaced intervals around the circumference of the circle and one sub-sample in the center of the circle (Figure 1). If collecting samples in a detonation crater, alter the size of the circle to include the entire detonation crater and record the diameter of the circle in the Field Logbook.
3. Place the seven sub-samples into a large disposable or stainless steel bowl and mix the combined soil thoroughly (crushing clumps) to ensure a representative sample.
4. The MS/MSD sample material and if required QA split may be collected from the same material homogenized (mixed) in the container with the parent sample. A duplicate sample requires

recollection of soil immediately adjacent to the collection locations of the parent sample, and homogenization in a separate container.

5. Transfer the mixed soil into the sample container(s). When sample containers are filled, wipe the threads of the jar, and secure the caps tightly. Place on ice as soon as possible (if required by sample preservation method).
6. After sampling is completed, backfill the hole with remaining soil to return the site to as close to original condition as possible.
7. Ensure samples are clearly labeled (including time of collection), label is protected with tape, document in Field Logbook, and capture coordinates.

Figure 1
CRREL 7-POINT WHEEL DIAGRAM



7.3 EQUIPMENT DECONTAMINATION

If non-disposable equipment is reused, one or more aqueous decontamination blanks may be required to verify the decontamination procedure thoroughly cleans equipment.

Sampling equipment decontamination will be conducted in an uncontaminated area free of dust. Unless otherwise specified in the QAPP, sampling equipment will be decontaminated using the following process:

1. Wash equipment with tap/potable water and laboratory-grade detergent (e.g., Alconox™ or Liquinox™).
2. A scrub brush will be used to remove any dirt and/or surface film.
3. Rinse equipment thoroughly with tap water.
4. Rinse equipment thoroughly with ASTM Type II or distilled water.

5. Remove excess water and allow equipment to dry.
6. Wrap equipment in aluminum foil, shiny side out.

If required by a Waste Management Plan, sampling equipment decontamination water may need to be containerized for subsequent chemical analysis and for proper disposal of decontamination water.

7.4 QUALITY ASSURANCE/QUALITY CONTROL

To ensure the validity of sample collection method and representativeness, QC, and if required by PWS, QA samples are collected. Field personnel will prepare the proper type and quantity of quality control samples as prescribed in the QAPP. Table 1 details the type and frequency of samples that may be collected.

Consult Site-Specific QAPP for field QC sample frequencies; laboratory QC sample frequencies are generally fixed in the laboratory subcontracts which reference Department of Defense (DoD) Quality Systems Manual (QSM).

There are no specific in field quality assurance activities which apply to the implementation of these procedures. However, the following QA/QC procedures apply.

1. All data must be documented within site logbooks and included in DQCR.
2. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout and calibration activities must occur prior to sampling/operation, and they must be documented in the Field Logbook and DQCR.

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Table 1: Quality Control Samples

Sample Type	Purpose	Collection (1)	Sample Number
Field Duplicates	To check reproducibility of laboratory and field procedures. To indicate non homogeneity	Collect at a rate specified in Worksheet #20 of QAPP.	Assign two separate (unique) sample numbers (i.e., one number to the parent sample and one number to the duplicate). Submit blind to Laboratory
Matrix Spike and Matrix Spike Duplicate (2)	Required by laboratory's contract to check accuracy and precision of sample analysis	Collect at a rate specified in Worksheet #20 of QAPP.	Label same as parent sample, and include MS/MSD after sample name on container. On Chain of Custody form, indicate MS/MSD next to parent sample and increase to # of containers provided.
Temperature Blanks	To check temperature of cooler upon arrival at laboratory to validate preservation.	Include bottle of water (usually small bottle provided by laboratory, but an unopened drinking water bottle can be used if lab temp blank bottle is not available.	No numbering or documentation on CoC needed.
Field Blanks (Consult QAPP Worksheet #20 to see if required)	To check cross-contamination during sample collection, sample shipment, and in the laboratory. Also to check sample containers.	Collect for each group of samples of similar matrix per day of sampling. Organics – use water (demonstrated to be free of contaminants of concern) Inorganic – Use metal-free (deionized or distilled) water.	Assign separate sample numbers to the field blanks. Submit blank to the lab Include on Chain of Custody Form
Volatiles Trip blank (Only when VOCs are identified in QAPP to be included in the sample analysis)	To check contamination during sample handling and shipment form field to laboratory	Use 40 ml VOA provided by lab. Place two VOAs with same name in each cooler used to ship volatile organic samples	Assign separate sample numbers to the trip blanks. Submit blank to the lab.
Equipment Blank or Rinse Blank	To check field decontamination procedures	Collect when non-disposable sampling equipment is decontaminated and reused in the field or when a sample collection vessel (bailer or beaker) will be used. Use blank water (water demonstrated to be organic free, deionized, or distilled for inorganics) to rinse water into sample containers	Assign separate sample numbers to the equipment blanks. Submit blank to the lab.

1. Consult the QAPP for field QC sample frequencies; laboratory QC sample frequencies are generally fixed in the laboratory subcontracts or specified in analytical methods.
2. Provide double volume for the soil/sediment matrix; the sample to be used for laboratory QC must be designated MS/MSD on the Chain of Custody Form.

8.0 REFERENCES

U.S. Environmental Protection Agency (USEPA), Standard Operating Procedures, “Soil Sampling” SOP 2012 Rev.0, 18 February 2000.

U.S. Army Corps of Engineers (USACE), Technical Guidance for Military Munitions Response Actions, Engineering Manual (EM) 200-1-15.

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STANDARD OPERATING PROCEDURE – OPS-40
LOCATION SURVEYS

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide all USA Environmental, Inc. (USA) employees and subcontractors with the minimum procedures and safety and health requirements applicable to perform Location Surveys operations at sites potentially containing unexploded ordnance (UXO) and/or munitions and explosives of concern (MEC).

Differential Global Positioning System (DGPS) equipment is used to lay out site features such as grids, transects, or site boundaries. DGPS equipment is also used to collect location data for items of interest such as MEC items or inaccessible areas. The steps in this SOP are to be carried out after the Real-Time Kinematic (RTK) Base Station and Rover (see SOP 1.3.0 and 1.4.0) have been set up and checked.

2.0 SCOPE

This SOP applies to all USA site personnel involved in the conduct of Location Survey operations on a UXO/MEC-contaminated site. The following USA procedures are not all inclusive nor are they applicable in all situations. This SOP is not a stand-alone document and is to be used together with the Quality Assurance Project Plan (QAPP), other USA SOPs, the USA Site Safety and Health Plan (SSHP), applicable Federal, state, and local regulations, and contract restrictions and guidance.

3.0 INTRODUCTION

This SOP is intended to be used by USA employees filling the GPS operator role on project sites. The procedures below are designed for Trimble RTK DGPS receivers and Trimble TSC3 Dataloggers.

4.0 PROCEDURES

4.1 STAKEOUT

1. If possible, coordinates of all points to be staked out should be loaded onto the datalogger (TSC3) before fieldwork begins by someone knowledgeable with the system (GPS operator, GIS Analyst, Site Geophysicist, etc.) This will help to reduce human error when hand-typing coordinates.
2. Ensure the correct job file is open on the datalogger. The job file contains all of the files and coordinates needed to complete the survey. If necessary, open the correct job, under the Files menu.
3. Click the Survey icon and select the Stakeout option and then select the Points option. The list of points available for stakeout should appear on the screen. If the list is blank, click the Add button at the bottom of the screen to add the points to the list.
4. Select a point to stake out by clicking on that point in the list. The screen then changes to the navigation screen.
5. Follow the guidance on the screen to navigate to the location of the point. As the Operator approaches the location, the navigation screen switches from the “coarse” navigation mode to the “fine” navigation mode.

6. While ensuring the survey range pole is level, the Operator slowly moves toward the location until the display indicates that he/she is within the GPS accuracy metrics for the project (generally, within a tenth in both the easting and northing values).
7. Push down gently on the range pole to create a small divot and mark the location on the ground. Use MEC avoidance practices by checking location with a metal detector before driving a wooden survey stake or pin flag into the ground. If the stake or pin flag cannot be installed at the location, offset to a safe location and note the offset on the stake or pin flag by writing down the direction and distance of the actual GPS location.
8. Mark the stake or flag with the Point ID.
9. Click Escape (Esc) to return to the point list on the datalogger.
10. Select the next point and repeat steps 4 through 9 above.

4.2 MEASURE POINTS

1. From the main menu on the datalogger, click the Survey icon and select Measure Points.
2. Give the point an appropriate name in the filename box.
3. Place the survey range pole at the location you would like to measure and ensure the pole is level by using the attached level bubble.
4. Hold the range pole steady and click the Measure button at the bottom right of the screen. The datalogger will measure for 5 seconds. If the GPS is moving too much, there will be an excessive movement error.
5. When the measurement is complete, click Store at the bottom right of the screen to store the point location.
6. Repeat steps 2 through 5 for each point to be measured.

4.3 TRANSFER DATA

1. From the main menu, click the Import/Export icon.
2. Select the Export Fixed Format Files.
3. Choose Comma Delimited from pull down menu.
4. Check to be sure: Point name = Field 1; Northing = Field 2; Easting = Field 3; Elevation = Field 4; Point Code = Field 5.
5. Click on Filename and verify where the file is being saved. Give the file an appropriate name. Write down location for reference later then click OK.
6. Click Accept at the bottom right of the screen.
7. At the Select Points screen, click All Points.
8. After the export is complete, click OK.
9. Exit General Survey.
10. Insert a USB thumb drive into the USB port at the bottom of the datalogger.
11. Open File Explorer from the Start menu.
12. Navigate to the folder that contains the file just exported.
13. Click and hold on the file for a menu to appear.

14. Click Copy.
15. Navigate to the location of the thumb drive.
16. Scroll to the bottom of the list of files and click and hold in an empty white space on the screen to bring up a menu.
17. Click Paste.
18. Remove thumb drive from datalogger and insert it into a field computer.
19. Copy files from thumb drive to the computer.

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STANDARD OPERATING PROCEDURE – OPS-41
SMALL BOAT OPERATIONS

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide the minimum procedures and safety and health requirements applicable to the transporting of personnel by boat to the cayos, and the towing, loading, unloading, and mooring of the Caribbean Marine Services (CMS) small barge.

2.0 SCOPE

This SOP applies to all project personnel, including contractor and subcontractor personnel, involved in the conduct of operations pertaining to the use of small boats and the CMS small barge. The small boats used for the TCRA range in size from 40 feet (ft) to 24 ft long (see Figure 1). They are used to transport the work force to the cays, shuttle the work force and equipment from the transport vessel to the shoreline, and act as chase boats to travel out to incoming boat traffic to request encroaching vessels to stay out of the exclusion zones.

Figure 1: Tow vessel and work boat example (left), and work force transport vessel example (right)

The CMS small barge is a one-off design floating platform that can be towed behind the CMS work boat. The small barge will be used primarily for the transport of Range Related Debris (RRD) and Munitions Debris (MD) that can be certified as Material Determined As Safe (MDAS). Though transport of the RRD and MD is possible inside the work boats, the RRD is anticipated to be primarily tires and most of the MD will likely consist of expended Bomb Dummy Units (BDUs) which, if they were loaded inside the work boats, could cause damage to the boat structure or boat surfaces.

The vessel must be manned by competent personnel and be properly licensed, registered, and insured for the operations being conducted. During movement of explosives the vessel is deemed to be in a non-passenger mode of operation. All personnel on-board will be required to have a personal flotation device.

This SOP is not intended to contain all of the requirements needed to ensure compliance.

3.0 REFERENCES

Procedures and information contained in this document were obtained from the references below:

- Final Supplemental Standard Operating Procedures (SOP) for Endangered Species Conservation and their Critical Habitat (Addendum 1-February 2015) (CESAJ, 2015)
- USA Corporate Safety and Health Program (CSHP)
- 33 CFR Chapter I, Coast Guard, Department of Transportation
- 46 CFR Chapter I, Coast Guard, Department of Homeland Security
- USACE EM 385-1-1, Safety and Health Requirements Manual
- AR 385-40 w/USACE Supplement, Accident Reporting and Records
- AR 385-10, The Army Safety Program

4.0 RESPONSIBILITIES

4.1 PROJECT MANAGER (PM)

The Project Manager (PM) 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 (SUXOS)

The Senior Unexploded Ordnance Supervisor (SUXOS) will ensure that this SOP is implemented for small boat 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 SAFETY OFFICER (UXOSO)

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 small boat and barge operations and conditions when they are employed to ensure compliance with this SOP and the SSHP.

5.0 PROCEDURE

All personnel, including contractor and subcontractor personnel, involved in small boat operations will be familiar with the potential safety and health and ecological hazards associated with the conduct of this operation, and with the work practices and control techniques to be used to reduce or eliminate these hazards.

5.1 SAFETY AND ECOLOGICAL HAZARDS AND OPERATIONAL CONTROL TECHNIQUES

The operational control techniques to be used during conduct of CMS small barge operations are discussed below.

- The small boat operator (Captain or coxswain) will visually inspect the vessel to ensure it is operational, seaworthy, has enough fuel for the day's activities, and it has all of the recommended USCG safety devices for the vessel's size (e.g., life preservers, fire extinguishers, etc.).
- All vessels will be operated in a safe manner for the sea conditions encountered. The vessel Captains or coxswains are responsible for vessel, crew and passenger safety at all times during transit. Should weather conditions appear to exceed what the vessel's Captain or coxswain feels

is safe for the vessel being employed, the Captain or coxswain will inform the UXOSO and will suspend small boat operations until the weather improves.

- The tow boat operator (Captain or coxswain) will visually inspect the barge, attachment points for both barge and tow boat, the tow lines, and USCG tow day heavy equipment daily prior to operation, and report any abnormalities/deficiencies to the UXOSO.
- The CMS small barge (floating platform) will be towed to the work site on an as-needed basis. When the CMS small barge is under tow, the tow boat operator will ensure the tow speed is limited to ensure the barge is not damaged during transit. Anticipated barge tow speeds are 5 knots or less.
- During small boat operations, the Final Supplemental SOP for Endangered Species Conservation and their Critical Habitat (Addendum 1-February 2015) will be adhered to. However, to meet the TCRA PWS, the following exceptions to the Final Supplemental SOP for Endangered Species Conservation and their Critical Habitat (Addendum 1-February 2015) that are specific to the TCRA Operation have been approved by the USACE and project stakeholders.
  - The CMS small barge will be brought close to the cayo shoreline and then a multipoint moor put in place to maintain its position for the loading of RRD and MD. The operator and field teams will ensure the small barge and vessel do not damage corals. The mooring points will be established on surfaces that are above sea level so as not to impact coral, or the mooring will be anchored on a sand bottom. Mooring points may be temporary and may consist of anchors set in a sand bottom or on a beach. Mooring points may also consist of mooring rings or suitable substitute set into large rocks above the waterline by drilling a hole, setting the mooring ring pin in the rock, and cementing the pin into the rock. Mooring lines will be constructed of polypropylene to ensure the lines remain afloat and that they do not sink to the sea floor and threaten corals or marine species. If setting anchors on the beach MEC avoidance measures will be used.
  - Vessels will not be moored overnight or left without a responsible person to ensure the vessel remains at its moor or anchorage.
  - When Field Teams are transported by one of the larger vessels (29 ft or longer), the transport vessel will be anchored or moored off shore of the cayo in deeper water. If anchored, it will anchor on a sand bottom. A smaller hard-hulled work boat (approximately 24 ft) will shuttle the field teams and equipment to shore. While approaching the shoreline, a watch will be placed on the bow of the vessel to ensure that no turtles or marine mammals are in the path of the boat, and corals are avoided. If marine mammals are seen within the path of the vessel, the boat shall follow the guidance found in the Final Supplemental SOP for Endangered Species Conservation and their Critical Habitat (Addendum 1-February 2015) (CESAJ, 2015) for avoidance of marine mammals and sea turtles. Once the vessel is in water shallow enough for personnel to wade ashore (approximately 18 to 24 inches), the boat should be held in place by established moorings or anchors, as the vessel is off-loaded. Anchors or mooring points will not be placed in coral, seagrass, or hardbottom.
- When RRD or MD is loaded onto the CMS small barge, it will packaged and contained by top-sealed bulk bags. The bulk bags will be placed and secured under the guidance of the tow boat vessel coxswain or Captain. At least two points of attachment will secure the bulk bags to the small barge. The barge load will not exceed its capacity of 2,000 lb.
- The primary offload site for the RRD and MD is at the USFWS or PRDNER boat ramps located inside Ensenada Bay (see QAPP Appendix B, Figure 6).
- The secondary offload site for the RRD and MD is at Soldado Point (see MEC QAPP Appendix B, Figure 7). To offload the small barge at Soldado Point, the barge will be pushed onto the beach by the tow vessel and then anchored to the shoreline until it is offloaded.
- The Accident Prevention Plan and associated Activity Hazard Analysis for boat operations will be followed.

5.2 PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS

The following personal protective equipment (PPE) will be used in preventing or reducing exposures associated with boat operations. These requirements will be implemented, unless superseded by site-specific requirements stated in the SSHP.

- Site personnel may use work boots with non-slip soles, which are required for use on the project site, or they may wear rubber-soled, closed-toe footwear on the boat and change into work boots when they arrive at the site.
- Appropriate clothing and PPE, to include cotton long- or short-sleeved shirt and long pants, personal flotation device, safety glasses or goggles, leather or canvas work gloves and cap. Hearing protection (as required due to noise of boat engine). Gloves will be worn while handling RRD and MD.
- Life jackets will be worn while the small boat is in transit.

5.3 VESSEL MOVEMENT

Vessel movement will be accomplished only by authorized vessel crew members. The vessel Captain is responsible for all actions taken with regards to operations occurring on-board the vessel. The Captain will ensure that movement is conducted IAW U.S. Coast Guard (33 and 46 CFR), State, and local requirements.

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STANDARD OPERATING PROCEDURE
1.11.0 –SEEDING PROGRAM

1.0 Introduction

In order to provide dynamic monitoring of the quality of the geophysical data collection and target selection process throughout the project, blind seed items (BSIs) seed items will be placed in each grid to ensure that at least one item is encountered daily by each survey team. The seeding program is intended to test all aspects of geophysical data collection as follows:

- *Equipment functionality*: If the data collection equipment is functioning correctly during the project, the response generated by each of the seed items should be greater than a minimum acceptable response (testing DGM equipment functionality) and should be within a maximum distance for the measured location of the seed item (testing GPS functionality, as applicable).
- *Data collection*: In order for the seeds to be detected and selected as targets in the correct location, data must be collected properly over the seeds (i.e., maximum speed enforced, no gaps in data coverage, fiducials marked as necessary, and etc.).
- *Data processing*: The correct use of data leveling procedures should not result in the reduction of seed item responses to below the minimum acceptable response, and the correct application of latency values should result in the correct location of selected seed items with respect to the measured locations.
- *Target selection*: As long as the seed item has a response in the collected data greater than the project threshold, it should be selected as a target.
- *Analog Seeding*: For areas that remain inaccessible to DGM, Analog BSIs are placed per operator per lot: variable 1-2 large/deep and 1-3 small/shallow. Note: in rocky soils, variable coverage seeds may be used.

2.0 Procedure

Small industry standard objects (ISOs) will be placed within the grids per the Quality Assurance Project Plan (QAPP) before beginning DGM survey operations. All seed item burial/placement and tracking will be performed by the UXOQCS. The UXOQCS will clear a three foot radius around each location selected for a BSI prior to the initiation of any excavation. No seed items will be placed within three feet of an identified subsurface anomaly. BSIs will be buried at one of the depth/orientation combinations used in the IVS (or Analog Test Strip). The location and orientation of all seeds as well as the depth of each BSI will be recorded following placement using RTK DGPS equipment or a tape measure or ruler. Tape measures and rulers will be used to locate BSIs in grids where RTK DGPS is not usable. The grid corners, origin, and Y axis direction will be established prior to BSI placement and location measured.

The expected response for the seed items will be determined from initial IVS measurements along offset lines. As with the seed items in the IVS, the minimum acceptable response for the seed items will be ≥75 percent of the minimum expected response. Additionally, the position of the anomaly peak should be within 0.85m (GPS-located data) or 0.90m (fiducially-located data) of the known location(s) of the test item.

The UXOQCS will maintain a spreadsheet of the seed locations and limit access only to the QC Geophysicist for use in evaluating whether the measurement quality objects (MQOs) were achieved.

For purposes of evaluating MQOs, the UXOQCS or QC Geophysicist will be supplied with the processed data from the site, including selected targets, so the data and targets can be compared to the recorded locations of the seed items. The UXOQCS will report, if applicable, the

success or failure with regard to the seed items to the Project Geophysicist. The Project Geophysicist will prepare a root cause analysis for any seed item either absent from the processed data or not on the selected target list. The UXOQCS also monitors the recovery of each BSI by the intrusive teams. Failure to recover a BSI results in a lot failure.

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
P.O. BOX 4970
JACKSONVILLE, FLORIDA 32232-0019

REPLY TO
ATTENTION OF

CESAJ-PM-M

FEB 25 2015

MEMORANDUM FOR SEE DISTRIBUTION LIST

SUBJECT: Final Supplemental Standard Operating Procedures (SOP) for Endangered Species Conservation and their Critical Habitat (Addendum 1 – February 2015), Defense Environmental Restoration Program for Formerly Used Defense Sites (DERP-FUDS) Property No. I02PR0068, Culebra, Puerto Rico

The Jacksonville District, U.S. Army Corps of Engineers is enclosing for your records a copy of the Final Supplemental SOP for Endangered Species Conservation and their Critical Habitat (Addendum 1 – February 2015). A copy of the draft Addendum was provided to the resource agencies via e-mail for review and comment on December 1st, 2014. Review comments from the National Marine Fisheries Service (NMFS) and the Puerto Rico Environmental Quality Board (EQB) were received on December 5th, 2014 and January 7th, 2015, respectively. Responses to comments as well as the revised Addendum 1 were provided to NMFS and EQB on February 13, 2015.

Should you need additional information, please contact me at 904-232-1758 or by e-mail at John.E.Keiser@usace.army.mil or Mr. Wilberto Cubero at 904-232-1426 or by e-mail at Wilberto.Cubero-Deltoro@usace.army.mil.

Sincerely,

Encls

John E. Keiser, P.E.
FUDS Program Manager
Military/Interagency &
International Service Branch

Distribution List Final Supplemental SOP for Endangered Species Conservation and their Critical Habitat (Addendum 1 – February 2015), DERP-FUDS Property No. I02PR0068, Culebra, Puerto Rico	
Ms. Wilmarie Rivera Federal Facilities Coordinator PR Environmental Quality Board 1375 Ponce de León Avenue San Juan, PR 00926-2604	Ms. Marelisa Rivera US Fish and Wildlife Service Road 301, Km 5.1 Boquerón, PR 00622
Dr. Lisamarie Carrubba NOAA Fisheries Caribbean Field Office Road 301, Km 5.1 Boquerón, PR 00622	Dr. Craig Lilyestrom Director, Marine Resources Division Department of Natural & Environmental Resources PO Box 366147 San Juan PR 00936-6147
Mr. Julio Vazquez US EPA Region 2 Special Project Branch/Federal Facilities Section 290 Broadway – 18th Floor New York, NY 10007-1866	Ms. Diane E. Wehner NOAA Office of Response and Restoration 290 Broadway Rm 2059 New York, NY 10007
Ms. Ana Roman US Fish and Wildlife Service Culebra National Wildlife Refuge Manager Road 301, Km 5.1 Boquerón, PR 00622	Mr. Richard Henry US Fish and Wildlife Service 2890 Woodbridge Ave. Edison, NJ 08837
Mr. Jose Rivera NOAA Fisheries c/o USACE Antilles Office 400 Fernández Juncos, Parada 7.5 Puerta de Tierra, PR 00901-3299	

FINAL

Supplemental Standard Operating Procedures for Endangered Species Conservation and their Critical Habitat

DERP-FUDS Property No. I02PR0068
Culebra, Puerto Rico

US Army Corps of Engineers
Jacksonville District

February 2014
(Addendum 1 February 2015)

ADDENDUM 1

SUPPLEMENTAL STANDARD OPERATING PROCEDURES ENDANGERED SPECIES CONSERVATION AND HABITAT PROTECTION DERP-FUDS PROJECT NO. I02PR0068, CULEBRA, PUERTO RICO

1.0 PURPOSE AND NEED

The purpose of this document is to 1) supplement, not replace, the *February 2014 Supplemental Standard Operating Procedures (SOPs) for Underwater Investigations for Defense Environmental Restoration Program for Formerly Used Defense Site (DERP-FUDS) Project No. I02PR006802, Culebra, Puerto Rico*, 2) serve as guidance for USACE and its Contractors in order to avoid or minimize impacts to listed species and their designated critical habitat and species proposed for Endangered Species Act (ESA) listing during geophysical surveys, intrusive investigations/MC environmental sampling, and controlled detonation activities, 3) satisfy the substantive requirements of the ESA, 4) incorporate newly listed species, and 5) update the POC list for coordination and reporting.

2.0 LISTED OR PROPOSED FOR LISTING SPECIES

A description of threatened or endangered species and their habitat as well as species proposed for listing that are known to occur or have the potential to occur in the waters around Culebra Island and adjacent cays have been discussed in the previously developed and coordinated SOPs listed below.

a. SOPs for Endangered Species Conservation and their Habitat – July 2008

b. Addendum to the July 2008 SOPs – April 2011

c. SOPs for Endangered Species Conservation and their Critical Habitat during Underwater Investigations – April 2012

d. Supplemental SOPs for Endangered Species Conservation and their Critical Habitat during Underwater Investigations – February 2014

Subsequent to the February 2014 supplement, ESA listing decisions became final and additional species have been proposed for listing as threatened or endangered under the ESA. The species for which ESA listing decisions are now final and additional species now proposed for ESA-listing are discussed below:

a. On September 10, 2014, the National Marine Fisheries Service (NMFS) published a final rule in the Federal Register (79 FR 53851) to list 20 coral species as threatened under the ESA (effective date October 10, 2014). Five of these species are known to occur in Puerto Rico including: Pillar Coral (*Dendrogyra cylindrus*), Rough Cactus Coral (*Mycetophyllia ferox*), Lobed Star Coral (*Orbicella annularis*), Mountainous Star Coral (*Orbicella faveolata*), and Boulder Star Coral (*Orbicella franksi*)(genus *Orbicella* formerly known as *Montastraea*). In addition, the determination to maintain the status of Elkhorn Coral (*Acropora palmata*) and Staghorn Coral (*Acropora cervicornis*) as threatened rather than changing their listing to endangered was included in this final rule. Please note: the listed species common names above were taken from the final rule (79 FR 53851) and supersede those in 2012 SOPs for Endangered Species Conservation and their Critical Habitat during Underwater Investigations – April 2012, Page 21 Section 3.13 Species of Corals Proposed for Listing under the ESA, Page 23: Section 3.13.2.1, and Page 24 Section 3.13.2.3.

b. On September 2, 2014, NMFS published a final rule in the Federal Register (79 FR 38213) to list the Central and Southwest (SW) Atlantic Distinct Population Segment (DPS) of Scalloped Hammerhead Shark (*Sphyrna lewini*) as a threatened species under the ESA. NMFS is also considering critical habitat for the Central & SW Atlantic DPSs. These DPSs include the U.S. Caribbean. NMFS does not currently have any explosive guidelines specific to sharks. For the scalloped hammerhead a conservative estimate is application of the predictive equations and example calculations for fish from 2014 SOPs, Appendix E, Section 4.2. However, this species isn't expected to be common in the work area given the shallow depths and overfishing. Because this is an underwater species that doesn't need to surface to respire, perhaps the highest potential for observation would be through diver survey prior to any intrusive work. However, sharks could still swim into the area and not be seen. Sharks should be far more resilient to pressure wave injury than air bladdered fish, turtles, and marine mammals because they have no swim bladder (or air containing organs). External injury (eyes, gills, scale loss, contusions) or auditory damage could occur if the shark is fairly close to the blast. However, mortal injury or death is unlikely. Therefore, the acoustic impact calculations for fish from the 2014 SOPs will be used to establish zones of influence for sharks during in-water detonation/blow-in-place activities.

c. On September 2, 2014, NMFS issued a proposed rule and request for comments (79 FR 51929) and announced a 12-month finding and listing determination on a petition to list the Nassau Grouper (*Epinephelus striatus*)

as threatened or endangered under the ESA. The 105 day document comment period ends on December 31, 2014.

d. On November 5, 2014, NMFS announced a 12-month finding (79 FR 65628) and listing determination on a petition to list the Queen Conch (*Strombus gigas*) as threatened or endangered under the ESA. NMFS completed the status review and determined that there was not enough evidence to warrant listing at this time.

3.0 MEASURES TO AVOID OR MINIMIZE POTENTIAL IMPACTS

The measures in the SOPs listed in Section 2.0 above will be implemented to minimize the risk of unintended impacts to these newly listed species, species proposed for ESA-listing, and all other threatened or endangered species and their habitat during RI/FS underwater investigation. Activities that may pose potential impacts to listed species include, but are not limited to running aground, accidental collision or vessel strike, personnel during snorkeling and diving operations, equipment [e.g. multi-beam, side scan sonar, remotely operated vehicle (ROV), hand-held magnetometers, electromagnetic (EM) platforms, and video cameras], intrusive investigations requiring excavation of the marine bottom, removal and transport of anomalies from underwater locations to terrestrial collection points, and accidental detonation.

By implementation of these measures, adverse impacts to listed species or their habitats are expected to be avoided or minimized. It should be noted that the Contractor will be required to implement these SOPs during any underwater work.

The POC list for coordination and reporting from the February 2014 Supplemental SOP has been updated and is presented below.

4.0 POINTS OF CONTACT FOR SOPs COORDINATION AND REPORTING

Name	Organization	Telephone/Email
Wilberto Cubero Project Manager	USACE, Jacksonville	Office: 904-232-1426 Wilberto.Cubero-delToro@usace.army.mil
José Méndez Forward Project Manager	USACE, Antilles Office	Office: 787-729-6877 Jose.M.Mendez@usace.army.mil
Paul DeMarco Biologist	USACE, Jacksonville	Office: 904-232-1897 Paul.M.DeMarco@usace.army.mil

Name	Organization	Telephone/Email
Wendy Weaver Archaeologist	USACE, Jacksonville	Office: 904-232-2137 Wendy.Weaver@usace.army.mil
Roland Belew Project Manager	USACE, Huntsville	Office: 256-895-9525 Roland.G.Belew@usace.army.mil
Kelly Enriquez Geophysicist	USACE, Huntsville	Office: 254-895-1373 Kelly.D.Enriquez@usace.army.mil
Sarah Dyer Technical Manager	USACE, Huntsville	Office: 256-509-3498 Sarah.e.dyer@usace.army.mil
Edwin Muñiz Field Supervisor	FWS	Office: 787-851-7297 Edwin_Muñiz@fws.gov
Marelisa Rivera Deputy Field Supervisor	FWS	Office: 787-851-7297 x. 206 Marelisa_Rivera@fws.gov
Susan Silander Project Leader Caribbean Islands National Wildlife Refuges Complex	FWS	Office: 787-851-7258 x. 306 Susan_Silander@fws.gov
Ana M. Roman Deputy Project Leader and Culebra NWR Manager	FWS	Office: 787-742-0115 / 787-306-1389 Ana_Roman@fws.gov
Lisamarie Carrubba Caribbean Field Office Protected Resources Division	NMFS	Office: 787-851-3700 x. 206 Lisamarie.Carrubba@noaa.gov
José Rivera Habitat Conservation Division	NMFS	Office: 787-405-3605 Jose.A.Rivera@noaa.gov
Diane Wehner Regional Resource Coordinator Office of Response and Restoration	NOAA	Office: 240-338-3411 Diane.Wehner@noaa.gov

Name	Organization	Telephone/Email
Wilmarie Rivera Program Manager	EQB	Office: 787-767-8181 ext. 6141 WilmarieRivera@jca.gobierno.pr
Julio F. Vazquez Remedial Project Manager	EPA Region II	Office: 212-657-4323 Vazquez.Julio@epa.gov
Nilda Jimenez Marrero Marine Resource Division	DNER	Office: 787-772-2022 njimenez@drna.gobierno.pr
Craig Lilyestrom, Director Marine Resource Division	DNER	Office: 787-772-2022 Craig.Lilyestrom@drna.gobierno.pr

US Army Corps of Engineers
Jacksonville District

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B. Guide with the minimum information required for the Daily Observer Log Sheet

C. Recommended Coral Relocation and Reattachment Protocol

D. List of seabirds that occur in the Project Area

E. Equation to calculate the potential extent of acoustic impacts from underwater detonations

LIST OF ACRONYMS

DERP	Defense Environmental Restoration Program
DM	Decision Matrix
DNER	Department of Natural and Environmental Resources
EBS	Environmental Baseline Survey
EQB	Environmental Quality Board
EM	Electromagnetic
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESP	Explosives Site Plan
FS	Feasibility Study
FUDS	Formerly Used Defense Sites
FWS	U.S. Fish and Wildlife Service
GPS	Global Positioning System
MC	Munitions Constituent
MD	Munitions Debris
MDAS	Material Documented as Safe
MEC	Munitions and Explosives of Concern
MPPEH	Material Potentially Presenting an Explosive Hazard
MRA	Munitions Response Area
MRS	Munitions Response Sites
Navy	Department of Navy
NMFS	National Marine Fisheries Service
QC	Quality Control
RI	Remedial Investigation
ROV	Remote Operated Vehicle
SCUBA	Self Contained Underwater Breathing Apparatus
SLRA	Screening Level Risk Assessment
SOPs	Standard Operating Procedures
TPP	Technical Project Planning
UIT	Underwater Investigation Team
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
UXO	Unexploded Ordnance
WP	Work Plan

SUPPLEMENTAL STANDARD OPERATING PROCEDURES
ENDANGERED SPECIES CONSERVATION AND HABITAT PROTECTION
DERP-FUDS PROJECT NO. I02PR0068, CULEBRA, PUERTO RICO

1.0 INTRODUCTION

The U.S. Army Corps of Engineers (USACE) is conducting Environmental Baseline Surveys (EBS) on Culebra Island Munition Response Sites (MRSs) underwater portions. The EBS is the first of three (3) phases of the Remedial Investigation (RI) being conducted within these areas. The RI is comprised of the following phases:

a. Phase I – Hydrographic Survey and Underwater Visual Surveys.

b. Phase II - Geophysical Surveys to detect metallic anomalies.

c. Phase III - Intrusive Investigations/Munitions Constituents (MC) Environmental Sampling.

The overall objective of the RI/Feasibility Study (FS) is to determine the nature and extent of any contamination related to munitions and explosives of concern (MEC) and/or MC within the underwater portions of these MRSs. The main objectives of the underwater investigations are to a) characterize and map benthic habitats within investigation areas, b) determine, identify and map endangered or threatened species, in particular coral colonies, c) gather the necessary information to determine potential effects (e.g. location of species versus location of suspected MEC) on endangered or threatened species during remedial investigations and cleanup activities, d) determine presence or absence of MC and MEC, e) characterize the nature and extend of MC and MEC presence, and f) determine if the MC or MEC pose an unacceptable risk to human health and the environment, which would require further considerations or a response action.

2.0 PURPOSE AND NEED

The purpose of this document is to 1) supplement, not replace, the *April 2012 Standard Operating Procedures (SOPs) for Underwater Investigations for Defense Environmental Restoration Program for Formerly Used Defense Site (DERP-FUDS) Project No. I02PR006802, Culebra, Puerto Rico* 2) serve as guidance for USACE and its Contractors in order to avoid or minimize impacts to listed, or proposed for listing, species and their designated critical habitat during geophysical surveys, intrusive investigations/MC environmental sampling, and controlled detonation activities, and 3) satisfy the substantive requirements of the Endangered Species Act (ESA).

3.0 LISTED OR PROPOSED FOR LISTING SPECIES

A description of threatened or endangered species and their habitat as well as species proposed for listing that are known to occur or have the potential to occur in the waters around Culebra Island and adjacent cays have been discussed in previously developed and coordinated SOPs. The following SOPs are being incorporated by reference into this document and they can be found in **Appendix A**:

a. SOPs for Endangered Species Conservation and their Habitat – July 2008

b. Addendum to the July 2008 SOPs – April 2011

c. SOPs for Endangered Species Conservation and their Critical Habitat during Underwater Investigations – April 2012

4.0 MEASURES TO AVOID OR MINIMIZE POTENTIAL IMPACTS

The following measures will be implemented to minimize the risk of unintended impacts to threatened or endangered species and their habitat during RI/FS underwater investigation. Activities that may pose potential impacts to listed species are, but not limited to running aground, accidental collision or vessel strike, personnel, snorkeling and diving operations, equipment (e.g. multi-beam, side scan sonar, remotely operated vehicle (ROV), hand-held magnetometers, electromagnetic (EM) platforms, and video camera), intrusive investigations requiring excavation of the marine bottom, removal and transport of anomalies from underwater locations to terrestrial collection points and accidental detonation.

By implementation of these measures, adverse impacts to listed species or their habitats are expected to be avoided or minimized. It should be noted that the Contractor will be required to implement these SOPs during any underwater work as well as the previously coordinated SOPs included in Appendices A.

4.1 General Conservation Measures

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

4.1.2 Training/Briefing: Prior to initiating work all personnel shall receive training or briefings regarding the importance of endangered species, their characteristics, how they can be identified, potential and critical habitats, types of material in which they may hide, actions

to take if are sighted, and avoidance measures to be followed as detailed in the SOPs. For additional information refer to **Appendix A**. This training or briefing shall be prepared and offered by qualified personnel (e.g. biologist, marine biologist, environmental scientist, among others). The Contractor shall submit their qualifications to the USACE for review and approval. The training or briefing will also include safety and emergency procedures.

4.1.3 Civil and Criminal Penalties: The Contractor shall instruct all personnel associated with the project of the potential presence of threatened or endangered species. All personnel shall be advised that there are civil and criminal penalties for harming, harassing, killing or otherwise altering the natural behavior or condition of threatened or endangered species protected under the ESA, the Puerto Rico Wildlife Law, the Puerto Rico Coral Reef Conservation Law and the Regulation to Govern the Endangered and Threatened Species of the Commonwealth of Puerto Rico. ESA gives both the U.S. Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS) responsibility for enforcing its provisions. The Commonwealth regulations to protect endangered and threatened species are enforced by the Puerto Rico Department of Natural and Environmental Resources (DNER).

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

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

4.2 Non-Intrusive Geophysical Underwater Investigation Conservation Measures

The following supplements but does not replace conservation measures established in the SOPs listed in Section 3.0 above.

4.2.1 All transect sections with scattered coral, reef, or colonized hard bottom will be surveyed with a method which results in no contact with the sea floor or with coral heads that

extend close to the water surface. Detailed information on the appropriate equipment selection process will be provided in the WP and coordinated with the TPP Team. The equipment/system used in any underwater MRS portion will depend primarily on personnel safety, depth of water, and type of habitat present.

4.2.2 While several systems and EM platforms may be used during geophysical surveys, it is possible that in areas with varying amounts of submerged aquatic vegetation (e.g. seagrass) a system that is designed to come in contact with the sea floor may be used. For Quality Control (QC) purposes, prior to conducting the survey, a single transect across an area of submerged aquatic vegetation coverage will be surveyed using the proposed system. Qualified personnel will perform an assessment of the test area to determine if any adjustment is necessary to minimize disturbance to sand, macro algae and seagrass. After work is complete, the surveyed area will be inspected to ensure no impact to submerged aquatic vegetation has occurred.

4.2.3 In shallow water areas (1 to 4 feet) where contact with the bottom is not desired, the EM coil will be floated or will be suspended beneath a floating platform.

4.2.4 In areas with coral that are too deep for the floated system, or in areas containing coral heads with high relief, an ROV platform may be used to propel the EM coil along the transect while ensuring contact with the coral head is avoided. If the ROV EM platform is not suitable for selected transect segments these segments will be surveyed by divers or snorkelers as an instrument aided visual transect.

4.2.5 Divers/snorkelers will use handheld magnetometers to identify metallic anomalies, which may represent MEC or MPPEH. All equipment shall be used in a manner to avoid physical contact with corals.

4.2.6 QC will be established at all times to ensure appropriate pre-selected equipment is used throughout underwater investigation work as coordinated with TPP Team.

4.2.7 Anomalies along transects may be investigated upon discovery. Intrusive investigation will be conducted following measures listed in the next section (4.3).

4.3 Intrusive Underwater Investigation and Material Potentially Presenting an Explosive Hazard (MPPEH) Relocation Conservation Measures

Certified unexploded ordnance (UXO) divers/snorkelers will conduct the anomaly intrusive investigations. If the anomaly is at the surface, the investigation will be completed without disturbing the area or item, and if the anomaly is buried in sediments it will be uncovered by excavating down to the anomaly using hand tools, then the investigation will be performed to determine the vertical extent and boundaries of contamination and possible remedial actions.

Following are the measures to be implemented to protect listed species and their habitat during intrusive investigation. It should be noted that during all intrusive investigation phases qualified observers shall be present to scan the work area for sea turtles and marine mammals and take necessary measures to protect the species.

4.3.1 Excavations will be conducted in unconsolidated sediments and seagrass areas only. If the anomaly is located within coral or hardbottom areas the anomaly will be investigated visually only. However, if the anomaly is not encrusted in hardbottom or coral and can be easily removed by hand and has no coral colonization by listed or proposed corals, it can be removed and relocated to the designated processing area.

4.3.2 Divers will film and take pictures of the area around the anomaly to be investigated. If the anomaly is located in corals or hardbottom areas, divers will investigate an area with a three (3) meter radius, the center of which is the anomaly. Within that area, divers will determine the distance to and location of all listed and proposed coral. The pictures shall include measurements of distance between anomalies and listed or proposed corals and size of item. Care will be taken to avoid damaging corals or seagrass, if present.

4.3.3 If the anomaly is suspected to be MPPEH, a visual device will be placed temporarily next to the munition to provide a reference point for later investigation. This device shall have enough weight to remain in place without skipping along the bottom to avoid impact to corals until the investigation is complete. Once the investigation is complete, it will be removed.

4.3.4 UXO divers/snorkelers investigating anomalies within seagrass areas will be careful to maintain root systems as much as possible. Pre and post pictures shall be taken and shall include a measurement of the area investigated. Should intact plugs of seagrass be removed they will be replanted following the removal of the anomaly. As a possible method, the seagrass can be cut on three sides and rolled up. After work is complete, the excavated area will be filled with sand, if necessary, then the seagrass will be rolled back into place and staked with biodegradable stakes to enable the grass to reestablish quickly.

4.3.5 Each MPPEH item will be evaluated as a separate scenario. A Decision Matrix (DM) will be developed to provide timely decisions and methods of relocation and disposal. The DM will be included in the RI Phase III WP.

4.3.6 When feasible, if the anomaly is not munition related, the anomaly is not cemented in hard substrate, and ESA-listed or proposed corals are not attached to it, it will be brought to the surface and relocated to the designated terrestrial processing area for appropriate disposal. If non listed corals are attached, as feasible and as detailed in **Appendix C**, the recommended Coral Relocation and Reattachment Protocol will be followed.

4.3.7 No intrusive investigation, MEC/MPPEH removal, or MEC/MPPEH handling in MRSs adjacent to beaches will be conducted during the 48-hour period following the emergence of sea turtle hatchlings.

4.3.8 Anomalies or MPPEH Acceptable to Move: Anomalies that are 1) exposed or only shallowly buried in soft sediments, 2) are acceptable to move, and 3) its removal will not cause damage to listed species (e.g. listed corals are not attached) or their designated critical habitat will be relocated to the designated terrestrial processing site for disposal (see Section 4.4 for more information). Prior to removal, the UXO team must agree that the MEC/MPPEH is acceptable to move.

4.3.8.1 Prior to the anomaly/MEC/MPPEH removal effort, qualified personnel will verify the locations of listed and proposed corals, designated critical habitat and seagrass within the immediate vicinity. Listed and proposed coral species location will be identified with temporary underwater buoys or visual devices as a visual aid for the UXO team while setting up equipment for the removal. All removal actions shall be documented. Pre and post pictures of the area shall be taken with a scale measure next to the anomaly/MEC/MPPEH.

4.3.8.2 For soft sediment and seagrass areas, once an anomaly is reacquired, the MEC/MPPEH UXO investigation team will expose and recover the anomaly source using hand tools (such as spades, trowels, shovels). For coral and hardbottom areas, if the anomaly is not encrusted in hardbottom or coral and can be easily removed by hand and has no coral colonization by listed or proposed corals, it can be removed and relocated to the designated processing area. If non listed corals are attached, as feasible and as detailed in **Appendix C**, the recommended Coral Relocation and Reattachment Protocol will be followed. The MEC/MPPEH UXO investigation team will transfer recovered MEC/MPPEH to the shore or designated terrestrial location for processing and disposal.

4.3.8.3 Removal may occur by hand or by using lifting equipment (e.g. remotely with a lifting balloon). MEC that are acceptable to move but will cause an unacceptable risk to diver due size and weight of MEC will be moved remotely. Care will be taken to avoid damaging corals or seagrass during removal. However, corals that are not listed or proposed for listing, although it is not desired, may be damaged during MEC removal or disposal as a necessity. This may happen if corals are attached or in contact with the MEC item. As feasible and as detailed in **Appendix C**, the recommended Coral Relocation and Reattachment Protocol will be followed.

4.3.8.4 The terrestrial processing site will be located within the boundaries of the Munition Response Area (MRA). Its potential location will be provided in WP to the TPP. MPPEH items will not be transported out of the MRA.

4.3.9 Anomalies or MPPEH Not Acceptable to Move: Anomalies or MPPEH that are deeply buried or that are located in areas where removal of the item could result in damage to listed or proposed coral species or destruction or adverse modification of designated critical habitat will be accurately mapped by GPS and left in place.

4.3.9.1 These items will be marked by the placement of a solid clump next to it to provide a reference point for later investigation/action. For the purposes of these SOPs, a clump is defined as a heavy weight (such as a 7 pound mushroom anchor) that is placed 12-inches north of the item. The clump is not attached to a line or buoy but provides the divers with a visual reference for future identification. The clump location and placement shall not impact listed or proposed coral species. If the placement of a solid clump is not feasible (e.g. presence of listed species), the item will be accurately mapped by GPS.

4.3.9.2 The areas surrounding the anomaly or MPPEH will be filmed paying particular attention to corals and biology in the immediate vicinity. If the anomaly is located in corals or hardbottom areas, divers will investigate an area with a three (3) meter radius, the center of which is the anomaly. Within that area divers will determine the distance to and location of all listed and proposed coral. The pictures shall include measurements of distance between anomalies and listed or proposed corals and size of item. These films will be used later when identifying a suitable method for disposal. If it is determined that BIP is required and it is estimated that the potential blast impact radius is greater than 3 meters, additional investigation may be required.

4.3.10 Environmental Sampling: Samples will be taken at locations where Munition Debris (MD) or suspected MPPEH items are observed. Detailed information on the environmental sampling will be provided in the WP to the TPP Team. Any sampling work shall avoid impacts to protected species.

4.4 MEC/MPPEH Disposal/Detonation Site Conservation Measures

4.4.1 Prior to removal of MEC/MPPEH from underwater locations, the Contractor in coordination with USACE will establish a designated terrestrial MEC/MPPEH disposal/detonation site. All recovered underwater MEC/MPPEH will be transferred to this site for processing and inspection to determine disposal method. Following appropriate inspection procedures, items that do not pose a risk will be designated or reclassified to Material Documented as Safe (MDAS) and transported off of Culebra for final disposal.

4.4.2 The MEC/MPPEH processing and disposal/detonation site will be established on a beach to provide convenient access by UXO removal teams working in the offshore waters and to minimize disturbance of vegetation and protected species on Culebra. The site will not be located in lagoon areas.

4.4.3 Qualified and experienced personnel will inspect the beach that would be used for MEC/MPPEH processing and detonation for the presence of sea turtles, sea turtle nests, and signs of recent sea turtle activity. An area not recently used by sea turtles and at least 100 meters from any place of active sea turtle use would be selected as the detonation site to the maximum extent practicable. Daily beach surveys will be conducted by qualified personnel to determine whether sea turtles are using beaches within the MRS. It should be noted that the contactor shall follow additional conservation measures provided in the July 2008 (pages 6-9) and April 2012 (Section 4.2) SOPs.

4.4.4 During MEC/MPPEH transfer and processing, qualified observer would continue to survey the beaches for signs of sea turtle activity. No human activity would occur until beaches are clear of sea turtles. Any active sea turtle nests will be marked and a 100-meter protection zone will be created around each nest to prevent incidental damage during detonation. It should be noted that the contactor shall follow additional conservation measures provided in the July 2008 (pages 6-9) and April 2012 (Section 4.2) SOPs.

4.4.5 All MEC/MPPEH detonation/processing will be performed during daylight hours to minimize the possibility that hatchlings would emerge from the nests during working hours. Detonation will be delayed until 48 hours have passed from the time of hatchling observation on the beach.

4.4.6 There are listed and migratory seabird species that have the potential to occur in the project area. The Roseate Tern (*Sterna dougallii*) is listed as threatened and the Brown Pelican (*Pelecanus occidentalis*) was delisted due to recovery but is being monitored. A complete list of seabirds that occur in the project area is included in **Appendix D**. Prior to detonation, a qualified observer will check the beach and adjacent waters for the presence of protected and listed seabird species by scanning the area with 10 X 50 binoculars. The qualified observer will also survey the beaches for signs of bird nesting. If bird nests are found within the detonation site and/or blast impact area, no detonation will be conducted in that area. If any protected bird species are within 200 meters of the detonation site, MEC detonation will be delayed until after the animal(s) leave the area. In addition, if blast impacts will extend into nearshore waters, a qualified observer for sea turtles and marine mammals shall be required. If these species are observed the detonation shall be postponed until the animal has left the impact zone or more than 30 minutes have elapsed since it was last sighted.

4.4.7 Immediately prior to detonation, a qualified observer will scan the overhead sky for the presence of any birds. If birds are in flight within 100 meters of the detonation site, the detonation will be delayed until no birds are within 100 meters of the detonation site.

4.4.8 The MEC/MPPEH will be demolished and/or demilitarized by controlled detonation using explosives to be provided by local vendors on as-needed basis. When feasible, all demolition events will be covered with sandbags to mitigate the blast effects and to reduce the risk of shrapnel being ejected. Additional measures may be implemented based on the calculations to adjust and establish exclusion areas. Munition debris (MD) will be recovered after detonation for appropriate disposal.

4.5 In-Water Detonation/Blow-in-Place (BIP) Conservation Measures

In-water detonations of MEC/MPPEH, including BIP, may occur during this project. All BIPs shall be closely coordinated with TPP Team. In-water detonations present unique challenges to the avoidance of unintended adverse impacts on protected marine species. As such, in addition to the measures listed above and established in previous SOPs, special conservation measures are described in this section to reduce the potential for adverse impacts should underwater detonations occur. Additional measures will be provided in the WP and/or Explosive Site Plan (ESP) to the TPP Team.

4.5.1 When possible, the MEC/MPPEH will be relocated to the designated terrestrial processing site for disposal as long as it is acceptable to move and it can be physically moved. The Senior UXO Supervisor and UXO Safety Officer must agree that the item is acceptable to move.

4.5.2 Appropriate sand substrate areas will be chosen during all phases of the investigation as potential MEC disposal sites based on safety considerations and minimizing impacts to resources of concern to the maximum extent practicable. These areas will be used only if MEC/MPPEH are unstable or represent a safety concern.

4.5.3 Prior to any detonation (24 hours minimum), the Contractor, in coordination with USACE staff, shall contact NMFS, FWS, the Environmental Protection Agency (EPA), the Puerto Rico Environmental Quality Board (EQB), the Puerto Rico Department of Natural and Environmental Resources (DNER) and the U.S. Coast Guard (USCG) to inform them of a planned underwater detonation.

4.5.4 Detonations will be done during daylight hours only, and under conditions of good visibility that ensure the exclusion zone is clear of marine mammals and sea turtles.

4.5.5 No detonation shall occur when protected marine species (marine mammals, sea turtles and corals) are known or suspected within the exclusion zone. The exclusion zone

delineation will also consider the potential level of acoustic impacts following the Young's (1991) equation in **Appendix E**. It should be noted that the excerpts from NMFS's explosive guidance provided in Appendix E are in draft form and a complete review and approval process is still pending. The guidance is provided to assist with determinations of the potential extent of acoustic impacts to sea turtles and marine mammals so that decisions can be made as to which items cannot be detonated without further coordination with the TPP Team. The water surface within the entire exclusion zone will undergo a visual search for protected marine species a minimum of 30 minutes prior to detonation. Should a protected marine mammal or sea turtle species be observed, the detonation shall be postponed until the animal has been observed outside of the exclusion zone, or more than 30 minutes have elapsed since it was last sighted.

4.5.4 Constant vigilance over the exclusion zone will be maintained for a minimum of 30 minutes following a detonation, and a thorough water surface inspection of the zone shall be completed immediately following a detonation to search for injured or dead protected marine species and surrounding coral and hardbottom habitat impacts. Impacts to coral and hardbottom habitat will be documented using pictures and measures and the information provided to the TPP Team. Should an injured or dead protected species be observed, immediately contact the appropriate response hotline (Marine Mammals: (877) 433-8299; Sea Turtles: (727) 824-5312; and DNER (787) 645-5593). Emergency handling procedures for an injured sea turtle or mammal will be provided by NOAA.

4.5.5 All observed stranding of protected marine species should be reported to the appropriate hotline, regardless of whether or not the stranding is the result of a detonation or other component of the project.

4.5.6 Constant vigilance for the presence of protected marine species during all aspects of the project, particularly in-water activities, is required.

4.5.7 Visual surveys within the vicinity of the work areas for that day shall be made prior to the start of work each day, and prior to resumption of work following any break of more than one half hour.

4.5.8 To the extent practicable and depending the ordnance type, appropriate techniques will be implemented to avoid and minimize damage to marine habitat. Detailed information will be provided in the ESP to the TPP Team.

4.5.9 All in–water work shall be conducted following the marine mammals and sea turtles avoidance measures established above and in previously coordinated SOPs.

5.0 POINTS OF CONTACT FOR SOPs COORDINATION AND REPORTING

Name	Organization	Telephone/Email
John Keiser Project Manager Formerly Used Defense Sites Program	USACE, Jacksonville	Desk: 904-232-1758 John.E.Keiser@usace.army.mil
José Méndez Forward Project Manager	USACE, Antilles Office	Desk: 787-729-6877 Jose.M.Mendez@usace.army.mil
Iván Acosta Chief, Special Projects Section	USACE, Jacksonville	Desk: 904-232-2050 Ivan.Acosta@usace.army.mil
Wilberto Cubero Environmental Scientist	USACE, Jacksonville	Desk: 904-232-2050 Wilberto.Cubero-delToro@usace.army.mil
David McCullough Archaeologist	USACE, Jacksonville	Desk: 904-232-3685 David.L.McCullough@usace.army.mil
Roland Belew Project Manager	USACE, Huntsville	Desk: 256-895-9525 Roland.G.Belew@usace.army.mil
Teresa Carpenter Technical Manager	USACE, Huntsville	Desk: 256-895-1659 Teresa.M.Carpenter@usace.army.mil
Kelly Enriquez Geophysicist	USACE, Huntsville	Desk: 254-895-1373 Kelly.D.Enriquez@usace.army.mil
Edwin Muñiz Field Supervisor	FWS	Desk: 787-851-7297 Edwin_Muñiz@fws.gov
Susan Silander Project Leader Caribbean Islands National Wildlife Refuges Complex	FWS	Desk: 787-504-5938 Susan_Silander@fws.gov
Ana M. Roman Deputy Project Leader and Culebra NWR Manager	FWS	Desk: 787-742-0115 / 787-306-1389 Ana_Roman@fws.gov

Name	Organization	Telephone/Email
Lisamarie Carrubba Caribbean Field Office Protected Resources Division	NMFS	Desk: 787-851-3700 Lisamarie.Carrubba@noaa.gov
José Rivera Habitat Conservation Division	NMFS	Desk: 787-405-3605 Jose.A.Rivera@noaa.gov
Julio F. Vazquez Remedial Project Manager	EPA Region II	Desk: 212-657-4323 Vazquez.Julio@epa.gov
Nilda Jimenez Marrero Marine Resource Division	DNER	Mobile: 787-645-5593 njimenez@drna.gobierno.pr
Craig Lilyestrom Marine Resource Division	DNER	Desk: 787-999-2200 ext. 2689 craig_02@icloud.com
Damaris Delgado Bureau of Coast, Reserves and Refuges	DNER	Desk: 787-999-2200 ext. 2107 ddelgado@drna.gobierno.pr
Wilmarie Rivera Program Manager	EQB	Desk: 787-767-8181 ext. 6129 WilmarieRivera@jca.gobierno.pr

APPENDIX A

SOPs for Endangered Species Conservation and their Critical Habitat during Underwater Investigations – April 2012

US Army Corps of Engineers
Jacksonville District

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LIST OF ACRONYMS

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

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

1.0 INTRODUCTION

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

Figure 1. Location Map of Culebra.

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

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

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

Figure 2. DERP-FUDS Projects for Culebra.

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

2.0 PURPOSE AND NEED

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

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

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

3.0 LISTED THREATENED OR ENDANGERED SPECIES

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

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

3.1 Loggerhead Sea Turtle (*Caretta caretta*)

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

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

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

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

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

3.2 Green Sea Turtle (*Chelonia mydas*)

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

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

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

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

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

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

Figure 5. Green Sea Turtle Critical Habitat.

3.3 Leatherback Sea Turtle (*Dermochelys coriacea*)

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

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

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

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

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

3.4 Hawksbill Sea Turtle (*Eretmochelys imbricata*)

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

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

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

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

3.5 Antillean Manatee (*Trichechus manatus manatus*)

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

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

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

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

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

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

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

3.6 Humpback Whale (*Megaptera novaeangliae*)

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

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

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

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

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

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

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

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

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

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

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

3.7 Fin or Finback Whale (*Balaenoptera physalus*)

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

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

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

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

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

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

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

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

3.8 Sei Whale (*Balaenoptera borealis*)

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

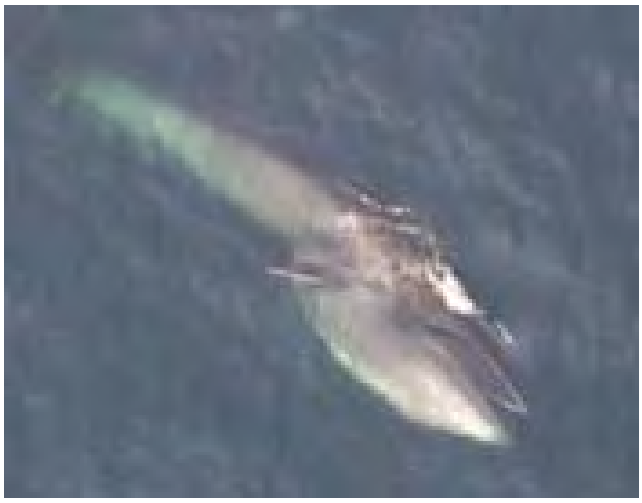


Figure 11. Sei Whale
Source: http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/seiwhale.htm#more

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

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

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

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

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

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

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

3.9 Sperm Whale (*Physeter macrocephalus*)

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

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

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

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

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

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

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

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

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

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

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

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

3.10 Blue Whale (*Balaenoptera musculus*)

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

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

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

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

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

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

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

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

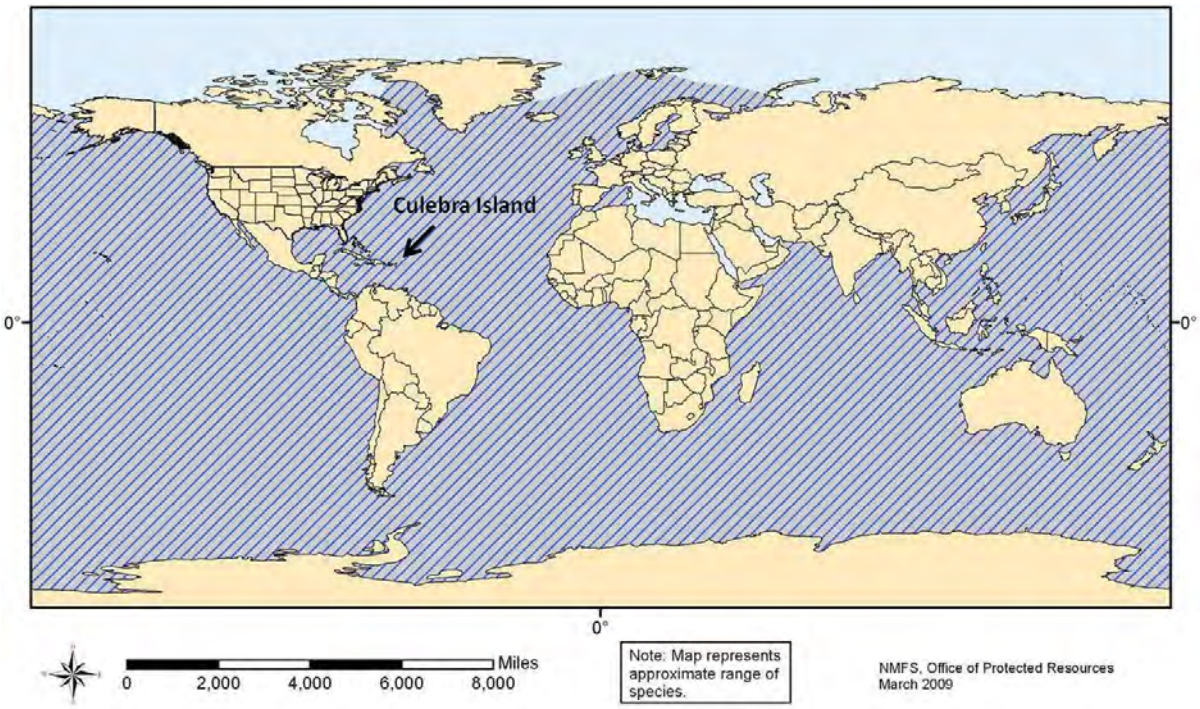


Figure 14. Approximate range map for Humpback, Sei, Sperm and Blue whales.

3.11 Elkhorn coral (*Acropora palmata*)

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

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

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

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

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

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

3.12 Staghorn coral (*Acropora cervicornis*)

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

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

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

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

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

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

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

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

Figure 17. Elkhorn and Staghorn Corals Critical Habitat.

3.13 Species of Corals Proposed for Listing under the ESA

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

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

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

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

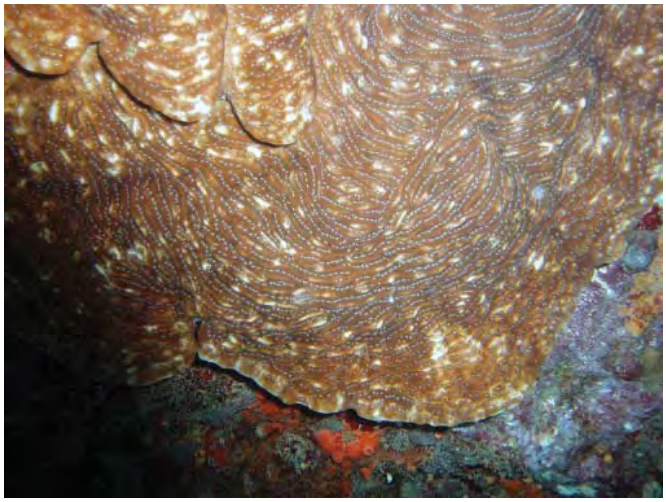


Figure 19. Lamarck's Sheet Coral
Source: http://coralpedia.bio.warwick.ac.uk/en/corals/agaricia_lamarcki.html

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

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

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

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

3.13.2 *Montastraea* Complex

3.13.2.1 Boulder Star Coral (*Montastraea annularis*)

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

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

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

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

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

3.13.2.2 Mountainous Star Coral (*Montastraea faveolata*)

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

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

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

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

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

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

3.13.2.3 *Montastraea franksi*

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

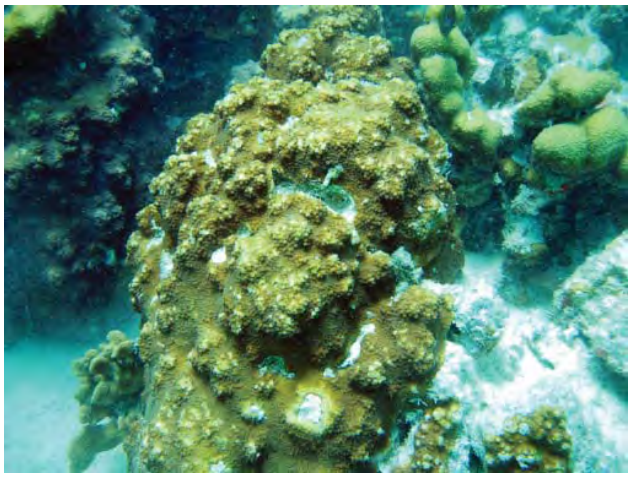


Figure 22. *Monstastraea franki*
Source: http://coralpedia.bio.warwick.ac.uk/images/Montastraea%20franksi01.JPG

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

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

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

3.13.3 Pillar Coral (*Dendrogyra cylindrus*)

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

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

Color: Light tan to golden brown and chocolate brown.

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

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

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

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

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

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

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

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

3.13.5 Rough Cactus Coral (*Mycetophyllia ferox*)

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

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

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

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

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

4.0 MEASURES TO AVOID OR MINIMIZE POSSIBLE IMPACTS

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

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

4.1 General Conservation Measures

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

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

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

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

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

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

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

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

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

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

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

4.2 Staging Area and Sea Turtle Nesting Monitoring

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

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

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

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

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

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

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

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

4.3 Coral and Seagrass Avoidance Measures

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

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

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

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

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

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

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

4.3.8 The following actions are prohibited:

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

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

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

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

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

4.4 Marine Mammals and Sea Turtles Avoidance Measures

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

4.5 Diving Operations and Equipment

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

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

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

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

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

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

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

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

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

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

4.6 Supplemental Information

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

5.0 POINTS OF CONTACT FOR SOPs COORDINATION AND REPORTING

Name	Organization	Telephone/Email
Tom Freeman Project Manager	USACE, Jacksonville	Desk: 904-232-1040 Thomas.R.Freeman.III@usace.army.mil
José Méndez Forward Project Manager	USACE, Antilles Office	Desk: 787-729-6877 Jose.M.Mendez@usace.army.mil
Iván Acosta Chief, Special Projects Section	USACE, Jacksonville	Desk: 904-232-2050 Ivan.Acosta@usace.army.mil
Wilberto Cubero Environmental Scientist	USACE, Jacksonville	Desk: 904-232-2050 Wilberto.Cubero-delToro@usace.army.mil
David McCullough Archaeologist	USACE, Jacksonville	Desk: 904-232-3685 David.L.McCullough@usace.army.mil
Roland Belew Project Manager	USACE, Huntsville	Desk: 256-895-9525 Roland.G.Belew@usace.army.mil
Teresa Carpenter Technical Manager	USACE, Huntsville	Desk: 256-895-1659 Teresa.M.Carpenter@usace.army.mil
Kelly Enriquez Geophysicist	USACE, Huntsville	Desk: 254-895-1373 Kelly.D.Enriquez@usace.army.mil
Edwin Muñiz Field Supervisor	FWS	Desk: 787-851-7297 Edwin_Muñiz@fws.gov

Name	Organization	Telephone/Email
Susan Silander Project Leader Caribbean Islands National Wildlife Refuges Complex	FWS	Desk: 787-504-5938 Susan_Silander@fws.gov
Ana Roman Deputy Project Leader and Culebra NWR Manager	FWS	Desk: 787-742-0115 / 787-306-1389 Ana_Roman@fws.gov
Lisamarie Carrubba Director, Caribbean Field Office	NMFS	Desk: 787-851-3700 Lisamarie.Carrubba@noaa.gov
José Rivera Habitat Conservation Division	NMFS	Desk: 787-405-3605 Jose.A.Rivera@noaa.gov
Julio F. Vazquez Remedial Project Manager	EPA Region II	Desk: 212-657-4323 Vazquez.Julio@epa.gov
Damaris Delgado Bureau of Coast, Reserves and Refuges	DNER	Desk: 787-999-2200 ext. 2107 ddelgado@drna.gobierno.pr
Wilmarie Rivera Program Manager	EQB	Desk: 787-767-8181 ext. 6129 WilmarieRivera@jca.gobierno.pr

LIST OF APPENDICES

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

B. Addendum to the 2008 SOPs (April 2011)

APPENDIX A

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

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

US Army Corps of Engineers
Jacksonville District

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

PURPOSE

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

SEA TURTLES

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

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

Nesting Seasons

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

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

Green Sea Turtle

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

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

Hawksbill Sea Turtle

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

Leatherback Sea Turtle

Acroporid Corals

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

Acropora cervicornis

Acropora palmata

<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.

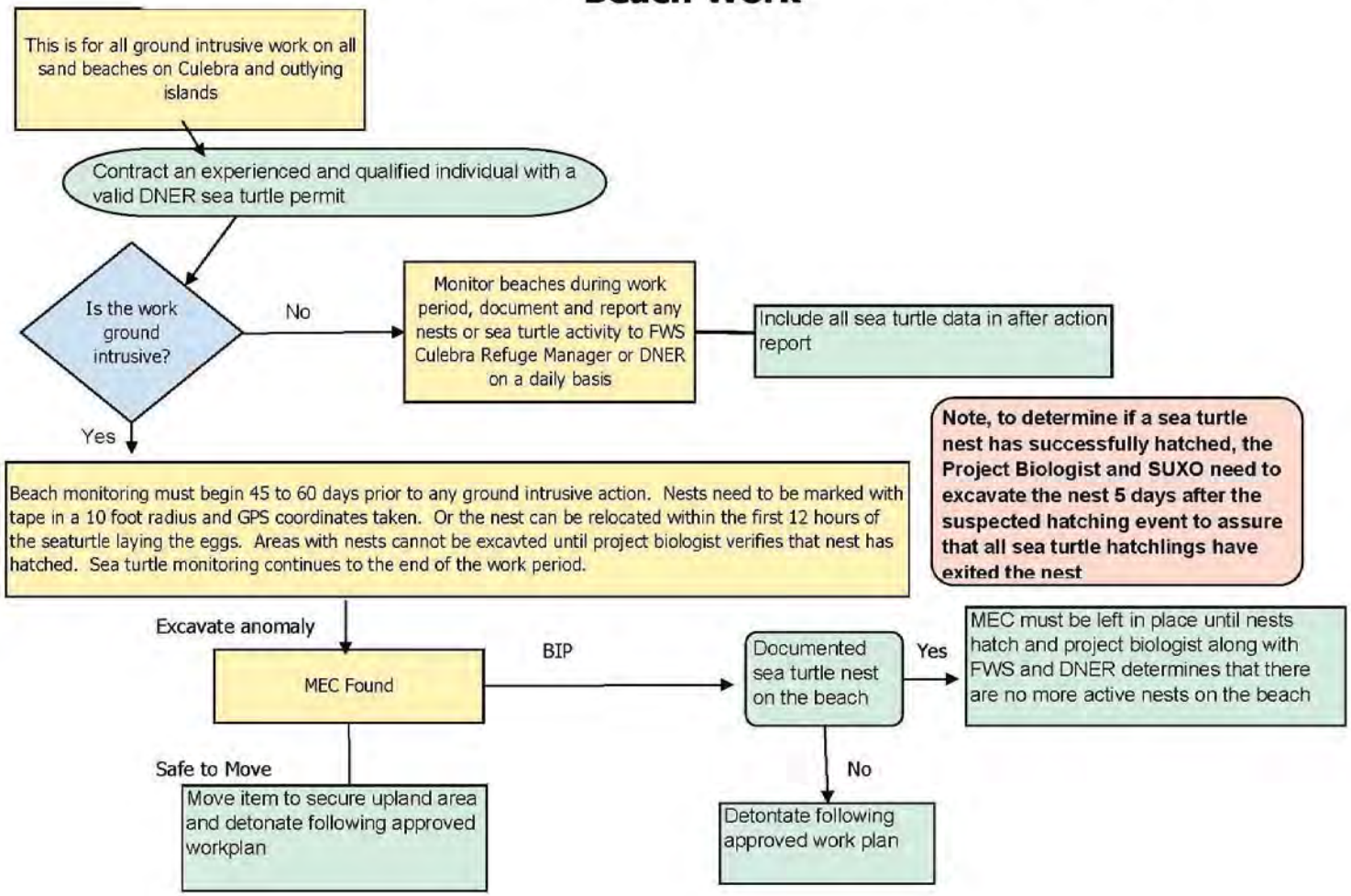
Prior to commencement of clearance activities, including vegetation removal and removal of unexploded ordnance, on Culebra, Culebrita, Cayo Norte and Cayo Luis Peña the contractor shall appoint a Project Biologist whose qualifications shall be submitted for the approval of the contracting officer and 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



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Designation of Beach Zones for Vegetation Removal and Munitions Detonation:

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

The work zones proposed are:

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

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

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

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

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

Vehicular Traffic

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

Vessel Traffic

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

NMFS Protected Species Vessel Strike Avoidance Measures and Reporting

Background

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

Protected Species Identification Training

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

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

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

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

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

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

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

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

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

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

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

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

Considerations for Other Species

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

Point of Contact for SOP Coordination

José Méndez, Project Manager
Jose.Mendez2@usace.army.mil
787-729-6893

Iván Acosta, Environmental Engineer
Ivan.Acosta@usace.army.mil
904-232-1693

Nelson Colón, Biologist
Nelson.R.Colon@usace.army.mil
904-232-2442

APPENDIX B

Addendum to the 2008 SOPs (April 2011)

FINAL

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

DERP-FUDS Project No. I02PR006802

Culebra, Puerto Rico

US Army Corps of Engineers

Jacksonville District

April 2011

US Army Corps of Engineers
Jacksonville District

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

1.0 INTRODUCTION

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

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

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

2.0 TERRESTRIAL LISTED THREATENED OR ENDANGERED SPECIES

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

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

2.1 Culebra Giant Anole (*Anolis roosevelti*)

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

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

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

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

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

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

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

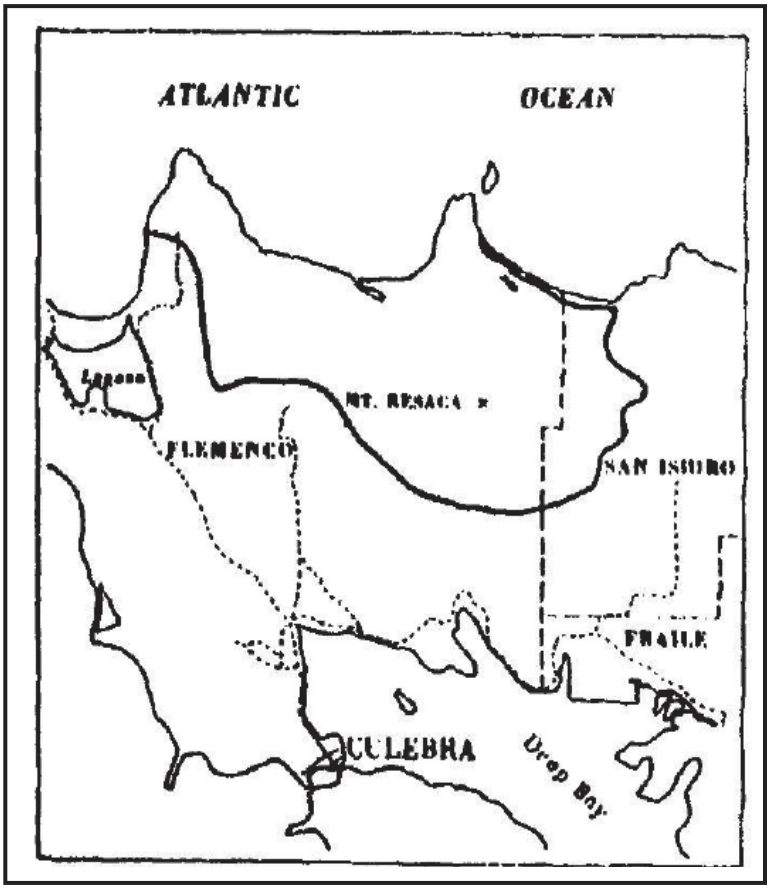

Figure 4. Boundaries of the critical habitat designated for the Culebra Island Giant Anole. Source: Critical Habitat Designations for PR and USVI (FWS 2007).

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

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

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

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

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

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

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

2.3 Wheeler's Peperomia (*Peperomia wheeleri*)

2.3.1 General Description: *Peperomia wheeleri* is an evergreen, glabrous, erect herb which may reach 1 meter in height. The stems root only at the base and may be up to 1 centimeter in diameter. The opposite leaves are entire, fleshy, elliptic to elliptic-obovate, with 3 or 5 main veins ascending from the base. The lower side of the leaf is 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.

4.0 POINT OF CONTACT FOR SOP COORDINATION

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

Thomas R. Freeman, Project Manager
Thomas.R.Freeman.III@usace.army.mil
Telephone: (314) 331-8785

José Méndez, Project Manager
Jose.M.Mendez@usace.army.mil
Telephone: (787) 729-6877

Iván Acosta, Chief Special Projects Section
Ivan.Acosta@usace.army.mil
Telephone: (904) 232-2050

Wilberto Cubero, Environmental Scientist
Wilberto.Cubero-delToro@usace.army.mil
Telephone: (904) 232-2050

U.S. Fish and Wildlife Services:

Edwin Muñiz, Field Supervisor
Edwin_Muniz@fws.gov
Telephone: (787) 851-7297

Ana Roman, Refuge Manager
Ana.Roman@fws.gov
Telephone: (787) 742-0115 or (787) 306-1389

National Marine Fisheries Service:

Lisamarie Carrubba, Director Caribbean Field Office
Lisamarie.Carrubba@noaa.gov
Telephone: (787) 851-3700

P.R. Department of Natural and Environmental Resources:

Roberto Matos, Refuges and Reserves
rmatos@drna.gobierno.pr
Telephone: (787) 999-2200 x.2718

Damaris Delgado López
ddelgado@drna.gobierno.pr
Telephone: (787) 999-2200

P.R. Environmental Quality Board:

Wilmarie Rivera, Federal Facilities Coordinator
WilmarieRivera@jca.gobierno.pr
Telephone: (787) 767-8181 x.6129

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APPENDIX B

Guide with the minimum information required for the Daily Observer Log Sheet

DAILY OBSERVER LOG SHEET
DERP-FUDS PROPERTY NO. I02PR0068
CULEBRA, PUERTO RICO

PROJECT INFORMATION	
Contractor:	Munition Response Site#:
USACE Contract#:	Project Location:
Observer Name (and Company):	Observer Location:
Date: Time:	Shift Start: Shift End:
Sunrise: Sunset:	Crew:

Weather and Visibility Information

Location	Time	Glare	Water Clarity	Seas (wave height)	Visibility	Wind Speed and Direction	Conditions on Land	Estimated % Cloud Cover

Sighting Log

Time	Location Coordinates	Species	Total Number	Adults	Juveniles	Closest Distance to Vessel	Activity or Behavoir and Direct of Movement	Time Last Seen

Daily Summary

Species	Total Number	Total Number Outside 50 feet	Total Number Inside 50 feet	Action Taken

Remarks:
_____
_____

Observer Signature: _____

APPENDIX C

Recommended Coral Relocation and Reattachment Protocol

Coral Relocation and Reattachment Protocol
for
DERP-FUDS Project No. I02PR006802,
Culebra, Puerto Rico

In order to minimize impacts to coral species, non-listed corals with diameters >4.0 in (>10.2 cm), or branched corals will be detached and relocated, to the extent possible, to the area where they are already located in adequate substrate where deemed safe from the expected impact prior to munitions and explosives of concern (MEC) and/or Material Potentially Presenting an Explosive Hazard (MPPEH) removal or disposal. If corals that are listed or proposed for listing are attached to MEC/MPPEH, no relocation or MEC/MPPEH removal effort will be conducted. Instead, additional coordination with the Technical Project Planning (TPP) Team is a requirement for situations where ESA-listed corals or corals proposed for listing are present in areas or on MEC/MPPEH in such a way that the removal of MEC/MPPEH would affect these corals.

For non-listed corals measuring 10 cm or more in diameter or branching corals, the following protocol has been developed as a guideline to decrease coral stress during transplant. It is recommended that two teams or individuals be utilized during the relocation process: one team/individual responsible for removing corals and a second team/individual mobilized and prepared for reattachment activities.

GENERAL CONSIDERATIONS FOR CORAL HANDLING AND TRANSPORTATION

- Each coral may be carried by hand or in a bucket to the relocation site.
- In order to reduce stress to the coral from transport and to increase the likelihood of success, the coral colonies should remain submerged in seawater at all times.
- Corals should be handled as little as possible.
- Detached coral colonies should not be in contact with each other to prevent additional harm to their structures and tissue.
- If a bucket or container is used for transportation and transportation will be above water (such as on a vessel to get from the removal site to the transplant site), the seawater should be routinely changed to avoid prolonged exposure to increased water temperatures.
- Corals should be reattached the same day they are removed; they should not be stored overnight in transport containers.
- Prior to any relocation, photograph (two pictures - one from the top and one from the side) the corals with a ruler or other object showing the size of the colony in the photograph. This can be used to determine whether there is any tissue loss or death during the relocation.

- Record the coordinates where the coral is removed from and the species being relocated.
- Clear all encrusting organisms from the edges of the corals.
- Prevent damage to the edges of corals.
- When possible, remove the entire coral colony in one piece.
- When removal of the entire colony is not possible, a partial removal of the colony will be completed to maintain the phenotypic genetic composition of corals from the investigation site. In this case, field notes should indicate this decision was made.
- Notes should be made regarding orientation of the coral in its natural setting to mimic that position at relocation site. The water depth at which the corals are transplanted should also be the same as those from which corals are removed.
- Place corals upright in transport containers, avoiding contact with other corals.
- Avoid touching coral tissue with bare hands. Gloves should be worn while handling the corals.

Recommended tools for removal and reattachment:

- rubber or dive gloves
- putty knife
- other thin bladed tools with beveled edges
- baskets or buckets
- chisels with thin blades
- chipping hammer
- underwater paper to record and track coral movements
- wire brush
- masonry nails
- Portland Type II cement and/or marine epoxy

IDENTIFICATION OF ADEQUATE RELOCATION SITE

The selection of the relocation site should consider the following:

- The substrate is hard bottom, free of sediment bedload
- No fire corals (*Millepora* spp.), sponges or harmful algae in the vicinity that could hamper coral colony survival and growth.
- High benthic topographic relief
- No predators observed in the vicinity
- The size of the site allows for the relocation activity to be conducted without harming other corals. Keep in mind the preparation of the site, coral colony size and the materials used to reattach the coral.

CORAL RELOCATION

Once the specific reattachment locations have been identified, the following protocol/guidelines should be followed during the reattachment process:

- Document the site coordinates and substrate type and depth
- Prepare the reattachment surface with a wire brush, removing biota, such as algae, and any sediment to expose rock substrate. Care should be taken to avoid contacting existing corals with wire brush.

For massive corals:

- Drive masonry nails, at least three, into the substrate at the site where the coral colony will be placed. Larger corals will require additional nails.
- Prepare a thick mixture of Portland Type II cement with molding plaster added, as necessary, to accelerate hardening of cement. Marine epoxy could be used instead of cement.
    - Place cement/epoxy over the masonry nails. The amount of cement should be enough for the colony to be inserted in the mixture so that there are no empty spaces between the coral colony and the mixture.
    - Insert the detached coral in the cement mixture, exerting some downward pressure.
    - Minimize exposure of coral skeleton by placing cement in voids or along dead coral edges.

- For branched corals:
    - Using wire and/or cable ties to fasten the colony to the masonry nails.
    - The colony should not move once fastened. If it does, epoxy could be added in certain points.
    - Corals may also be attached to appropriate substrate with wire and/or cable ties or by wedging fragments into small crevices and voids.

- Document the reattachment process by taking pictures of the colony, from the top and the side once the process is finished, including a scaled reference item in the picture. Take notes on the method used to reattached the colony.

The following links can be used as reference for the process described above:

- http://www.youtube.com/watch?v=_XaUttAUHv4 (NOAA 2009)
- http://www.youtube.com/watch?v=qRlfOu7fERw (NOAA 2011)

Once all of the transplantation activities have been completed, a detailed effort should be undertaken to map the transplanted colonies. A map of all reattached corals shall be developed and submitted to the TPP Team. This map must be geo-referenced using high accuracy GPS technology, show locations and depths of corals, and should be created immediately upon completion of the transplantation project, while coral transplants are still easily identifiable. Geo-referencing may be accomplished either by 1) geo-referencing each individual coral location or 2) referencing a central marker or staked GPS position, relative to which all corals are mapped. Still photography shall be used to document transplantation activities.

APPENDIX D

List of seabirds that occur in the Project Area

Culebra National Wildlife Refuge
U. S. Fish and Wildlife Service

Culebra Archipelago's Seabirds

Fifteen species of seabirds nest on fourteen islands and cays of the Culebra Archipelago and other 12 species occasionally visit the archipelago and surrounding waters at different times of the year (as showed in table 2 and 3). This fact makes to the present day the Culebra NWR one of the most important reserves in the Caribbean for seabirds. As part of the current management activities, the Service protects and conserves these essential nesting areas for seabirds. However, there are some aspects that increase habitat vulnerability for these species, as predators and human disturbances.

Table 2. Culebra Archipelago Seabirds

Species Name	Nesting?	Species Name	Nesting?
Audubon's Shearwater	Yes	Least Tern	Yes
Masked Booby	Yes	Great Shearwater	No
Brown Booby	Yes	Manx Shearwater	No
Red-footed Booby	Yes	Wilson's Storm-Petrel	No
White-tailed Tropicbird	Yes	Leach's Storm-Petrel	No
Red-billed Tropicbird	Yes	Double-crested Cormorant	No
Laughing Gull	Yes	Common Tern	No
Royal Tern	Yes	Arctic Tern	No
Sandwich Tern	Yes	Pomarine Skua	No
Cayenne Tern	Yes	Black Noddy	No
Roseate Tern	Yes	Herald's Petrel	No
Bridled Tern	Yes	Brown Pelican	Yes
Sooty Tern	Yes	Magnificent Frigatebirds	No*
Brown Noddy	Yes		

*need to be confirmed, potential areas for nesting occur

Tabla 3. Seabird areas on Culebra Archipelago

Seabird areas on Culebra Archipelago	Bird Name	Observed or Nesting	Nesting Period	Resident or Migratory
Flamenco Peninsula	Sooty Tern	nesting	March to September	Migratory
Luis Peña Cay	Audubon's Shearwater	nesting	February to July	Migratory
	White-tailed Tropicbird	nesting	February to September	Migratory
	Red-billed Tropicbird	nesting	May to September	Migratory
Del Agua Cay	Audubon's Shearwater	nesting	February to July	Migratory

	White-tailed Tropicbird	nesting	February to September	Migratory
	Bridled Tern	nesting	April to August	Migratory
	Brown Noddy	nesting	April to August	Migratory
Ratón Cay	Audubon's Shearwater	nesting	February to July	Migratory
	Red-billed Tropicbird	nesting	May to September	Migratory
	Roseate Tern	nesting	April to July	Migratory
	Bridled Tern	nesting	April to August	Migratory
	Brown Noddy	nesting	April to August	Migratory
Yerba Cay	Audubon's Shearwater	nesting	February to July	Migratory
	Red-billed Tropicbird	nesting	May to September	Migratory
	Roseate Tern	nesting	April to July	Migratory
	Bridled Tern	nesting	April to August	Migratory
	Sooty Tern	nesting	March to September	Migratory
	Brown Noddy	nesting	April to August	Migratory
Lobo Cay	Audubon's Shearwater	nesting	February to July	Migratory
	White-tailed Tropicbird	observed	February to September	Migratory
	Red-billed Tropicbird	observed	May to September	Migratory
Lobito Cay	Audubon's Shearwater	nesting	February to July	Migratory
	Red-billed Tropicbird	nesting	May to September	Migratory
	Laughing Gull	nesting	April to September	Migratory
	Royal Tern	nesting	May to July (Sept to April)	Migratory
	Sandwich Tern	nesting	May to July (Sept to April)	Migratory
	Cayenne Tern	nesting	May to July	Migratory
	Bridled Tern	nesting	April to August	Migratory
Noroeste Cay	White-tailed Tropicbird	nesting	February to September	Migratory
	Bridled Tern	nesting	April to August	Migratory
	Sooty Tern	nesting	March to September	Migratory
	Brown Noddy	nesting	April to August	Migratory
Molinos Cay	White-tailed Tropicbird	nesting	February to September	Migratory
	Red-billed Tropicbird	nesting	May to September	Migratory
	Roseate Tern	nesting	April to July	Migratory
	Bridled Tern	nesting	April to August	Migratory
	Sooty Tern	nesting	March to September	Migratory
	Brown Noddy	nesting	April to August	Migratory
Alcarraza Cay	Audubon's Shearwater	nesting	February to July	Migratory
	Red-billed Tropicbird	nesting	May to September	Migratory
	Masked Booby	nesting	Throughout the year	Resident
	Brown Booby	nesting	Throughout the year	Resident
	Bridled Tern	nesting	April to August	Migratory
	Sooty Tern	nesting	March to September	Migratory
	Brown Noddy	nesting	April to August	Migratory

Matojo Cay	Audubon's Shearwater	nesting	February to July	Migratory
	Red-billed Tropicbird	nesting	May to September	Migratory
	Royal Tern	nesting	May to July (Sept to April)	Migratory
	Laughing Gull	nesting	April to September	Migratory
	Sandwich Tern	nesting	May to July (Sept to April)	Migratory
Geniquí Cays	Red-billed Tropicbird	nesting	May to September	Migratory
	Brown Booby	nesting	Throughout the year	Resident
	Laughing Gull	nesting	April to September	Migratory
	Bridled Tern	nesting	April to August	Migratory
	Brown Noddy	nesting	April to August	Migratory
	Red-footed Booby	nesting	Throughout the year	Resident
Culebrita Island	Audubon's Shearwater	nesting	February to July	Migratory
	White-tailed Tropicbird	observed	February to September	Migratory

General comments:

As showed in table 3, throughout the year, the Culebra Island offshore cays receive a lot of seabirds for nesting, roost or just visit the cays and surrounding waters for feeding. Some of these species are observed during the year as regular residents or visitors: Red-footed Booby, Brown Booby, Magnificent Frigatebirds, and Brown Pelican. The first two species nest regularly in cays and the last species need to be confirmed for nesting but are regularly observed roosting on trees, shrubs or flying over the cays.

Seabirds are pelagic birds. This means that they just come to land to nest and after that, these pass the rest of the time flying over the ocean looking for food. The nesting season of seabirds consists of the period of time that birds are present or near lands doing courtships, nesting area selections, nesting periods, etc. This period is finished when fledglings or juveniles abandon the colony area. The most critical months in Culebra Island for seabirds are from February to August. During this period, the seabirds, and depending on the species, are in the process of courtship, selection of nesting areas, laying eggs, feeding their chicks, and protecting their fledglings from predators. Areas more used by birds in the Culebra Archipelago are Yerba, Molinos, Alcarraza, Geniqui, Lobito, Agua, Raton and Matojo cays and Flamenco Peninsula.

The most common and dangerous perturbations in the seabirds colonies are predators and human disturbances. In the Culebra offshore cays, introduced predators such as cats and rats, can eat eggs and chicks. Also, other predators (i.e., goats and deer) in the cays can manipulate and change the nesting habitat by grazing. Human disturbances as loud noise made by jet skis, boats, and other sources, or just the presence of one or more persons near the colony (ies) may cause abandonment of nests by adults which may cause eggs overheat and predated by ants, rats or cats. It is very important not to disturb the colonies during nesting season. Any work or activity necessary to do near or in colony areas, should be completed outside of nesting period.

APPENDIX E

Equation to calculate the potential extent of acoustic impacts from underwater detonations

2. Overview of Impacts to Protected Species

Underwater explosions may affect marine life by causing death, injury, temporary threshold shifts (TTS or recoverable hearing loss), or behavioral reactions, depending on the distance an animal is located from a blast. An underwater explosion is composed of an initial shock wave, followed by a succession of oscillating bubble pulses. A shock wave is a compression wave that expands radially out from the detonation point of an explosion. At a distance from a detonation, the propagation of the shock wave may be affected by several components including the direct shock wave, the surface-reflected wave, the bottom-reflected wave, and the bottom-transmitted wave. The direct shock wave results in the peak shock pressure (compression) and the reflected wave at the air-water surface produces negative pressure (expansion). For an explosion with the same energy and at the same distance, an underwater blast is much more dangerous to animals than an air blast. The shock wave in air dissipates more rapidly and tends to be reflected at the body surface; in water the blast wave travels through the body and may cause internal injury to gas-filled organs due to impedance differences at the gas-liquid interface.

Beyond the distance from a detonation causing injury, explosives use in designated critical habitat, during certain times of year, or occurring in other biologically important habitats (e.g., migration corridors, spawning and nesting areas, and juvenile habitats) could have potentially adverse consequences on animals. In response to noise, behavioral reactions could potentially result in impairment of feeding, sheltering, reproduction, or other biologically important functions of animals. Exposure to a noise can also result in temporary or permanent hearing impairment, depending on the sound pressure level and exposure duration. Therefore, the hearing abilities of animals and behavioral disturbance are important considerations when assessing the potential impacts from projects resulting in noise.

2.1. Effects on Sea Turtles

Explosions are known to injure and kill sea turtles (Duronslet et al. 1986, Gitschlag 1990, Gitschlag and Herczeg 1994, Klima et al. 1988, O'Keefe and Young 1984). NMFS studied the effects of offshore oil and gas structure removals using 23 kg (50 lb) of nitromethane (Klima et al. 1988). Loggerhead (*Caretta caretta*) and Kemp's ridley (*Lepidochelys kempii)* sea turtles were located at distances of 213.4 m (700 ft), 365.8 m (1,200 ft), 548.6 m (1,800 ft), and 914.4 m (3,000 ft) from the platform removed with explosives. The charges were placed inside platform pilings at a depth of 5 m below the mudline. Four sea turtles within 365.8 m of the detonation were unconscious, as well as an individual at 914.4 m (3,000 ft). Sea turtles were expected to have drowned if not recovered from the water following the detonation. All turtles exposed to the blast exhibited everted cloacas and vasodilation lasting 2-3 weeks.

The sea turtle ear appears to be adapted to both aerial and aquatic environments. Sea turtles have a primitive reptilian ear and are considered to be hearing generalists, having limited hearing abilities at lower frequencies. Although there is some variation in sea turtle hearing measurements between species and size classes (Ketten and Bartol 2006), the available data suggest that species of sea turtles are likely sensitive to frequencies from approximately 100 Hertz (Hz) to 2,000 Hz (Lenhardt 1994, Lenhardt et al. 1996, McCauley et al. 2000a and 2000b, Moein et al. 1994, O'Hara and Wilcox 1990), with greatest underwater hearing sensitivities below 1,000 Hz (Ketten and Bartol 2006). Behavioral reactions to the sound produced from

explosions may be important if they occur in biologically important areas such as foraging areas, near nesting beaches during nesting season, or in developmental juvenile habitats.

2.3. Effects on Marine Mammals

Blast damage in marine mammals has been investigated using both submerged terrestrial mammals (Goertner 1982, Yelverton et al. 1973, Richmond et. al 1973) and cadavers (Myrick et al. 1990, Ketten et. al 2003). At close ranges to a detonation, mortality and life threatening injuries may occur. At increasing distance from the blast, the effects of the shock wave lessen, but effects such as hearing loss and behavioral responses may still occur. There are a variety of factors that may affect noise effects on marine mammals. Marine mammals are at greatest risk of injury when they are at the same depth as, or slightly above, the explosion (Keevin and Hempen 1997). Risks drop off quite sharply above and below this depth; however, the pressure waves produced from an explosion may propagate very differently, depending on environmental factors. Additionally, smaller marine mammals are more susceptible to blast injury than larger animals at the same exposure levels. Frequently occurring or repeated detonations over a given time period may cause behavioral changes that disrupt biologically important behaviors or result in TTS.

The hearing abilities of marine mammals are generally classified as lower-frequency hearing for mysticetes (baleen whales) and higher-frequency hearing for odontocetes (toothed whales). Based on anatomical studies, mysticetes are believed to generally hear sounds in the 0.01 to 20 kHz range, depending on the species (e.g., Helweg et al. 2000, Parks et al. 2001, 2007). Odontocetes generally hear over a much broader range of higher frequencies from approximately 0.2 to 180 kHz (e.g., Cook et al. 2006, Erbe 2002, Houser and Finneran 2006, Kastelein et al 2003, Szymanski et al. 1999) with best hearing between approximately 5 and 100 kHz, depending on the species. Increasingly, more hearing measurements are becoming available for more odonotcete species and have been summarized elsewhere (Nedwell et al. 2004); however, the general range of hearing abilities described above can be used for planning projects that result in infrequent, impulsive sounds from underwater detonations of explosives.

2.4. Behavioral Reactions to Detonations

At ranges beyond those causing injury, animals are susceptible to behavioral disturbances from underwater noise in the frequencies of their hearing range. Explosions produce loud, broadband noise that is audible to many species, but the main frequencies produced are often influenced by the medium being blasted (e.g., rock, concrete, and pilings) and blasting technique (e.g., placement inside or outside the structure, burial or borehole depth, and type of charge). Important behavioral effects on feeding, resting, and reproduction should always be considered during project planning.

Based on the duration of noise produced from construction activities, repeated exposure to acoustic energy (e.g., pile driving, geophysical surveys, dredging, and vessel noise) could potentially result in a broader range of behavioral effects than single, impulsive energy waves, such as those resulting from detonations. Detonations resulting in a single, instantaneous detonation would not be expected to result in significant behavioral disturbance; however, temporary reactions or startle responses to the noise may occur. Likely reactions to a single detonation may range from no reaction (Madsen and Møhl 2000), annoyance, attraction to or

avoidance of the noise, or a startle response from the sudden onset of the noise (SRS Technologies 2001). Observed reactions could include diving, surfacing, schooling, increased respiration, or swimming away from the noise (Collins et al. 2001, Richardson et al. 2001, Nowacek et al. 2007). The effects of startle responses are usually temporary and minor, although sudden onset of impulsive noises may have potentially adverse consequences (Jehl and Cooper 1980, SRS Technologies 2001).

Recommended exposure levels in which behavioral reactions are expected appear in Table 1. Single, discrete detonation events are generally not expected to result in significant changes in behavior under most circumstances; however, certain life history stages or behavioral states need consideration when assessing impacts of noise. In the southeast U.S., project areas in or near known spawning grounds, calving areas, nesting beaches, important foraging areas, migration corridors, or designated critical habitat may be more likely to disturb animals. These areas may have seasonal or environmental characteristics that are important to protected species. NMFS is available to assist with identifying any areas of potential concern near a project area.

Table 1. Onset of behavioral responses to a single impulsive noise.

Impact Zone	Cetaceans[a]	Sea Turtles[b]	Fishes [c]
Harassment (Behavior)	≥ 160 dB_{rms} re 1 μPa	166_{rms} dB re 1 μPa or 155 dB re 1 μPa-s	160_{peak} dB re 1 μPa

[a]Recommended interim criteria for marine mammals

[b]Based on McCauley et al 2000a

[c]Recommended level based on data from Skalski et al. 1992.

Although most single detonations typically don't result in significant behavioral changes, the level of behavioral response of an animal can be strongly dependent on the repetitiveness of the disturbing stimulus. As a guiding principal, projects involving multiple detonations per day should be evaluated for their potential to significantly affect the behavior of an animal. For any projects in which repetitive explosions may occur, the potential for adverse behavioral effects must be evaluated on a project-by-project basis with NMFS.

3. Defining Zones of Influence

Defining zones of influence allows NMFS and project planners to estimate the potential area affected and determine appropriate mitigation measures for protected species.

1. **Mortality Zone:** The distance from a detonation within which mortality may occur.

2. **Injury Zone:** the distance from a detonation within which non-lethal injury may occur, but mortality is not expected.

3. **Danger Zone:** The distance from a detonation within which both injury and mortality may occur.

4. **Harassment Zone (TTS):** the distance from a detonation within which temporary hearing loss may occur.

5. **Harassment Zone (Behavior):** the distance from a detonation within which behavioral reactions may occur.

6. **Watch Zone:** an additional buffer zone that may be monitored to detect animals that are heading towards the impacted area. The watch zone radius may vary depending on the type of project and species potentially occurring in the project area.

Different zones of influence should be considered when determining the range of effects from any given noise. Useful terms to describe zones of influence and estimate probable impacts from explosions (and avoidance of) are 1) a mortality zone, 2) an injury zone, 3) a danger zone (mortality and injury zones combined), 4) a harassment zone (TTS), 5) a harassment zone (behavior), and 6) a watch zone (Figure 1). Defining zones of influence is also important to establish common terminology to discuss potential impacts to protected species. The term *impact zone* may also be used in reference to the distance from an explosion within which the potential for adverse effects may occur, including the potential for mortality, injury, and harassment.

4. Calculating Zones of Influence

NMFS' Southeast Region currently accepts three general methods to calculate zones of influence, depending on the activity type: 1) energy and pressure thresholds; 2) unconfined blasts; and 3) confined blasts using stemmed charges. The zones of influence needed for a project area and how they are estimated will vary depending on the method used, as well as project-specific details.

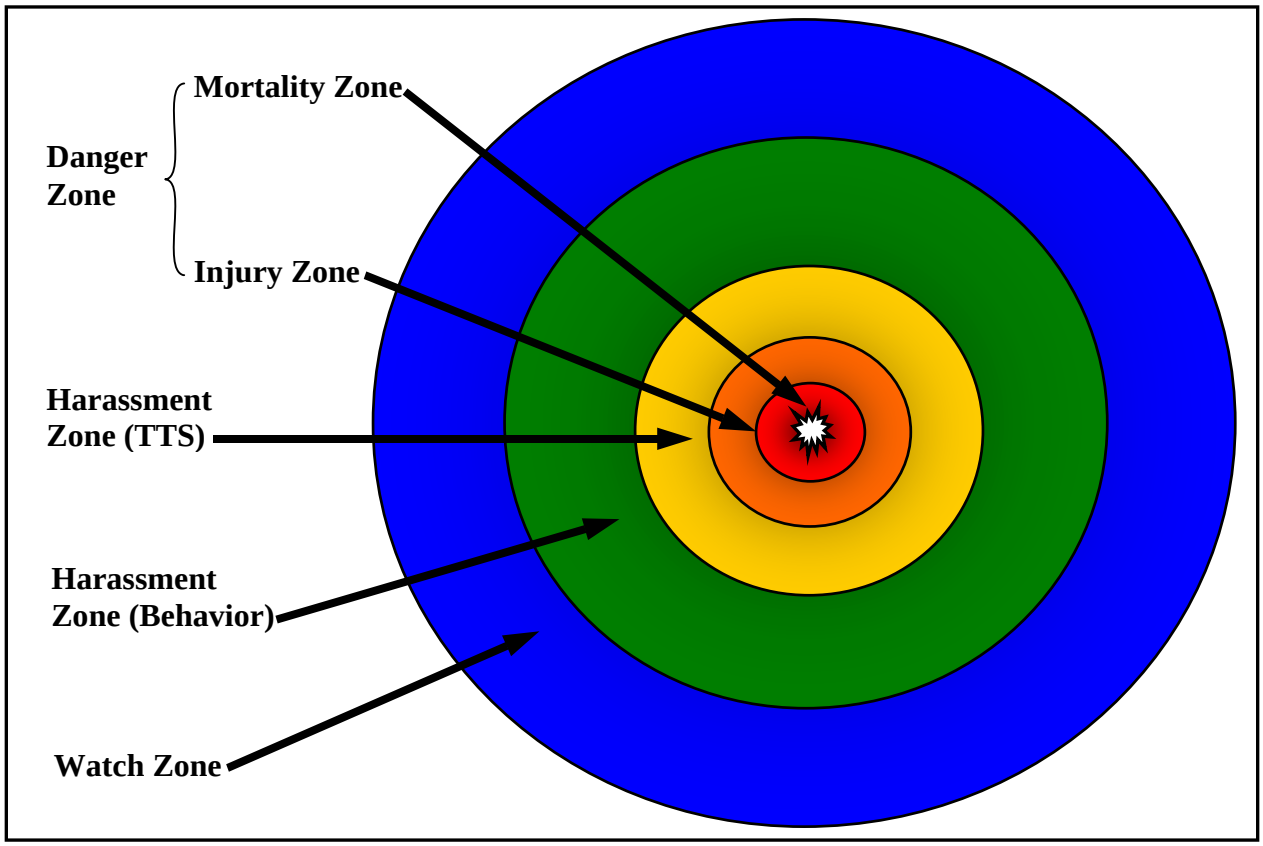

Figure 1. An example of zones of influence from explosives detonated in open water.

4.1. Energy and Pressure Thresholds

Threshold criteria for marine mammals and sea turtles were initially established for ship shock trials of the SEAWOLF submarine and the WINSTON S. CHURCHILL vessel, and description and derivation of these criteria can be found in the environmental impact statements prepared for these activities (Department of the Navy 1998 and 2001). Recently, these criteria have been revised and are currently undergoing further review by NMFS and may be applied to other protected vertebrate species. Standard impulsive and acoustic metrics used in this document are defined below.

Peak Pressure: peak pressure is commonly used to measure maximum positive pressure or peak amplitude of impulsive sources with units of psi.

Positive Impulse: Positive impulse is the time-averaged pressure disturbance from an explosive source with units in psi-ms.

Sound Exposure Level (SEL): SEL is the time cumulative sum of squares pressure divided by the duration of the sound. SEL levels have units of dB re 1 $\mu Pa^2 \cdot s$ and other an assessment of risk to multiple exposures, such as pile driving.

Energy flux density (EFD): EFD is the time integral of the squared pressure divided by

the impedance. EFD levels have units of dB re 1 $\mu Pa^2 \cdot s$.

1/3-Octave band: The 1/3 octave selected is the hearing range at which the subject animals' hearing is believed to be most sensitive.

It is noteworthy that the EFD and SEL metrics are converted to decibels in a slightly different way, but are very similar. The SEL and EFD metrics often are used to refer to the same quantity, namely, the time integral of square pressure divided by the product of sound speed and density. This definition for EFD, however, is not strictly correct for complex pressure fields; SEL may be a more appropriate metric in an analysis of potential impacts from explosive sources. However, both SEL and EFD are reported in the literature and are comparable metrics. NMFS recommends that SEL should be used whenever possible.

Marine Mammal and Sea Turtle Mortality Thresholds
To determine the potential physical injury from explosions, pressure thresholds are used based on the mass of the animal. Studies with animals have shown that as the mass of the animal increases, the pressure required to result in lung injury increases. Pressure is commonly measured as positive impulse or peak pressures. Threshold levels can be established to estimate distances from an explosion in which different impacts varying in severity may occur, that may characterize levels at which harassment, injury, or death may be expected. Although body mass is associated with blast injury, there is no not association with auditory and behavioral effects discussed below. Predictive equations for lung injury Equation 1 and example thresholds based on body mass of sea turtles and marine mammals appear in Table 2.

The recommended threshold level for the onset of mortality in sea turtles and marine mammals from explosions (Yelverton and Richmond 1981) is given by:

1% mortality can be estimated by: $LN\ I = 2.588 + 0.386\ Ln\ M$, and

50% mortality can be estimated by $LN\ I = 3.019 + 0.386\ Ln\ M$

where I is positive impulse (psi-ms) and M is body mass (kg).

Example 4.1
Using the above equation to find the threshold level at which the onset of mortality (1%) is expected for a 27 lb (10 kg) juvenile green sea turtle in the Laguna Madre, Texas, we find:

<u>10 kg green sea turtle</u>
$LN\ I = 2.588 + 0.386\ Ln\ (10)$
$LN\ I = 2.588 + 0.889$
$LN\ I = 3.477$

Finding the inverse natural log to solve for impulse (I) yields:
$I = e^{3.477}$
$I = 2.71828^{4.33}$

$I = 32.36$ psi-ms

In general, smaller animals and their associated smaller impulse values result in larger impact zones. This equation does not consider the possible effects of animal depth; however, it is generally applicable to general estimating the onset of mortality for blasting projects in coastal areas, and it is highly conservative since it estimates the injury range at which only 1% of animals would be expected to experience lung injury. Following the calculation of the appropriate threshold level, the shock wave needs to be modeled to determine the range from the detonation at which the threshold level will be realized. These calculations are complex and require knowledge of the project details, environment, shock wave theory and modeling. These calculations are discussed in greater detail in Department of Defense (2001 and 2007).

To predict auditory effects from single explosions, two different acoustic energy thresholds (dual criteria) may be used to predict effects to sea turtles and marine mammals: a sound exposure level (SEL) and a pressure threshold (Table 2). The auditory criteria resulting in permanent

Table 2. Zones of influence for marine mammals and sea turtles from explosions.

Impact Zone	*Criterion Definition*	Threshold Level
Mortality Zone	Onset of severe lung injury (1% of animals; dependent on body mass)	$\text{Ln } I = 2.588 + 0.386 \text{ Ln } M$[a]
Injury Zone	Onset of PTS	≥46 psi, 230_{peak} dB re 1 μPa, or 198 dB re 1 μPa^2-s
Harassment Zone (TTS)	Onset of TTS	≥23 psi[b], 224_{peak} dB re 1 μPa[c]; or 183 dB μPa^2-s at frequencies in any 1/3 octave band above 100 Hz for odontocetes and sea turtles; or above 10 Hz for mysticetes.

[a]Yelverton and Richmond 1981
[b]Finneran et al 2002
[c]Southall et al. 2007

threshold shift (PTS or non-recoverable hearing loss) and TTS are applicable to single detonation events that do not result in repeated exposures to noise. Since auditory effects have not been shown to be associated with the size of the animal, specific threshold levels can be used.

However, repeated exposures to noise resulting from consecutive detonations of explosions may result in different threshold levels, this does not typically occur and is limited to some types of military testing and training exercises and special blasting requirements of some construction projects. Longer durations to noise exposure may result in greater magnitude effects on animals, and may require additional consideration when conducting a risk assessment. In general, longer duration noises have a greater likelihood to result in hearing loss, than shorter, impulsive noises of the same intensity.

Some specific models have been developed for some activities using these criteria (e.g., explosive removal of offshore oil and gas structures in the Gulf of Mexico) and are discussed elsewhere (Dzwilewski and Fenton 2003). When deciding which criteria to use, each threshold level must be calculated to determine the more conservative criteria that yields the larger zone of influence. NMFS currently recommends that the SEL be estimated to account for the total energy produced during detonations; however, peak pressure is also acceptable. In cases where empirical data exist, dual criteria exist for the impact threshold. If SEL levels are not used, the equivalent dB unit of measurement used should always be clearly reported.

Summary of Threshold Criteria

These criteria may be used to establish impact zone areas in which probable impacts can be expected, and appropriate mitigation measures designed to avoid or minimize the risk of harm to protected species. A discussion of the calculations conducted for these criteria are provided in the environmental impact statement prepared for the shock trial of the *Mesa Verde* (Department of Defense 2008). NMFS regards these criteria (Table 3) as the preferred approach to estimating impacts on sea turtles and marine mammals; however, potential impacts to sturgeon and the smalltooth sawfish are more difficult to quantify by discrete threshold levels and is dependent on the size class and/or life history stage of fishes in the project area. Additionally, many project planners often do not have the necessary information on the project to model the required distance at which the thresholds are realized. In absence of all the information necessary to complete the calculations, reasonable assumptions may be necessary to model shock wave propagation and determine dual criteria thresholds for protected species.

With information on the noise characteristics of the detonation and species affected, accurate estimates of impact zones can be determined for sea turtles and marine mammals. Some limitations of the criteria include assumptions about the propagation of shock waves, depth of charge, and variations in propagation environments at different project areas. Although specific threshold criteria can be set for protected species, modeling of threshold levels from explosions may be limited by modeling capabilities, and conservative assumptions regarding impact zones and potential effects to species may be needed. Because there are many other variables to consider, NMFS may request field verification measurements to be made prior to establishing final zones of influence when a large degree of uncertainty exists.

4.2. Unconfined Blasts

Unconfined or open-water blasts include a wide variety of explosives uses for construction, demolition, and other marine projects. For unconfined blasts, precise injury zones cannot be calculated without calculating pressure measurements. These equations are considered very conservative; and, therefore, are acceptable for protected species mitigation during project planning. Young (1991) developed predictive equations based on observed safe ranges (radius) from a detonation, and be used to predict the danger zone for protected species:

$$\text{Fish Danger Zone (ft)} = 95\ (\text{fish weight in lb})^{-.13}(\text{max lb/delay})^{.28}(\text{depth of charge in ft})^{.22}$$

$$\text{Sea Turtle Danger Zone (ft)} = 560\ \sqrt[3]{\text{max lb/delay}}$$

$$\text{Calf Porpoise Danger Zone (ft)} = 578\ (\text{max lb/delay})^{.28}$$

$$20\text{-ft Whale Danger Zone (ft)} = 327\ (\text{max lb/delay})^{.28}$$

The equation to estimate danger zones for fishes is based on data from open-water blasts in shallow water. Although it is based on a limited range of conditions, the equation is appropriate for sturgeon due to their association with riverine and coastal shallow-water habitats. Although the above models are based on observed safe ranges from an explosion where no apparent injury or mortality was observed, they do not precisely predict differing levels of effects within the range between the detonation point and safe distance (e.g., the specific distances in which mortality and injury are expected are not known). However, these models are very conservative predictors to avoid serious injury and mortality. NMFS considers the equations developed by Young to be very conservative at avoiding serious injury and harassment. Although they were not developed to predict distances to avoid non-serious injury (PTS), these effects of PTS may be found within these conservatively estimated danger zones.

Many variables are often unknown in planning phases, and these models are useful for predicting safe ranges to avoid mortality when more precise harassment zone modeling cannot be completed. NMFS may request an estimation of these zones of influence for section 7 consultation under the ESA, or when applying for an incidental harassment authorization under the MMPA if determined to be necessary. In such cases, a conservative estimate of a non-serious injury and harassment zone should be estimated based upon available information from similar projects or field measurements. If sufficient information is available, a more rigorous analysis of environmental impact modeling for zones of influence should be completed.

Example 4.2
A hypothetical demolition project plans to remove an existing two-lane causeway and construct a new six-lane causeway over an estuarine bay. A total of 8 blast events will be conducted over a 30-day period. For one detonation sequence, a total net explosive weight (NEW) of 200 lb (60-lb, two 50-lb, and a 40-lb charge) will be detonated with three 25 ms delays between each detonation. The charges will be detonated at a depth of 20 ft to sever support structures for removal. The species occurring in the project area and information for the detonation sequence appears in the table below.

Species in Project Area	Abundance in Bay (0)	Charge Weights/Series (lb)	Max. NEW/25 ms Delay
Gulf sturgeon	60	40	60
green sea turtle	3	50	
Kemp's ridley sea turtle	2	50	
loggerhead sea turtle	18	60	
bottlenose dolphins	37		

Subadult Gulf sturgeon utilize the project area during the scheduled blasting activities of January-February. Subadult sturgeon foraging in the area have weights ranging from 0.7 lb to 5.3 lb (Clugston et al. 1995).

Example Calculations

The equations to predict the danger zone for fishes, sea turtles, and dolphins to mortality and serious injury can be solved for each species by:

$$\text{Fish Danger Zone (ft)} = 95\,(.70)^{-.13}(60)^{.28}(20)^{.22}$$
$$= 95\,(1.05)(3.15)(1.93)$$
$$= 95\,(6.38)$$
$$= 606 \text{ ft}$$

$$\text{Sea Turtle Danger Zone (ft)} = 560\,\sqrt[3]{60}$$
$$= 560\,(3.91)$$
$$= 2{,}192 \text{ ft}$$

$$\text{Dolphin Calf Danger Zone (ft)} = 578\,(60)^{.28}$$
$$= 578\,(3.15)$$
$$= 1{,}821 \text{ ft}$$

In the above example, the Gulf sturgeon danger zone (606 ft) is much smaller than that predicted for sea turtles (2,192 ft) and dolphins (1,821 ft). For sea turtles and dolphins, size of animals and depth of charge are not needed to solve the equation because they are based upon observed safe ranges. Although this may be convenient to solving the calculation, the resulting danger ranges for sea turtles and dolphins are conservatively large as a result. The danger zones predicted for sea turtles and marine mammals using these equations for explosive charges < 1,000 lb result in quite larger distances than those calculated using the energy and pressure criteria, and often approximate, but are slightly more conservative than, harassment zones predicted by the dual criteria thresholds for TTS. However, additional distances may be needed to account for these potential effects if they are determined to be beyond the danger range.

Visually Observable Species

For visually observable species, the size of the area to be monitored is usually determined by the species affected over the largest area, which in the above example are sea turtles. When estimations of zones of influence are necessary using the equations developed by Young, it may be desirable to compare the zones of influence predicted with the safe range equations with similar projects that have calculated more precise zones of influence for sea turtles and marine mammals using the dual criteria thresholds (Table 1). Field measurements are desirable requirements of operation plans of common types of activities to verify the predicted zones of influence.

Species Not Visually Observable

The most sensitive size class is accounted for by using the lowest mass of subadult Gulf sturgeon in the area (0.70 lb). Since sturgeon cannot be effectively monitored by visual observers, physical barriers, bubble curtains, or reducing the NEW of the charge might be considered by project planners. If such measures cannot be effectively deployed, seasonal restrictions may be an appropriate measure to avoid potential mortality altogether. The Young equation is considered appropriate for Gulf sturgeon because it was developed based on data for shallow-

depth, open-water explosions. In addition to their common association with shallow-water habitats, sturgeon generally spend most of their time on the bottom, where fishes are less vulnerable from open-water explosions (Young 1991), but not necessarily from buried charges. However, this open-water equation conservatively estimates safe ranges for species of sturgeon. It is important to note that as depth of the charge increases or the mass of the fish decreases, the distance of the safe range from the explosion will increase for a charge of equivalent NEW. Keevin and Hempen (1997) provide a thorough summary of other models to estimate lethal zones for fishes when additional parameters are known.

In summary, NMFS' Southeast Regional Office considers these conservative equations sufficient for mitigation planning purposes to avoid injury and mortality when more precise calculations of zones of influence cannot be completed. Additional considerations of impacts associated with non-lethal injury and harassment may be necessary, and may be dependent on the details of the project.

4.3. Confined Blasts Using Stemmed Charges

Confined blasts in boreholes are a method in which the explosive charge is placed in a borehole and capped with an inert material such as angular rock or crushed stone. Confined borehole blasting or stemmed charges are used primarily during channel and harbor deepening. Confined blasts increase the work done by the explosives while decreasing the amount of pressure released into the water column (Hempen et al. 2005, Nedwell and Thandavamoorthy 1992). Detonations in open water will produce both higher amplitude and higher frequency shock waves than contained detonations; thus, the technique of stemming charges results in reduced pressures and lower aquatic organism mortality than the same explosive charge weight detonated in open water (Hempen et al. 2007, Nedwell and Thandavamoorthy 1992).

The inert material must be irregularly shaped since regularly-shaped materials may be expelled during detonation and will not effectively "dampen" the blast wave. To be effective, the stemming material should be within 1/20 to 1/8 of the borehole diameter. The stemming material is not acceptable if it contains more than 10% fines (smaller than 1/20 of the borehole diameter). Stemming material should be placed at a minimum vertical length of three borehole diameters above the placed charge within sound rock or concrete. Since this approach has been based on specific measurements of underwater rock blasting projects, blasting methods that do not follow established methods for confined blasting should use an unconfined blast model to determine the appropriate impact zone or estimate zones of influence, such as that provided in section 4.2 above, or conduct field experiments to measure pressure and energy propagation from the specified blasting method so that new models may be derived.

The following equations are recommended to estimate the zone~~s~~ of influence for confined, stemmed charges (Hempen et al. 2007, Jordan et al. 2007):

Danger Zone Radius (ft) = 260 $\sqrt[3]{\text{lb/delay}}$

Harassment Zone Radius (ft) = 520 $\sqrt[3]{\text{lb/delay}}$

Watch Zone Radius (ft) = three times the distance of the mortality and injury zone

Example 4.3

Using the same blast scenario provided in example 4.2, but with confined, stemmed blasts instead of open-water, the zone of influence equations yield:

Danger Zone Radius (ft) $= 260\sqrt[3]{60}$
$= 1{,}018$ ft

Harassment Zone Radius (ft) $= 520\sqrt[3]{60}$
$= 2{,}036$ ft

Watch Zone Radius (ft) $= 3(260\sqrt[3]{60})$
$= 3{,}054$ ft

Based on studies to date (Hempen et al. 2005, Nedwell and Thandavamoorthy 1992), the above equation is believed to be highly conservative in estimating zones of influence for protected species, and mitigation based on this model has been tested in the field (Jordan et al. 2007). A limitation of this model, as with the above open-water blast equations, is that it does not estimate threshold levels for various types of effects from a confined blast, but estimates a conservative safe range from injury and mortality for all species. Although there would be a greater risk of mortality the closer an animal comes to the point of detonation, the distance is conservatively protective since both injury and mortality are assumed to have an equal chance of occurring if an animal were within the danger zone.

Hempen et al. (2007) estimated a mortality zone for fishes based on a low lethal level of 40 psi for stemmed charges. NMFS believes this level may be appropriate for larger size classes of fish, but not for smaller size classes (see Figure 2). If only large animals are found in a project area, the 40-psi criteria may be appropriate. NMFS recommends the equations above be used for estimating impacts to all size classes during project planning.

5. Assessing Impacts to Protected Species

Analytical frameworks are useful decision-making tools for protected species management. Analytical frameworks can be used to break down, or deconstruct, an activity into individual components, identify the potential effects of the noise components in the environment, and determine the level of risk posed by the noise-producing activity (Figure 4). Each noise component can be characterized by considering many factors such as the propagation characteristics of the noise, the environmental characteristics and habitat type, and species found in the area. Once all the important variables of the action and species are considered, a risk

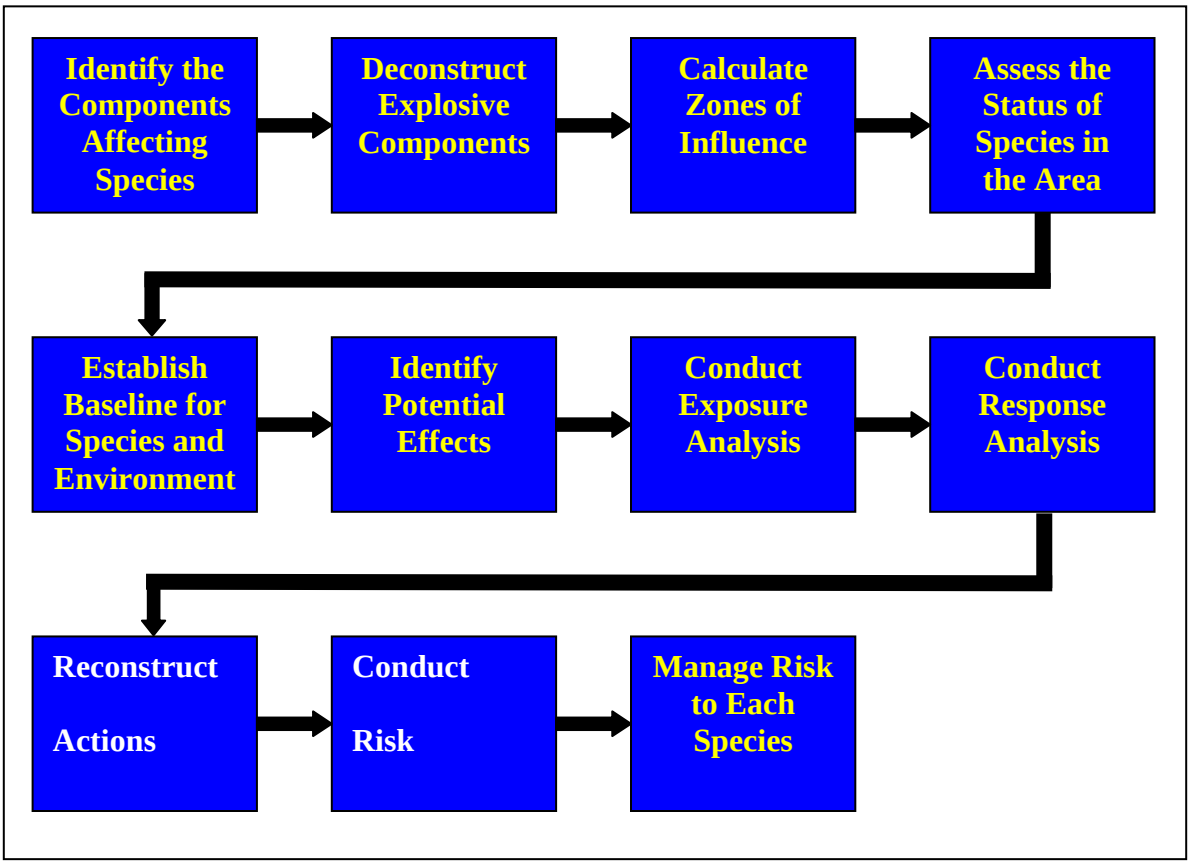

Figure 4. A general analytical framework to assess risk to protected species from explosions.

assessment is performed to determine the probability of undesirable effects occurring, and any measures to minimize or avoid those effects can then be considered.

Analytical frameworks utilize mathematical models or conceptual approaches to assess the potential risks to different species. The types of effects routinely considered include the potential for injury or death, the potential for harassment to occur, and habitat effects resulting from the activity. Information on any protected species in the project area is needed to properly assess any potential impacts. Information such as species abundance, animal behavior, hearing abilities, habitat characteristics, critical habitat designations, and other available information in the project area need to be considered. For example, a project can be deconstructed into its main components such as time of year, project duration, charge weights, number of explosions per day, and other variables (see *Summary of Information Needed* section below). Noise from the project can further be deconstructed into pressure units (psi) and dB units (EFD). Using the threshold criteria or models discussed in previous sections, zones of influence can be calculated to determine probable effects to protected species or critical habitat. For any effects that need mitigating, a number of different mitigation tools may be used to avoid or minimize impacts to protected species and their habitats.

Information Needed to Assess Impacts

A complete description of the activity and an assessment of impacts to protected species from explosives should be submitted with a request for consultation or incidental take authorization to NMFS. NMFS may also consider other actions associated with the use of explosives that may affect protected species such as vessel traffic, dredging, construction noise, effects on habitat quality, and other potential effects of the action. Any additional activities that may result in impacts to protected species or those identified in consultation with NMFS should also be identified. An analysis of all activity components that may affect protected species should be conducted, and those resulting in potentially adverse affects identified. For explosives use, a detailed blasting plan should be submitted with, or integrated within the impact analysis for a particular activity. The information needed for NMFS to assess activities using explosives includes:

- A description of the types of targets or structures on which explosives will be used;
- The type of explosives used;
- Details of the use of delays, stemming, charge placement, and depth of detonation;
- The total number of detonations or detonation sequences for the project, and number per day;
- The maximum explosive weight detonated per 25 ms period for each detonation sequence;
- The number of delays used and delay time for each detonation sequence;
- The time of year (months) the blasting is planned; and
- The total number of days blasting is expected to occur;
- A description of habitat in which explosives will be used including depth, salinity, water temperature, substrate type, and biota;
- A description of protected species and habitat in the project area;
- A summary of potential effects to species and habitat from the activity;
- An estimation of the zones of influence to protected species indicating the method by which they were calculated. Models and mitigation methods may be approved on a case-by-case basis, or as new information becomes available regarding blast modeling or exposure criteria for protected species;
- An analysis of effects to protected species;
- An analysis of effects on protected species habitats and primary constituent elements (PCEs) of any critical habitat, if designated in the project area;
- A proposed mitigation/monitoring plan for the project; and
- Observer qualifications

A well-prepared blasting plan can partially fulfill the recommendations for biological assessments (BAs) and environmental assessments (EAs). Guidelines on the preparation of a BAs and EAs, and information regarding section 7 consultation can be found on the Southeast Regional Office web site at http://sero.nmfs.noaa.gov/pr/pdf/BA_guide_comboeh081105.pdf.

Information regarding applying for an incidental take authorization under the Marine Mammal Protection Act may be found at http://www.nmfs.noaa.gov/pr/permits/incidental.htm.

6. Measures to Reduce the Risk of Harm to Protected Species

Environmental mitigation should be a part of every blasting plan and include appropriate measures identified in the risk assessment for the species and habitats found in the project area. For common activities requiring explosives, such as oil and gas structure decommissioning, some standard recommendations have been developed in coordination with NMFS. A "suite" of measures that applies to all the protected species found in a project area is desirable for flexibility in project planning, as well as for species-specific management needs. Because fish are not readily observable, visual surveys alone cannot avoid impacts; therefore, additional mitigation should be considered when protected species of fish are present in a project area. The suite of measures below should be considered when preparing protected species mitigation measures for blasting plans. Implementation of these measures does not necessarily ensure that all impacts will be avoided. Project-specific recommendations may be discussed during consultation with NMFS.

1. Establish zones of influence based upon protected species found in the project area, using an appropriate model.

2. The lowest NEW per detonation should be used to complete the work for a particular construction, severance, or demolition activity. Using smaller NEWs is associated with smaller impact zones where protected species (listed species and marine mammals) could be harmed. Shaped and fracturing charge designs are being developed and refined by the demolition industry that increase the efficiency of the work, resulting in smaller NEWs than for "bulk" charges. Water gel explosives have a lower detonation velocity, generating less shock energy than some other high-detonation velocity explosives (e.g., dynamite) and have lesser impacts on aquatic animals.

3. The use of delays should be maximized between individual blasts to separate the total NEW into a blast episode, creating a series of discrete, consecutive blasts. A blast episode consists of a single blast or a series of blasts that are detonated with a delay to lower the overpressure at a received distance in the environment. Discrete detonations using delays effectively reduce the zones of influence. For delay intervals less than 25 milliseconds (ms), NMFS recommends that zones of influence for protected species be estimated by calculating the distances for the summed explosive weight detonated per 25 ms period.

4. The use of bubble curtains, physical barriers, and other mitigation techniques to dampen the shock wave from detonations should be considered. The effectiveness of mitigation techniques may vary depending on the environment (e.g., currents and water depth), number and NEW of the explosives used, and other project details. Bubble curtains dampen or attenuate the sound transmitted through the bubble curtain. A bubble curtain for explosives may consists of shock-resistant materials at various depths and distances from an explosion. The bubble curtain should be effective at reducing pressure to levels below those resulting in harm to the species found in the project area.

5. The perimeter of impact zones should be established and demarcated (e.g., with landmarks or brightly colored buoys) for visual reference when conditions permit. Land- or ship-based observations may use binoculars and the naked eye to monitor the zones of influence. Fixed focus, vector binoculars are useful to establish distance from the project site and identify species. When aerial surveys are proposed, an aerial survey plan should be submitted to NMFS for approval with the mitigation plan.

6. Qualified observers should be used that have completed an approved training program to monitor the zones of influence. Each observer should be equipped with a two-way radio dedicated to protected species communication, polarized sunglasses, binoculars, a red flag or other backup communication, and any necessary data recording equipment.

7. Monitoring should be conducted from the highest vantage point(s) and/or other locations that provide the best, clear view of the entire zone of influence. These vantage points may be on the structure being removed or on nearby surface vessels such as crew boats.

8. A sufficient number of observers should be used to effectively monitor the established zones of influence under variable charge sizes and environmental conditions. The number of observers used may be dependent on numerous factors including whether aerial or vessel/shore-based observations are used, the size of the zones of influences, distance from shore, sea state, and observer fatigue.

9. For large zones of influence, or to augment visual observations, passive acoustic monitoring may be utilized to detect vocal species of marine mammals when animals are not readily observable at the surface. However, passive listening should not be used as a replacement for an adequate number of visual observers.

10. If divers are used during the demolition, they should be instructed to scan subsurface areas around the removal site for the presence/absence of protected species during the course of removal operations.

11. The chief observer should have authority to immediately halt activities should a protected species be observed within the impact zone, or is in the watch zone and in imminent danger of injury by heading toward the impact zone.

12. Surveys should be conducted before and after each blast episode. The duration and method of surveys should be determined in consultation with NMFS. Post-detonation observations are to start at the removal site and proceed in the direction of wind and current movement from the blast location.

13. Surface and/or aerial protected species surveys should be conducted in environmental conditions adequate for effective visual observation. Aerial surveys should be conducted during daylight hours and cease when marine conditions are not adequate for visual observations, or when the pilot/removal supervisor determines that helicopter operations must be suspended. Detonations should be delayed until conditions improve sufficiently for monitoring to be effectively completed.

14. When a protected species is sighted or heard within the impact zone, detonations should be postponed until it is verified to be outside of the impact zone.

15. Blasting should be limited to daylight hours (between one hour after sunrise and one hour before sunset). If pre-detonation and post-detonation surveys are to be conducted, pre-detonation surveys shall not begin prior to sunrise and detonations must not occur if the post-detonation survey cannot be concluded prior to sunset.

16. Detonation of scare charges to intentionally harass sea turtles or marine mammals into leaving a project area is prohibited. Scare charges using detonation cord are potentially harmful to fishes (California Department of Fish and Game 2002) if the mass of the explosives is not considered. In some cases, scare charges may be necessary to reduce the risk of mortality to sturgeon and smalltooth sawfish in the immediate area of a blast. Detonation caps not exceeding 0.5 g (Collins et al. 2001) may be approved on a case-by-case basis for use as scare charges for sturgeon and smalltooth sawfish. Scare charges not exceeding 0.5 g are also recommended to avoid the attraction of marine mammals, sea turtles, and piscivorous fishes that are stunned or wounded by the scare charge.

17. All protected species entering the impact zone should be allowed to move out of the area under their own volition. Enticing marine mammals to bow-ride or intentionally harassing animals into leaving the area is prohibited.

18. All “shock-tubes" and detonation wires should be recovered and removed after each blast.

19. The chief observer should submit a post-project report within 30 days of completion of the project to the permitting agency. The report should include project information, including but not limited to, a description of the project and explosives used, survey information, environmental conditions, and observations of protected species. Reports should be available to NMFS upon request.

20. Report dead or injured protected species to your local stranding network contacts. A list of sea turtle stranding responders is available at http://www.sefsc.noaa.gov/seaturtleSTSSN.jsp.
    A list of marine mammal stranding network responders for each state is available at http://www.nmfs.noaa.gov/pr/health/networks.htm or may be reported to the marine mammal stranding hotline at 877-433-8299.
    All other dead or injured protected species should be reported to NMFS’ Southeast Regional Office by telephone at (727) 824-5312, or by FAX at (727) 824-5309.

Additional Considerations

The following mitigation measures may be recommended under some circumstances to avoid impacts to important habitats and behaviors of protected species.

1. Avoid blasting techniques in regions that may affect any primary constituent elements of critical habitat designated for a listed species.

2. When blasting in inshore habitats, blasting should be conducted at low tide, above the water line to reduce the transmission of energy into the water column.

3. Sequence work to minimize impacts to biologically important areas such as migration corridors, important foraging areas, spawning habitats, near nesting beaches, calving areas, or in juvenile or developmental habitats protected species. These considerations may involve temporal or seasonal considerations when blasting in biologically important habitats.

4. No debris from the blasting operations should be left on the seafloor unless the structure is to be decommissioned as an artificial reef. The amount of debris scattered by blasting should be minimized to the greatest extent practicable (e.g., the use of blast mats). Methods should be used to minimize benthic and habitat disturbances such as removing structures below the mudline, use of blasting mats, and removing debris off the seafloor with appropriate methods, and in consultation with NMFS.

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APPENDIX H. STANDARD OPERATING PROCEDURES (SOPS) AND CERTIFICATION

This appendix contains the Laboratory SOPs and ELAP Certification.

The following SOPs are included:

MSE018IS	Mechanical Shaker Extraction for Solid Explosive Samples using Incremental sampling (IS) techniques EPA METHOD 8330B;Rev. 5, 10/2015
HPL8330	Explosive compounds: Diode array detector by high pressure liquid chromatography, Rev. 9, 06/29/16
HPL8321	Method 8321 LC-Mass Spectrometer Analysis of Carbamate / Urea and Nitroaromatic /Nitrosamine Compounds. Rev 5, 01/04/16

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[Cert]-DoD ELAP CERT A2LA Scope Additions (Exp 06-30-17)

American Association for Laboratory Accreditation

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

AGRICULTURE & PRIORITY POLLUTANTS LABORATORIES, INC. (APPL, INC.)
908 N. Temperance Ave.
Clovis, CA 93611
Contact: Diane Anderson Phone: 559-275-2175

ENVIRONMENTAL

Valid To: June 30, 2017 Certificate Number: 4064.01

In recognition of the successful completion of the A2LA evaluation process, (including an assessment of the laboratory's compliance with ISO IEC 17025:2005, the 2009 TNI Standard, and the requirements of the DoD Environmental Laboratory Accreditation Program (DoD ELAP) as detailed in version 5.0 of the DoD Quality Systems Manual for Environmental Laboratories) accreditation is granted to this laboratory to perform recognized EPA methods using the following testing technologies and in the analyte categories identified below:

Testing Technologies

High Resolution Gas Chromatography/Mass Spectormetry, ICP-OES, ICP-Mass Spectrometry, Atomic Absorption Spectrometry, Gas Chromatography/ECD/FID, Liquid Chromatography- Mass Spectometry, High Performance Liquid Chromatography, Ion Chromatography, Titrimetry

			Solid Hazardous Waste	
Parameter/Analyte	Potable Water	Non-potable Water	Aqueous	Solid/Chemical
PCB Congeners				
2,2',3,4,4',5,5'-Heptachlorobiphenyl (PCB 180)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,2',3,4,4',5'-Hexachlorobiphenyl (PCB 138)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,2',4,4',5,5'-Hexachlorobiphenyl (PCB 153)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,2',4,5,5'-Pentachlorobiphenyl (PCB 101)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,2',5,5'-Tetrachlorobiphenyl (PCB 52)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,3,3',4,4',5,5'-Heptachlorobiphenyl (PCB 189)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,3,3',4,4',5-Hexachlorobiphenyl (PCB 156)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,3,3',4,4',5'-Hexachlorobiphenyl (PCB 157)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,3',4,4',5,5'-Hexachlorobiphenyl (PCB 167)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,3,4,4',5-Pentachlorobiphenyl (PCB 114)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,3',4,4',5-Pentachlorobiphenyl (PCB 118)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,3',4,4',5'-Pentachlorobiphenyl (PCB 123)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,4,4'-Trichlorobiphenyl (PCB 28)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A

			Solid Hazardous Waste	
Parameter/Analyte	Potable Water	Non-potable Water	Aqueous	Solid/Chemical
3,3',4,4',5,5'-Hexachlorobiphenyl (PCB 169)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
3,3',4,4',5-Pentachlorobiphenyl (PCB 126)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
3,3',4,4'-Tetrachlorobiphenyl (PCB 77)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,3'-Dichlorobiphenyl (PCB 6)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,2',3,3',4,4',5,6-Octachlorobiphenyl (PCB 195)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,2',3,5'-Tetrachlorobiphenyl (PCB 44)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,2',5-Trichlorobiphenyl (PCB 18)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,2',3,3',4,4'-Hexachlorobiphenyl (PCB 128)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,3',4,4'-Tetrachlorobiphenyl (PCB 66)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
Decachlorobiphenyl (PCB 209)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
3,4,4',5-Tetrachlorobiphenyl (PCB 81)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
1,2'-Dichlorobiphenyl (PCB 8)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,2',3,3',4,4',5-Heptachlorobiphenyl (PCB 170)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,2',3,4,5,5',6-Heptachlorobiphenyl (PCB 187)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (PCB 206)	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
PCB 129 + 138 + 163	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
PCB 153 + 168	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
PCB 156 + 157	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
PCB 180 + 193	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
PCB 20 + 28	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
PCB 90 + 101 + 113	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
PCBs, total	----------	EPA 1668/1668A	EPA 1668/1668A	EPA 1668/1668A
Metals				
Aluminum	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Antimony	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Arsenic	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Barium	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Beryllium	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Boron	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Cadmium	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Calcium	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Chromium	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Cobalt	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Copper	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Iron	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Lead	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Magnesium	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Manganese	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Molybdenum	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Nickel	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Potassium	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C

			Solid Hazardous Waste	
Parameter/Analyte	Potable Water	Non-potable Water	Aqueous	Solid/Chemical
Selenium	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Silver	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Sodium	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Strontium	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Thallium	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Tin	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Titanium	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Total Phosphorus	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Vanadium	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Zinc	----------	EPA 6010B/6010C	EPA 6010B/6010C	EPA 6010B/6010C
Aluminum	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Antimony	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Arsenic	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Barium	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Beryllium	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Boron	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Cadmium	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Calcium	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Chromium	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Cobalt	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Copper	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Iron	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Lead	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Magnesium	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Manganese	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Molybdenum	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Nickel	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Potassium	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Selenium	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Silver	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Sodium	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Strontium	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Thallium	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Tin	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Titanium	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Vanadium	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Zinc	----------	EPA 6020/6020A	EPA 6020/6020A	EPA 6020/6020A
Mercury	EPA 245.1	EPA 245.1/7470A	----------	----------
Mercury	----------	----------	EPA 7471A/7471B	EPA 7471A/7471B
Pesticides/Herbicides/PCBs/TPH/ Fumigants				
1,2,3-Trichloropropane	----------	EPA 8011	----------	----------
1,2-Dibromo-3-chloropropane (DBCP)	----------	EPA 8011	----------	----------
1,2-Dibromomethane (EDB, Ethylene dibromide)	----------	EPA 8011	----------	----------

			Solid Hazardous Waste	
Parameter/Analyte	Potable Water	Non-potable Water	Aqueous	Solid/Chemical
DRO (Diesel Range Organics), C10-C28	----------	EPA 8015B/8015C/8015D	EPA 8015B/8015C/8015D	EPA 8015B/8015C/8015D
RRO (Residual Range Organics), C25-C36	----------	EPA 8015B/8015C/8015D	EPA 8015B/8015C/8015D	EPA 8015B/8015C/8015D
DRO (Diesel Range Organics), C10-C25	----------	AK102	AK102	AK102
RRO (Residual Range Organics), C25-C36	----------	AK103	AK103	AK103
MRH (Mid-range hydrocarbons), C9-C18	----------	KS-MRH / HRH	KS-MRH / HRH	KS-MRH / HRH
HRH (High-range hydrocarbons), C19-C35	----------	KS-MRH / HRH	KS-MRH / HRH	KS-MRH / HRH
GRO (Gasoline Range Organics), C6-C10	----------	EPA 8015B/8015C/8015D	EPA 8015B/8015C/8015D	EPA 8015B/8015C/8015D
GRO (Gasoline Range Organics), C6-C10	----------	AK101	AK101	AK101
GRO (Gasoline Range Organics), C6-C10	----------	EPA 8260B/8260C	EPA 8260B/8260C 8260B/8260C	EPA 8260B/8260C
GRO (Gasoline Range Organics), C6-C10	----------	AK101-MS	AK101-MS	AK101-MS
LRH (Low-Range hydrocarbons), C5-C8	----------	KS-LRH	KS-LRH	KS-LRH
Methane	----------	RSK-175	RSK-175	RSK-175
Ethane	----------	RSK-175	RSK-175	RSK-175
Ethene	----------	RSK-175	RSK-175	RSK-175
4,4'-DDD	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
4,4'-DDE	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
4,4'-DDT	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
a-BHC	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
a-Chlordane	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
Aldrin	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
b-BHC	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
Chlordane	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
d-BHC	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
Dieldrin	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
Endosulfan I	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
Endosulfan II	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
Endosulfan sulfate	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
Endrin	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
Endrin aldehyde	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
Endrin ketone	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
g-BHC (Lindane)	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
g-Chlordane	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
Heptachlor	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
Heptachlor epoxide	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
Hexachlorobenzene	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
Methoxychlor	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
Toxaphene	----------	EPA 8081A/8081B	EPA 8081A/8081B	EPA 8081A/8081B
2,2',3,4,4',5,5'-Heptachlorobiphenyl (PCB 180)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
2,2',3,4,4',5'-Hexachlorobiphenyl (PCB 138)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A

			Solid Hazardous Waste	
Parameter/Analyte	Potable Water	Non-potable Water	Aqueous	Solid/Chemical
2,2',4,4',5,5'-Hexachlorobiphenyl (PCB 153)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
2,2',4,5,5'-Pentachlorobiphenyl (PCB 101)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
2,2',5,5'-Tetrachlorobiphenyl (PCB 52)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
2,3,3',4,4',5,5'-Heptachlorobiphenyl (PCB 189)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
2,3,3',4,4',5-Hexachlorobiphenyl (PCB 156)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
2,3,3',4,4',5'-Hexachlorobiphenyl (PCB 157)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
2,3',4,4',5,5'-Hexachlorobiphenyl (PCB 167)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
2,3,4,4',5-Pentachlorobiphenyl (PCB 114)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
2,3',4,4',5-Pentachlorobiphenyl (PCB 118)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
2,3',4,4',5'-Pentachlorobiphenyl (PCB 123)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
2,4,4'-Trichlorobiphenyl (PCB 28)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
3,3',4,4',5,5'-Hexachlorobiphenyl (PCB 169)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
3,3',4,4',5-Pentachlorobiphenyl (PCB 126)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
3,3',4,4'-Tetrachlorobiphenyl (PCB 77)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
3,4,4',5-Tetrachlorobiphenyl (PCB 81)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
Aroclor 1016/1242	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
Aroclor-1016 (PCB-1016)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
Aroclor-1221 (PCB-1221)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
Aroclor-1232 (PCB-1232)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
Aroclor-1242 (PCB-1242)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
Aroclor-1248 (PCB-1248)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
Aroclor-1254 (PCB-1254)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
Aroclor-1260 (PCB-1260)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
Aroclor-1260 (PCB-1262)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
Aroclor-1260 (PCB-1268)	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
PCB 129 + 138 + 163	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
PCB 153 + 168	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
PCB 156 + 157	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
PCB 180 + 193	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
PCB 20 + 28	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
PCB 90 + 101 + 113	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
PCBs, total	----------	EPA 8082/8082A	EPA 8082/8082A	EPA 8082/8082A
2,4,5-T	----------	EPA 8151A	EPA 8151A	EPA 8151A
2,4,5-TP	----------	EPA 8151A	EPA 8151A	EPA 8151A
2,4-D (2,4-Dichlorophenoxyacetic acid)	----------	EPA 8151A	EPA 8151A	EPA 8151A
2,4-DB	----------	EPA 8151A	EPA 8151A	EPA 8151A
Dalapon	----------	EPA 8151A	EPA 8151A	EPA 8151A
Dicamba	----------	EPA 8151A	EPA 8151A	EPA 8151A
Dichlorprop	----------	EPA 8151A	EPA 8151A	EPA 8151A
Dinoseb	----------	EPA 8151A	EPA 8151A	EPA 8151A
Pentachlorophenol	----------	EPA 8151A	EPA 8151A	EPA 8151A
Silvex (2,4,5-TP)	----------	EPA 8151A	EPA 8151A	EPA 8151A
MCPA	----------	EPA 8151A	EPA 8151A	EPA 8151A
MCPP	----------	EPA 8151A	EPA 8151A	EPA 8151A

			Solid Hazardous Waste	
Parameter/Analyte	Potable Water	Non-potable Water	Aqueous	Solid/Chemical
Pugeable Organics (volatiles-VOC)				
1,1,1,2-Tetrachloroethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,1,1-Trichloroethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,1,2,2-Tetrachloroethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,1,2-Trichloroethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,1,2-Trichlorotrifluoroethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,1-Dichloroethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,1-Dichloroethene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,1-Dichloropropene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,2,3-Trichlorobenzene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,2,3-Trichloropropane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,2,4-Trichlorobenzene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,2,4-Trimethylbenzene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,2-Dibromo-3-chloropropane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,2-Dibromoethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,2-Dichlorobenzene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,2-Dichloroethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,2-Dichloropropane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,3,5-Trimethylbenzene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,3-Dichlorobenzene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,3-Dichloropropane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
1,4-Dichlorobenzene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
2,2-Dichloropropane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
2-Butanone (Methyl ethyl ketone)	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
2-Chloroethyl vinyl ether	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
2-Chlorotoluene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
2-Hexanone	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
4-Chlorotoluene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
4-methyl-2-pentanone	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Acetone	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Acetonitrile	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Acrolein	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Acrylonitrile	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Benzene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Bromobenzene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Bromochloromethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Bromodichloromethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Bromoform	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Bromomethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Carbon disulphide	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Carbon tetrachloride	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Chlorobenzene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Chloroethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Chloroform	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C

			Solid Hazardous Waste	
Parameter/Analyte	Potable Water	Non-potable Water	Aqueous	Solid/Chemical
Chloromethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
cis-1,2-Dichloroethene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
cis-1,3-Dichloropropene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Cyclohexane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Dibromochloromethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Dibromomethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Dichlorodifluoromethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Ethyl benzene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Ethyl tert-butyl ether (ETBE)	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Hexachlorobutadiene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Hexachloroethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Iodomethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Isopropyl ether (DIPE)	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Isopropylbenzene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
m+p-Xylene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Methylacetate	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Methylcyclohexane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Methyl tert-butyl ether (MTBE)	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Methylene chloride (Dichloromethane)	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Naphthalene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
n-Butyl benzene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
n-Propylbenzene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
o-Xylene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
p-isopropyl toluene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
sec-Butyl benzene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Styrene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
tert-Amyl methyl ether (TAME)	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
tert-Butyl alcohol (t-Butanol)	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
tert-Butyl benzene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
tert-Butyl ethyl ether (ETBE)	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Tetrachloroethene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Toluene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Total Xylenes	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
trans-1,2-Dichloroethene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
trans-1,3-Dichloropropene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Trichloroethene	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Trichlorofluoromethane	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Vinyl Acetate	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Vinyl chloride	----------	EPA 8260B/8260C	EPA 8260B/8260C	EPA 8260B/8260C
Extractable Organics (semivolatiles-SVOC)				
1,1'-Biphenyl	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
1,2,4,5-Tetrachlorobenzene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
1,2,4-Trichlorbenzene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
1,2-Dichlorobenzene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D

			Solid Hazardous Waste	
Parameter/Analyte	Potable Water	Non-potable Water	Aqueous	Solid/Chemical
1,3-Dichlorobenzene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
1,4-Dichlorobenzene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
1,4-Dioxane	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
2,3,4,6-Tetrachlorophenol	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
2,4,5-Trichlorophenol	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
2,4,6-Trichlorophenol	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
2,4-Dichlorophenol	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
2,4-Dimethylphenol	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
2,4-Dinitrophenol	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
2,4-Dinitrotoluene (2,4-DNT)	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
2,6-Dichlorophenol	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
2,6-Dinitrotoluene (2,6-DNT)	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
2-Chloronaphthalene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
2-Chlorophenol	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
2-Methyl-4,6-Dinitrophenol	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
2-Methylnaphthalene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
2-Methylphenol (o-Cresol)	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
2-Nitroaniline	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
2-Nitrophenol	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
3, 4-Methylphenol (m+p-Cresol)	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
3,3'-Dichlorobenzidine	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
3-Nitroaniline	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
4-Bromophenyl phenyl ether	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
4-Chloro-3-methylphenol	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
4-Chloroaniline	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
4-Chlorophenyl phenylether	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
4-Methylphenol (p-Cresol)	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
4-Nitroaniline	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
4-Nitrophenol	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Acenaphthene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Acenaphthylene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Acetophenone	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Aniline	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Anthracene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Atrazine	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Benzaldehyde	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Benzidine	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Benzo(a)anthracene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Benzo(a)pyrene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Benzo(b)fluoranthene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Benzo(g,h,i)perylene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Benzo(k)fluoranthene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Benzoic acid	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Benzyl alcohol	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Benzyl butyl phthalate	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Biphenyl	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D

			Solid Hazardous Waste	
Parameter/Analyte	Potable Water	Non-potable Water	Aqueous	Solid/Chemical
bis(2-Chloroethoxy) methane	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
bis(2-Chloroethyl) ether	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
bis(2-Chloroisopropyl) ether	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
bis(2-Ethylhexyl) phthalate (DEHP)	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Butyl benzyl phthalate	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Caprolactam	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Carbazole	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Chrysene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Dibenz(a,h) anthracene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Dibenzofuran	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Diethyl phthalate	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Dimethyl phthalate	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Di-n-butyl phthalate	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Di-n-octyl phthalate	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Fluoranthene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Fluorene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Hexachlorobenzene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Hexachlorobutadiene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Hexachlorocyclopentadiene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Hexachloroehane	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Indeno(1,2,3-cd) pyrene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Isophorone	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Naphthalene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Nitrobenzene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
N-nitrosodimethylamine	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
N-nitrosodi-n-propylamine	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
N-nitrosodiphenylamine	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Pentachlorophenol	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Phenanthrene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Phenol	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Pyrene	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
Pyridine	----------	EPA 8270C/8270D	EPA 8270C/8270D	EPA 8270C/8270D
1-Methylnaphthalene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM
2-Methylnaphthalene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM
Acenaphthene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM
Acenaphthylene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM
Anthracene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM
Benzo(a)anthracene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM
Benzo(a)pyrene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM

			Solid Hazardous Waste	
Parameter/Analyte	Potable Water	Non-potable Water	Aqueous	Solid/Chemical
Benzo(b)fluoranthene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM
Benzo(b+k)fluoranthene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM
Benzo(g,h,I)perylene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM
Benzo(k)fluoranthene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM
Chrysene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM
Dibenzo(a,h)anthracene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM
Fluoranthene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM
Fluorene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM
Indeno(1,2,3-cd) pyrene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM
Naphthalene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM /8270D SIM	EPA 8270C SIM/8270D SIM
Phenanthrene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM
Pyrene	----------	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM	EPA 8270C SIM/8270D SIM
Dioxins/Furans				
1,2,3,4,6,7,8,9-OCDD	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
1,2,3,4,6,7,8,9-OCDF	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
1,2,3,4,6,7,8-Hpcdd	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
1,2,3,4,6,7,8-Hpcdf	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
1,2,3,4,7,8,9-Hpcdf	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
1,2,3,4,7,8-Hxcdd	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
1,2,3,4,7,8-Hxcdf	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
1,2,3,6,7,8-Hxcdd	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
1,2,3,6,7,8-Hxcdf	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
1,2,3,7,8,9-Hxcdd	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
1,2,3,7,8,9-Hxcdf	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
1,2,3,7,8-Pecdd	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
1,2,3,7,8-Pecdf	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
2,3,4,6,7,8-Hxcdf	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
2,3,4,7,8-Pecdf	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
2,3,7,8-TCDD	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
2,3,7,8-TCDF	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
Hpcdd, total	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
Hpcdf, total	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
Hxcdd, total	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
Hxcdf, total	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A

			Solid Hazardous Waste	
Parameter/Analyte	Potable Water	Non-potable Water	Aqueous	Solid/Chemical
PCDD + PCDF, total	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
PCDD, total	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
PCDF, total	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
Pecdd, total	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
Pecdf, total	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
TCDD, total	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
TCDF, total	----------	EPA 8290/8290A	EPA 8290/8290A	EPA 8290/8290A
Carbamates/Energetics				
Aldicarb	----------	EPA 8321A	EPA 8321A	EPA 8321A
Ammonium Picrate	----------	EPA 8321A	EPA 8321A	EPA 8321A
Barban	----------	EPA 8321A	EPA 8321A	EPA 8321A
Baygon (Propoxur)	----------	EPA 8321A	EPA 8321A	EPA 8321A
Bromacil	----------	EPA 8321A	EPA 8321A	EPA 8321A
Carbaryl	----------	EPA 8321A	EPA 8321A	EPA 8321A
Carbofuran	----------	EPA 8321A	EPA 8321A	EPA 8321A
Chloroxuron	----------	EPA 8321A	EPA 8321A	EPA 8321A
Diuron	----------	EPA 8321A	EPA 8321A	EPA 8321A
Linuron	----------	EPA 8321A	EPA 8321A	EPA 8321A
Methiocarb	----------	EPA 8321A	EPA 8321A	EPA 8321A
Methomyl	----------	EPA 8321A	EPA 8321A	EPA 8321A
Oxamyl	----------	EPA 8321A	EPA 8321A	EPA 8321A
Picric Acid	----------	EPA 8321A	EPA 8321A	EPA 8321A
Propham	----------	EPA 8321A	EPA 8321A	EPA 8321A
Siduron	----------	EPA 8321A	EPA 8321A	EPA 8321A
Nitroguanidine	----------	EPA 8321A	EPA 8321A	EPA 8321A
Guanidine Nitrate	----------	EPA 8321A	EPA 8321A	EPA 8321A
Perchlorate	----------	EPA 6850	EPA 6850	EPA 6850
1,3,5-Trinitrobenzene	----------	EPA 8330A/8330B	EPA 8330A/8330B	EPA 8330A/8330B
1,3-Dinitrobenzene	----------	EPA 8330A/8330B	EPA 8330A/8330B	EPA 8330A/8330B
2,4,6-Trinitrotoluene	----------	EPA 8330A/8330B	EPA 8330A/8330B	EPA 8330A/8330B
2,4-Dinitrotoluene	----------	EPA 8330A/8330B	EPA 8330A/8330B	EPA 8330A/8330B
2,6-Dinitrotoluene	----------	EPA 8330A/8330B	EPA 8330A/8330B	EPA 8330A/8330B
2-Amino-4,6-dinitrotoluene	----------	EPA 8330A/8330B	EPA 8330A/8330B	EPA 8330A/8330B
2-Nitrotoluene	----------	EPA 8330A/8330B	EPA 8330A/8330B	EPA 8330A/8330B
3-Nitrotoluene	----------	EPA 8330A/8330B	EPA 8330A/8330B	EPA 8330A/8330B
4-Amino-2,6-dinitrotoluene	----------	EPA 8330A/8330B	EPA 8330A/8330B	EPA 8330A/8330B
4-Nitrotoluene	----------	EPA 8330A/8330B	EPA 8330A/8330B	EPA 8330A/8330B
HMX (Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine)	----------	EPA 8330A/8330B	EPA 8330A/8330B	EPA 8330A/8330B
Nitrobenzene	----------	EPA 8330A/8330B	EPA 8330A/8330B	EPA 8330A/8330B
Nitroglycerin	----------	EPA 8330A/8330B	EPA 8330A/8330B	EPA 8330A/8330B
Pentaerythritoltetranitrate (PETN)	----------	EPA 8330A/8330B	EPA 8330A/8330B	EPA 8330A/8330B
RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)	----------	EPA 8330A/8330B	EPA 8330A/8330B	EPA 8330A/8330B
Tetryl (Methyl-2,4,6-trinitrophenylnitramine)	----------	EPA 8330A/8330B	EPA 8330A/8330B	EPA 8330A/8330B
3,5-Dinitroaniline	----------	EPA 8330A/8330B	EPA 8330A/8330B	EPA 8330A/8330B

			Solid Hazardous Waste	
Parameter/Analyte	Potable Water	Non-potable Water	Aqueous	Solid/Chemical
Inorganics				
Ignitability	----------	----------	EPA 1030	EPA 1030
pH / Corrosivity	----------	EPA 9040C	----------	----------
pH / Corrosivity	----------	----------	EPA 9045C/D	EPA 9045C/D
Chromium VI	EPA 218.6/ 218.7	EPA 218.6/218.7	----------	----------
Chromium VI	----------	EPA 7199	EPA 7199	EPA 7199
Chromium VI	----------	EPA 7196A	EPA 7196A	EPA 7196A
Bromide	EPA 300.0	EPA 300.0	EPA 300.0	EPA 300.0
Chloride	EPA 300.0	EPA 300.0	EPA 300.0	EPA 300.0
Fluoride	EPA 300.0	EPA 300.0	EPA 300.0	EPA 300.0
Nitrate as N	EPA 300.0	EPA 300.0	EPA 300.0	EPA 300.0
Nitrite + Nitrate as N	EPA 300.0	EPA 300.0	EPA 300.0	EPA 300.0
Nitrite as N	EPA 300.0	EPA 300.0	EPA 300.0	EPA 300.0
Orthophosphate as P	EPA 300.0	EPA 300.0	EPA 300.0	EPA 300.0
Phosphate and Orthophosphate - as P	EPA 300.0	EPA 300.0	EPA 300.0	EPA 300.0
Sulfate	EPA 300.0	EPA 300.0	EPA 300.0	EPA 300.0
Bromide	----------	EPA 9056/9056A	EPA 9056/9056A	EPA 9056/9056A
Chloride	----------	EPA 9056/9056A	EPA 9056/9056A	EPA 9056/9056A
Fluoride	----------	EPA 9056/9056A	EPA 9056/9056A	EPA 9056/9056A
Nitrate as N (NO3- as N)	----------	EPA 9056/9056A	EPA 9056/9056A	EPA 9056/9056A
Nitrite + Nitrate as N	----------	EPA 9056/9056A	EPA 9056/9056A	EPA 9056/9056A
Nitrite as N	----------	EPA 9056/9056A	EPA 9056/9056A	EPA 9056/9056A
Sulfate	----------	EPA 9056/9056A	EPA 9056/9056A	EPA 9056/9056A
Phosphate and Orthophosphate - as P	----------	EPA 9056/9056A	EPA 9056/9056A	EPA 9056/9056A
Phosphate / Orthophosphate / Total Phosphorus	SM 4500 PE	SM 4500 PE	SM 4500 PE	SM 4500 PE
Cyanide, total and Amenable	----------	EPA 9010C & 9014	EPA 9010C & 9015	EPA 9010C & 9015
Cyanide, total and Amenable	SM 4500CN B,C,E,G	SM 4500CN B,C,E,G	SM 4500CN B,C,E,G	SM 4500CN B,C,E,G
Ammonia as N	EPA 350.1	EPA 350.1	EPA 350.1	EPA 350.1
Total Kheldahl Nitrogen	EPA 351.2	EPA 351.2	EPA 351.2	EPA 351.2
Nitrate as N	EPA 353.2	EPA 353.2	EPA 353.2	EPA 353.2
Nitriate + Nitrate as N	EPA 353.2	EPA 353.2	EPA 353.2	EPA 353.2
Nitrite as N	EPA 353.2	EPA 353.2	EPA 353.2	EPA 353.2
Nitrocellulose	EPA 353.2mod	EPA 353.2mod	EPA 353.2mod	EPA 353.2mod
Bicarbonate	SM 2320B	SM 2320B	SM 2320B	SM 2320B
Carbonate	SM 2320B	SM 2320B	SM 2320B	SM 2320B
Hydroxide	SM 2320B	SM 2320B	SM 2320B	SM 2320B
Total Alkalinity (CaCO3)	SM 2320B	SM 2320B	SM 2320B	SM 2320B
Specific conductance, Conductivity (25C)	SM 2510B	SM 2510B	SM 2510B	SM 2510B
Total Dissolved Solids (TDS)	EPA 160.1	EPA 160.1	EPA 160.1	EPA 160.1
Total Dissolved Solids (TDS)	----------	SM 2540C	SM 2540C	SM 2540C

			Solid Hazardous Waste	
Parameter/Analyte	Potable Water	Non-potable Water	Aqueous	Solid/Chemical
Non-Filterable Residue (TSS)	----------	SM 2540D	SM 2540D	SM 2540D
Ferrous Iron	SM 3500-Fe Bc	SM 3500-Fe Bc	SM 3500-Fe Bc	SM 3500-Fe Bc
Sulphide	SM 4500-S2F	SM 4500-S2F	SM 4500-S2F	SM 4500-S2F
Oil & Grease	SM 5520B	SM 5520B	SM 5520B	SM 5520B
TPH (Gravimetric)	SM 5520BF	SM 5520BF	SM 5520BF	SM 5520BF
n-Hexane Extractable Material (O&G)	----------	EPA 1664A	EPA 1664A	EPA 1664A
TPH (SGT-HEM)	----------	EPA 1664A	EPA 1664A	EPA 1664A
Total Organic Carbon (TOC)	----------	----------	WALKLEY-BLACK	WALKLEY-BLACK
Sample Preparation				
TCLP Extraction	----------	----------	EPA 1311	EPA 1311
SPLP Extraction	----------	----------	EPA 1312	EPA 1312
Acid digestion for metals analysis	----------	EPA 3010A	EPA 3010A	----------
Microwave assisted acid digestion for metals analysis	----------	EPA 3015A	EPA 3015A	----------
Acid digestion for metals analysis	----------	----------	EPA 3050B	EPA 3050B
Microwave assisted acid digestion for metals analysis	----------	----------	EPA 3051A	EPA 3051A
Alkaline digestion for hexavalent chromium	----------	----------	EPA 3060A	EPA 3060A
Separatory funnel extraction	----------	EPA 3510C	EPA 3510C	----------
Liquid-Liquid extraction	----------	EPA 3520C	EPA 3520C	----------
Soxhlet extraction	----------	----------	EPA 3540C	EPA 3540C
SPE extraction for explosives	----------	EPA 3535A	EPA 3535A	----------
Ultrasonic extraction	----------	----------	EPA 3550B	EPA 3550B
Silica gel cleanup	----------	EPA 3630C	EPA 3630C	EPA 3630C
Sulfuric acid cleanup	----------	EPA 3660B	EPA 3660B	EPA 3660B
Sulfuric acid - Permanganate cleanup	----------	EPA 3665A	EPA 3665A	EPA 3665A
Purge and trap	----------	EPA 5030B/5030C	EPA 5030B/5030C	EPA 5030B/5030C
Closed-system purge and trap extraction	----------	EPA 5035/5035A	EPA 5035/5035A	EPA 5035/5035A
Mercury digestion	EPA 245.1	EPA 7470A	EPA 7470A	EPA 7470A
Mercury digestion	----------	EPA 7471A/7470B	EPA 7471A/7470B	EPA 7471A/7470B
Herbicide extraction	----------	EPA 8151A	EPA 8151A	EPA 8151A
Incremental sampling	----------	----------	EPA 8330B, Appendix A	EPA 8330B, Appendix A

			Solid Hazardous Waste	
Parameter/Analyte	Potable Water	Non-potable Water	Aqueous	Solid/Chemical
Waste Extraction test (WET) (STLC)	----------	----------	CCR Chapter 11, Article 5, Appendix II	CCR Chapter 11, Article 5, Appendix II

Accredited Laboratory

A2LA has accredited

AGRICULTURE & PRIORITY POLLUTANTS LABORATORIES, INC. (APPL, INC.)

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for technical competence in the field of

Environmental Testing

In recognition of the successful completion of the A2LA evaluation process that includes an assessment of the laboratory's compliance with ISO/IEC 17025:2005, the 2009 TNI Environmental Testing Laboratory Standard, and the requirements of the Department of Defense Environmental Laboratory Accreditation Program (DoD ELAP) as detailed in version 5.0 of the DoD Quality System Manual for Environmental Laboratories (QSM), accreditation is granted to this laboratory to perform recognized EPA methods as defined on the associated A2LA Environmental Scope of Accreditation. This accreditation demonstrates technical competence for this defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009).

AMERICAN ASSOCIATION FOR LABORATORY ACCREDITATION
CORPORATE SEAL 1978
DISTRICT OF COLUMBIA
A2LA

Presented this 3rd day of March 2016.

Senior Director of Quality and Communications
For the Accreditation Council
Certificate Number 4064.01
Valid to June 30, 2017

For the tests to which this accreditation applies, please refer to the laboratory's Environmental Scope of Accreditation.

5+mse018IS, rev 5 IS Soil Explosive Extraction 10-5-15 cc21

Standard Operating Procedure

Mechanical Shaker Extraction for Solid Explosive Samples using Incremental sampling (IS) techniques
EPA METHOD 8330B

STATEMENT OF PURPOSE

The purpose of this SOP is to describe the procedure for the extraction of solid samples that are to be analyzed for explosives by EPA 8330B using the DoD QSM guidelines. The IS procedures listed in this SOP may also be apply to client specific projects for SVOCs and Metals analysis.

INSTRUCTIONS

1.0 Scope and Application

This SOP applies to all personnel involved in the mechanical shaker extraction of explosives in solid samples using IS procedures from EPA method 8330B, Appendix A, IS (Incremental Sampling).

2.0 Method Summary

2.1 Soil samples are dried to a constant weight, sieved, ground using a mechanical grinder (for firing ranges) or mortar and pestle (for ammunitions depots), incrementally sampled and extracted by mechanical shaker with Acetonitrile solvent.

2.1.1 The client should advise whether mechanical grinding is required for the project, depending on the type of site.

2.2 The samples are prepared for injection on HPLC instrumentation by filtering through an Acrodisc PSF GHP 0.2 um. They may also be centrifuged if necessary.

3.0 Detection Limits - NA

4.0 Definitions

4.1 Batch - Environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A preparation batch is composed of one to 20 environmental samples of the same NELAC-defined matrix, meeting the above-mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be 24 hours. An analytical batch is composed of prepared environmental samples (extracts, digestates or concentrates) which are analyzed together as a group. An analytical batch can include prepared samples originating from various environmental matrices and can exceed 20 samples. (NELAC Quality Systems Committee)

4.2 Calibration standard - A solution prepared from the primary dilution standard solution or stock standard solution and the internal standards and surrogate analytes. The calibration solutions are used to calibrate the instrument response with respect to analyte concentration.

4.3 Field Reagent Blank - An aliquot of reagent water or other blank matrix that is placed in a sample container in the laboratory and treated as a sample in all respects, including shipment to the sampling site, exposure to sampling site conditions, storage, preservation, and all analytical procedures. The purpose of the

FRB is to determine if method analytes or other interferences are present in the field environment.

4.4 Instrument Performance Check (IPC) - A solution of one or more compounds (analytes, surrogate, internal standard, or other test compounds) used to evaluate the performance of the instrument system with respect to a defined set of method criteria.

4.5 Laboratory control spike (LCS) - An aliquot of reagent water or other matrix to which known quantities of the method analytes are added in the laboratory. The LCS is analyzed exactly like a sample, and its purpose is to determine whether the methodology is in control, and whether the laboratory is capable of making accurate and precise measurements.

4.6 Laboratory Reagent Blank - An aliquot of reagent water or other blank matrix that is treated exactly as a sample including exposure to all glassware, equipment, solvents, reagents, internal standards, and surrogates that are used with other samples. The LRB is used to determine if method analytes or other interferences are present in the laboratory environment, the reagents, or the apparatus.

4.7 Limit of Detection (LOD) - An estimate of the minimum amount of a substance that an analytical process can reliably detect. An LOD is analyte- and matrix-specific and may be laboratory-dependent. The smallest amount or concentration of a substance that must be present in a sample in order to be detected at a high level of confidence (99%).

4.8 Limit of Quantitation (LOQ) - The minimum levels, concentrations, or quantities of a target analyte that can be reported with a specified degree of confidence. The lowest concentration that produces a quantitative result within specified limits of precision and bias. For DoD projects, the LOQ shall be set at or above the concentration of the lowest initial calibration standard. This also equates with the term Practical Quantitation Limit (PQL).

4.9 Matrix - A surrounding substance within which something originates, develops, or is contained, such as: drinking water, saline/estuarine water, aqueous substance other than drinking water or saline/estuarine water, non-aqueous liquid, biological tissue, solids, soils, chemical waste, and air.

4.10 Matrix duplicate (DUP) - Two aliquots of the same sample taken in the laboratory and analyzed separately with identical procedures. Analysis of a matrix sample and matrix sample duplicate, indicates precision associated with laboratory procedures, but not with sample collection, preservation, or storage procedures.

4.11 Matrix spike (MS) - An aliquot of an environmental sample to which known quantities of the method analytes are added in the laboratory. The matrix spike is analyzed exactly like a sample, and its purpose is to determine whether the sample matrix contributes bias to the analytical results. The background concentrations of the analytes in the sample matrix must be determined in a separate aliquot and the measured values in the matrix spike corrected for background concentrations.

4.12 Matrix spike duplicate (MSD) - Two aliquots of the same sample taken in the laboratory and analyzed separately with identical procedures. Analysis of a matrix spike and matrix spike duplicate, indicates precision associated with laboratory procedures, but not with sample collection, preservation, or storage procedures.

4.13 Method blank - An aliquot of reagent water or other blank matrix that is treated exactly as a sample including exposure to all glassware, equipment, solvents, reagents, internal standards, and surrogates that are used with other samples. The

method blank is used to determine if method analytes or other interferences are present in the laboratory environment, the reagents, or the apparatus.

4.14 Method detection limit (MDL) - The minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero, as determined from analysis of a sample containing the analyte in a given matrix, as described in 40 CFR Part 136, Appendix B, 1 July 1995 edition.

4.15 Practical quantitation limit (PQL) - The lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. The practical quantitation limit is generally three to ten times greater than the method detection limit.

4.16 Primary Dilution Standard - A solution of several analytes prepared in the laboratory from stock solution and diluted as needed to prepare calibrations solutions and other needed analyte solutions.

4.17 Quality Control Sample (QCS) - A solution of method analytes of known concentrations which is used to fortify an aliquot of LCS or sample matrix. The QCS is obtained from a source external to the laboratory and different from the source of calibration standards. It is used to check laboratory performance with externally prepared test materials.

4.18 Stock Standard Solution - A concentrated solution containing one or more method analytes prepared in the laboratory using assayed reference materials purchased from a reputable commercial source.

5.0 Interferences and Potential Problems

Special care must be taken in the handling of explosive samples. DO NOT CONCENTRATE the final extract using a heated water bath, due to the unstable nature of explosive compounds. THEY MAY DETONATE! For safety reasons, sample extracts must be stored in a refrigerator until instrument analysis. If extracts require concentration, a six-port nitrogen gas manifold may be used for gentle solvent blowdown.

6.0 Health and Safety

DO NOT CONCENTRATE the final extract using a heated water bath, due to the unstable nature of explosive compounds. THEY MAY DETONATE! For safety reasons, sample extracts must be stored in a refrigerator until instrument analysis. If extracts require concentration, a six-port nitrogen gas manifold may be used for gentle solvent blowdown.

7.0 Sample Preservation, Containers, Handling and Storage

A pre-cleaned plastic bag with zipper seal (for incremental sampling) may be used as the sample container for explosive analysis. Sample containers must be stored at or below 4° and handled carefully, due to the potential for detonation at high sample concentrations. If samples do not arrive to the laboratory chilled on ice, then it is not necessary to store them in the refrigerator. In such cases the client has determined it more beneficial to keep the sample at ambient temperatures to reduce condensation issues within the sample bag.

8.0 Quality Control

8.1 One method blank, one lab control spike and a set of matrix spikes must accompany each set of twenty samples (or fewer). If the client has not provided sufficient sample volume to perform MS/SMD, then a single LCS is sufficient. When mechanical grinding is employed, the method blank should be ground after at least one sample has been ground.

8.2 Puck Mill grinder verification: Use a mechanical Puck mill grinder to grind 500g sand to particle size <75um in diameter and passing the ground sand through a #60, 200 mesh sieve.) Document in the mechanical grinder logbook.

9.0 Equipment/Apparatus

9.1 Mechanical extraction shaker
9.2 2.5oz jars
9.3 8mL screw-cap vials
9.4 2mL injection vials
9.5 Laboratory Centrifuge
9.6 Mechanical ring-puck grinding mill
9.7 1000 gram grinder bowls with puck and lid
9.8 Soil Sieves (brass) – 2mm (#10 mesh)
9.9 Soil drying racks and trays
9.10 20mL volumetric pipettes
9.11 Silica sand
9.12 Variable-volume pipettors with tips
9.13 Laboratory Analytical Balance
9.14 Laboratory Balance (capacity ~ 15kg)
9.15 Laboratory Hood
9.16 Hepa-filter Vacuum
9.17 Flat/Spoon Stainless Steel spatulas
9.18 Ceramic mortar and pestles

10.0 Reagents and Standards

Reagent grade chemicals are used in all tests. Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the analysis. All reagents used are traceable at all steps of the procedure. Reference standards must be calibrated by a body that can provide ILAC-signatory (MRA) traceability.

10.1 Acetonitrile Burdick and Jackson HPLC Grade Cat# AH015-4.
10.2 Millipore Water from the Laboratory Source.

11.0 Calibration and Standardization - NA

12.0 Procedure

Sample Drying to a Constant Weight:

12.1 Place the entire contents of the client's plastic bag sample container onto a baker's tray labeled with the sample number and lined with aluminum foil.

12.2 If the client requires "wet" Incremental Sampling (prior to sample drying) for such analyses as metals or SVOCs, then a portion of the sample may be removed before the soil is put onto the drying tray. This step is not necessary if the client sends multiple containers for "wet" and "dry" IS techniques. If only one container is sent, then thoroughly homogenize the wet soil with a gloved hand prior to removing a portion before drying. The remaining soil for 8330B explosives or other "dry" IS techniques may then be placed on the drying tray.

12.3 If the client requires Metals or SVOC analysis and does not want the sample to be ground prior to IS, then place a colored sticker containing the letters "NG" (for no grind) on the tray to indicate that the sample should not be ground (due to the

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contribution of metals from the grinder bowl and potential breakdown of SVOCs during grinding).

12.3.1.1 The proper sticker placement on the tray will be verified by a supervisor or his/her designee who dates and initials the "I.S. Preparation Log Book". Verification will be based on the Extraction Backlog and whether or not IS Labworks codes are listed. It is also a good idea to verify the requirements for a particular project with the project manager prior to drying samples.

12.4 Use a gloved hand to break apart large soil agglomerates. Turn the plastic bag inside out and place on top of the tray to dry along with the sample.

12.5 Record the date / time and the weight of the tray plus sample in the "I.S. Preparation Log Book". Dry the sample trays using a baker's stackable rack at room temperature to a "constant weight" as described below: The room temperature should not exceed 22°C +/- 6°C. The daily room temperature is electronically recorded. If temperature criteria are exceeded, then the client should be notified in order to decide whether new aliquots of samples must be sent to the laboratory from the client.

12.6 The following morning visually examine the soil. If the soil appears to contain moisture then break up any soil clumps with a gloved hand and visually examine the soil again later. If not then weigh the tray containing the sample and record the weight, date and time in the "I.S. Prep Log", and place the trays back in the rack. After approximately one to three hours reweigh the tray and record the weight, date and time again.

12.7 If the weight is consistent with the previous weighing (within +/- 3%), then this step is complete. The technician should visually inspect the soil for dryness by using a gloved hand to break apart some of the soil clumps, making sure the soil within is dry and that the soil at the bottom of the tray is dry. Extra care must be taken for clay-like samples that tend to retain moisture by breaking up the soil clumps to ensure complete dryness. If the weight is still not constant, then place the sample trays back in the rack for additional drying and subsequent weighing until a constant weight is achieved before proceeding to the next step. Soil with residual moisture will not grind sufficiently, and soil clumping may be observed.

12.8 A tray containing blank commercial ground silica sand is placed on the baker's rack at all times while samples are being dried. This sand is to be used for method blanks (and LCS's) and will help monitor the presence of potential laboratory contaminants during the drying step. Since the sand is commercially ground it is not passed through the sieve.

NOTE: Explosive materials may appear as gray lumps in the soil sample. TNT-based explosives that have been exposed to sunlight may appear as reddish-orange lumps. The soil should be examined for such materials, since mechanical grinding is not recommended for pure explosive pieces, as they may detonate. Remove these particles and place in a Ziplock bag labeled with the sample ID and the following statement - "Hazardous-Potential Explosive"

Sample Sieving and Grinding:

12.9 Pass the entire dried sample through a metal 2mm (#10 mesh) screen sieve to eliminate coarse rocks, sticks and leaves. Fine vegetation (such as mosses or grass) should be physically shredded during sieving by applying pressure with a gloved hand to press the fine vegetation through the screen. (Some clients may request gross vegetation to be removed prior to sieving.) Do not intentionally include vegetation in

the portion of the sample that passes through the sieve, unless required by a specific project.

12.10 Examine the "non-passing" portion of the sample. Hard dirt clods should be manually ground using a ceramic mortar and pestle, in order to insure passage through the sieve. Repeat sieving and manual grinding of the non-passing portion until only material that cannot be manually ground remains (such as rocks or metal fragments).

12.11 Place the non-passing sample portion onto a clean tared zippered plastic bag on top of a balance. Record the passing and non-passing weights in IS log book. If the client requests, take a picture of the pass and non-passing together on the original tray showing the sample number sticker. Reserve the passing portion on the original tray for mechanical grinding.

12.12 Wipe down the tabletop with soap and water after processing samples. Wash the sieve in between each sample with soap and water and rinse with acetone. Allow the sieves to dry thoroughly, especially at the seal between the screen and the metal cylinder.

12.13 For sample analyses that do not require mechanical grinding, such as metals, PAH, perchlorate etc., proceed to the Incremental Sampling section 7.3 of this SOP. For samples that do require mechanical grinding, proceed to the next step.

12.14 Prior to grinding, use the last column in the "I.S. Prep Log Book" to document, date and initial that the samples have been incrementally sampled for metals and other analyses that do not require grinding.

12.15 Transfer the sieved soil portion into a metal grinder bowl. Place the puck on top of the soil and place the lid on top of the bowl. Use a mechanical Puck mill grinder to grind the entire sample to particle size <75um in diameter. (As was initially demonstrated by passing approximately 500g of ground sand through a #60, 200mesh sieve.) Depending on the amount of sample, several grindings may be required, since the grinding bowl may only hold up to 1000g at a time.

12.16 Use a single 90second grind cycle to pulverize the sample, unless the client requests a special 60 second grind cycle that is repeated five times (with a 2 min cool down period between grinds).

12.17 If the sample has been split into two or more bowls, then combine the portions back together into a labeled clean zippered plastic bag and thoroughly mix before incremental sampling. Place the contents of the bag back onto the tray before incremental sampling. If the client requests, take a digital photo of the ground sample and save to the "IS Photos" subdirectory sorted by ARF number and located on the shared documents T:\ drive.

12.18 In the mechanical grinder log book, record the sample ID, date, analyst initials, grind cycle time and serial number of the grinder bowl used to process each sample.

12.19 The lab technician should wear a lab coat, gloves and safety goggles for the grinding process. Due to the potential lead particles from ballistic material in the samples, the handling of finely ground soil samples exposed to open air should be done in the fume hood as much as possible (i.e.: transferring samples from bowl to tray, cleaning the bowls and incremental sampling).

12.20 Thoroughly clean the grinder bowl, puck and lid in between each sample with warm soapy water and rinse with clean water and then acetone. The Teflon lid seal should be removed with a small spatula and cleaned separately.

12.21 Grind clean commercial silica sand for the method blank and lab control spike with each batch of 20 field samples. The blank should be ground after at least one field sample has been ground.

12.22 The DoD QSM requires a composite grinder blank, in which silica sand can be ground in between each sample for version 4.2 and once after every 10 samples and at the end of the batch for version 5.0. Each grinder blank can be analyzed individually or composited, and will be analyzed according to SOP HPL8330B. The method blank will consist of a composite sample from all the grinder blanks performed for a given extraction batch. The analyst should change gloves in between processing each sample, in order to reduce cross contamination. The technician should ask the project manager regarding the grinder blank requirement for each particular project.

12.23 The DoD QSM requires a proficiency test sample (PT sample) to be analyzed as a LCS. The PT sample is ground with each analytical batch of 20 or less field samples. The PT sample is prepared in exactly the same manner as a field sample (e.g. sieved, ground and sub-sampled). The technician should ask the project manager regarding the PT sample requirement for each particular project.

Incremental Sampling (IS)

12.24 In a fume hood, spread the pulverized sample (from the grinder bowl) onto the original foil (or plastic bag)-lined drying tray to a depth of approximately 1-2 cm. For samples where multiple bowls are used to grind a sample, thoroughly mix the portions from each bowl on the tray before incrementally sampling. Use the flat end of a flat/spoon stainless steel spatula to scoop appropriate amount of soil from 30 random areas to reach the total needed for the analyses to be performed. For example, for the method 8270B take approximately 1g of soil from 30 random locations throughout the tray. Place it into a tared jar for a total weight of at least 30g. If the sample weight is above the amount needed, do not remove soil from the jar and put it back onto the tray. Record the exact weight to the nearest 0.01 grams on the extraction sheet. Continue this process for each analysis needed.

12.25 Matrix spike / Matrix Spike Duplicate and Sample Triplicate analysis are required by the DoD for each analytical batch. The technician should ask the project manager regarding the MS/MSD and Triplicate analysis for each particular project.

12.25.1 For samples requiring MS/MSD, perform MIS procedures once for the parent sample and then two subsequent times for the MS and the MSD, for a total of 3 jars to be extracted.

12.25.2 For samples requiring Triplicate analysis, perform MIS procedures for the designated sample three times for a total of 3 jars to be extracted.

12.26 For samples needing IS without mechanical grinding (such as SVOCs or Metals), spread the sieved “passing” portion of the sample on a clean labeled tray and perform the IS procedures listed above. For metals samples, IS at least 2.5 grams of sample. For SVOC samples, IS at least 30 grams of sample. Sample triplicates and matrix spikes are IS’d in separate jars.

12.27 After subsampling is complete, the remaining soil from the tray may be placed back into the original client’s plastic bag sample container and stored at the temperature appropriate for the analyses required, along with the “non-passing” portion of the soil. When IS is complete the sample is checked back into the COC database into an IS box# and put in receiving. After samples have been IS’d, the metals and extraction department will initial the IS log book. The EPA 8330B method does not require the dried, pulverized portion of the soil to be stored under refrigeration. Clean the fume hood in between each sample by using a Hepa-filter vacuum to remove soil particles. The analyst should change gloves in between processing each sample, in order to reduce cross contamination.

Sample Extraction

12.28 One method blank and one LCS are prepared with every analytical batch of 20 samples, using silica sand. The LCS is spiked after sieving and grinding. The blank and LCS are taken through the exact sample procedures as the samples, including sieving, grinding, incremental sampling and extraction. The method blank should be processed through the mechanical grinder after at least one sample has been processed.

12.29 One triplicate sample will be prepared with each analytical batch of 20 samples from a parent designated by the laboratory or the client. The triplicate sample may not be taken from any type of blank sample. One of the client's sample matrices is chosen by either the client or the laboratory for the triplicate. Check with the project manager to make sure that the client is aware of the triplicate requirement.

12.30 Spike soils with appropriate analytes and surrogates. One LCS and MS/MSD is required per analytical batch of 20 samples. If the client has not designated an MS/MSD on the COC, then check with the project manager before designating an MS/MSD in the laboratory.

12.31 Add 60 µL of the 8330 Soil Surrogate (See SOP HPL002 Standard and Spike Prep) to the prepared jars for the Blank and all field samples.

12.32 Add 200 µL of the 8330 Soil Spike (See SOP HPL002 Standard and Spike Prep) to the prepared jars for the LCS and MS/MSD.

12.33 One PT sample is required by the DoD QSM with every extraction batch. Depending on the client's project, the PT sample may not be requested by the client. It is the client's responsibility to obtain a variance for the PT sample. APPL personnel should check with the project manager before extraction. The PT soil sample already contains the analytes of interest from the supplier, so only the surrogate is added prior to extraction (but after sieving, grinding and Incremental Sampling (IS)).

12.34 Add 20mL Acetonitrile to each jar containing the spiked /surrogated soil. Place jars on a mechanical shaker for at least 18 hours.

12.35 Allow the extracts to settle for 30minutes and remove approximately 8mL of the extract and transfer to 8mL Teflon-screw-cap glass vials.

12.36 Store the samples in a refrigerator between 2℃ and 6℃. The original extract in the 2.5oz jar may be stored at room temperature until disposal.

12.37 Samples are be filtered through a 0.2-µm syringe filter (PALL GHP or equivalent) using a disposable PTFE syringe. All samples and QC in a batch should be filtered if any one of the samples is filtered.

12.38 Using a variable-volume pipettor, remove a portion of the final extract and combine with 3 parts of millipore water in an injection vial. Store under refrigeration until HPLC analysis.

13.0 Data Analysis and Calculations - NA

14.0 Data Assessment and Acceptance Criteria for QC - NA

15.0 Corrective Actions and Contingencies for Out of Control Data or Unacceptable Data - NA

16.0 Method deviations

APPL Inc. will filter the extracts to remove suspended soil particles rather than centrifuge the extracts, as suggested in the EPA method 8330B.

17.0 Pollution Prevention

All hazardous materials that are generated during the testing of samples must be properly collected and stored. Drums are available in the storage room for the following types of wastes- acidic, basic and solvents.

18.0 Waste Management

It is the laboratory's responsibility to comply with all federal, state, and local regulations governing waste management, particularly the hazardous waste identification rules and land disposal restrictions. The laboratory has the responsibility to protect the environment by minimizing and controlling all releases from fume hoods and bench operations.

19.0 Method Performance - NA

20.0 Equipment/Instrument Maintenance and Troubleshooting - NA

21.0 Computer hardware and software - NA

22.0 References

22.1 EPA Method 8330B, Revision 1, Oct 2006 "Nitroaromatics, Nitramines and Nitrate Esters by HPLC"

22.2 DoD QSM v. 5.0, July 2013

22.3 DoD QSM v. 4.2, October 2010

22.4 Guidance for Obtaining Representative Laboratory Analytical Subsamples from Particulate Laboratory Samples (EPA No. EPA/600/R-03/027 November 2003) Section 4

22.5 Technical Guidance Manual (TGM) for the Implementation of the Hawai'i State Contingency Plan Interim Final, Section 4.2 Multi-increment Sample Collection (DOH 2009).

22.6 ISO/IEC 17025:2005(E)

23.0 Any tables, diagrams, flowcharts, validation data

Diagram 1: Incremental Sampling Preparation LogBook.

SALUTATION

This procedure is applicable to all personnel who extract explosives from solid samples using the orbital shaker for EPA 8330B and the IS techniques described in EPA 8330B, Appendix A and DoD QSM.

Section Manager Name: Paula Young

Paula Young

Section Manager Signature: _____ Date: 10/5/15

QAU Director Name: Frances Lediaev

Frances Lediaev

QAU Director Signature: _____ Date: 105/15

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Diagram 1

Incremental Sampling Preparation Log Book # 1 Page #_____

ARF # / Project	Sample #	1st Weight *	2nd Weight *	3rd Weight *	4th Weight * (If Needed)	Passing Sample (weight of foil negligible)	Tarred Container + Non-passing Sample	I.S. before grind (Initial Box when Complete)
		Weight:_____g	Weight:_____g	Weight:_____g	Weight:_____g			Metals:_____
	AY_____	Date:_____	Date:_____	Date:_____	Date:_____	_____g	_____g	8270:_____
	NG sticker verified	Time:_____	Time:_____	Time:_____	Time:_____			8290:_____
	*Date/Initials*_____	Initials:_____	Initials:_____	Initials:_____	Initials:_____	Initials:_____	Initials:_____	Other:
		Weight:_____g	Weight:_____g	Weight:_____g	Weight:_____g			Metals:_____
	AY_____	Date:_____	Date:_____	Date:_____	Date:_____	_____g	_____g	8270:_____
	NG sticker verified	Time:_____	Time:_____	Time:_____	Time:_____			8290:_____
	*Date/Initials*_____	Initials:_____	Initials:_____	Initials:_____	Initials:_____	Initials:_____	Initials:_____	Other:
		Weight:_____g	Weight:_____g	Weight:_____g	Weight:_____g			Metals:_____
	AY_____	Date:_____	Date:_____	Date:_____	Date:_____	_____g	_____g	8270:_____
	NG sticker verified	Time:_____	Time:_____	Time:_____	Time:_____			8290:_____
	*Date/Initials*_____	Initials:_____	Initials:_____	Initials:_____	Initials:_____	Initials:_____	Initials:_____	Other:
		Weight:_____g	Weight:_____g	Weight:_____g	Weight:_____g			Metals:_____
	AY_____	Date:_____	Date:_____	Date:_____	Date:_____	_____g	_____g	8270:_____
	NG sticker verified	Time:_____	Time:_____	Time:_____	Time:_____			8290:_____
	*Date/Initials*_____	Initials:_____	Initials:_____	Initials:_____	Initials:_____	Initials:_____	Initials:_____	Other:
		Weight:_____g	Weight:_____g	Weight:_____g	Weight:_____g			Metals:_____
	AY_____	Date:_____	Date:_____	Date:_____	Date:_____	_____g	_____g	8270:_____
	NG sticker verified	Time:_____	Time:_____	Time:_____	Time:_____			8290:_____
	*Date/Initials*_____	Initials:_____	Initials:_____	Initials:_____	Initials:_____	Initials:_____	Initials:_____	Other:
		Weight:_____g	Weight:_____g	Weight:_____g	Weight:_____g			Metals:_____
	AY_____	Date:_____	Date:_____	Date:_____	Date:_____	_____g	_____g	8270:_____
	NG sticker verified	Time:_____	Time:_____	Time:_____	Time:_____			8290:_____
	*Date/Initials*_____	Initials:_____	Initials:_____	Initials:_____	Initials:_____	Initials:_____	Initials:_____	Other:
		Weight:_____g	Weight:_____g	Weight:_____g	Weight:_____g			Metals:_____
	AY_____	Date:_____	Date:_____	Date:_____	Date:_____	_____g	_____g	8270:_____
	NG sticker verified	Time:_____	Time:_____	Time:_____	Time:_____			8290:_____
	*Date/Initials*_____	Initials:_____	Initials:_____	Initials:_____	Initials:_____	Initials:_____	Initials:_____	Other:
		Weight:_____g	Weight:_____g	Weight:_____g	Weight:_____g			Metals:_____
	AY_____	Date:_____	Date:_____	Date:_____	Date:_____	_____g	_____g	8270:_____
	NG sticker verified	Time:_____	Time:_____	Time:_____	Time:_____			8290:_____
	*Date/Initials*_____	Initials:_____	Initials:_____	Initials:_____	Initials:_____	Initials:_____	Initials:_____	Other:

* Each recorded weight includes the foil-lined tray + the sample. **NG = No Grind** (applies to metals, PAH, Perchlorate, other methods etc.)

5+HPL8330, rev 9 6-29-16 cc1

Standard Operating Procedure

EXPLOSIVE COMPOUNDS: DIODE ARRAY DETECTOR BY HIGH PRESSURE LIQUID CHROMATOGRAPHY

STATEMENT OF PURPOSE

This procedure describes the analysis of explosive compounds in water, groundwater, hazardous wastes, and solid samples. Guidelines in EPA Method 8330A, 8330B, and the most recent version of the DoD Quality Systems Manual for Environmental Laboratories are used to guide this analytical process.

INSTRUCTIONS

1.0 Scope and Application

1.1 Method 8330A or Method 8330B is used to determine the concentration of Nitroaromatics and Nitramines by HPLC. Only method 8330A can be used to analyze samples for South Carolina.

1.2 Compound identification is supported by confirmatory analysis (secondary column). Tables 1-2 lists reporting limits for the target analytes.

1.3 If an individual project has its own QAPP with client specific requirements that are different than the SOP, the QAPP overrides the SOP.

1.4 This method is restricted to use by or under the supervision of trained analysts. Each analyst must demonstrate the ability to generate acceptable results with this method.

2.0 Method Summary

2.1 Method 8330A and Method 8330B provide high performance liquid chromatographic (HPLC) conditions for the detection of parts per billion levels of certain Nitroaromatics and Nitramines. Table 1 - 2 of this SOP lists the generic APPL reporting limits for water and soil samples. Alternatively, project-specific reporting limits may be used, if required by the client's QAPP. Lower reporting limits may be achieved by injecting a lower calibration standard or by concentrating the final extract.

2.2 Prior to use of this method, appropriate sample extraction techniques must be used. Extraction procedures for water and solid matrices are documented in: APPL SOP # MWE3535 (solid-phase extraction of routine water samples); MSE018MIS (mechanical grinding and orbital shaker extraction of soil samples using Incremental Sampling (IS)); and MSE018 (orbital shaker extraction of non-incremental samples).

2.3 A 40µl aliquot of the extract is injected into an HPLC, and Diode Array detectors to determine the presence of compounds of interest in the effluent.

2.4 If the interferences prevent proper detection of the analytes of interest, the method may also be performed on extracts that have undergone cleanup using silica gel column cleanup (Method 3620 or 3640).

2.5 Blanks, matrix spike/matrix spike duplicates and laboratory control samples are extracted at a rate of one set for every batch or one in twenty samples whichever is more frequent provided adequate volume is provided by the client.

3.0 Detection Limits

3.1 Table 1-2 list the quantitation limits (LOQ for DoD QSM) for all target analytes. If an individual project has its own QAPP with client specific requirements different to those in Tables 1-4, the client QAPP limits are used.

4.0 Definitions

4.1 Calibration standard - A solution prepared from the primary dilution standard solution or stock standard solution and the internal standards and surrogate analytes. The calibration solutions are used to calibrate the instrument response with respect to analyte concentration.

4.2 Field Reagent Blank - An aliquot if reagent water or other blank matrix that is placed in a sample container in the laboratory and treated as a sample in all respects, including shipment to the sampling site, exposure to sampling site conditions, storage, preservation, and all analytical procedures. The purpose of the FRB is to determine if method analytes or other interferences are present in the field environment.

4.3 Instrument Performance Check (IPC) - A solution of one or more compounds (analytes, surrogate, internal standard, or other test compounds) used to evaluate the performance of the instrument system with respect to a defined set of method criteria.

4.4 Laboratory control spike (LCS) - An aliquot of reagent water or other matrix to which known quantities of the method analytes are added in the laboratory. The LCS is analyzed exactly like a sample, and its purpose is to determine whether the methodology is in control, and whether the laboratory is capable of making accurate and precise measurements.

4.5 Laboratory Reagent Blank - An aliquot of reagent water or other blank matrix that is treated exactly as a sample including exposure to all glassware, equipment, solvents, reagents, internal standards, and surrogates that are used with other samples. The LRB is used to determine if method analytes or other interferences are present in the laboratory environment, the reagents, or the apparatus.

4.6 Limit of Detection (LOD) - An estimate of the minimum amount of a substance that an analytical process can reliably detect. An LOD is analyte- and matrix-specific and may be laboratory-dependent. The smallest amount or concentration of a substance that must be present in a sample in order to be detected at a high level of confidence (99%).

4.7 Limit of Quantitation (LOQ) - The minimum levels, concentrations, or quantities of a target analyte that can be reported with a specified degree of confidence. The lowest concentration that produces a quantitative result within specified limits of precision and bias. The LOQ shall be set at or above the concentration of the lowest initial calibration standard. This also equates with the term Practical Quantitation Limit (PQL).

4.8 Matrix - A surrounding substance within which something originates, develops, or is contained, such as: drinking water, saline/estuarine water, aqueous substance other than drinking water or saline/estuarine water, non-aqueous liquid, biological tissue, solids, soils, chemical waste, and air.

4.9 Matrix duplicate (DUP) - Two aliquots of the same sample taken in the laboratory and analyzed separately with identical procedures. Analysis of a matrix sample and matrix sample duplicate, indicates precision associated with laboratory procedures, but not with sample collection, preservation, or storage procedures.

4.10 Matrix spike (MS) - An aliquot of an environmental sample to which known quantities of the method analytes are added in the laboratory. The matrix spike is analyzed exactly like a sample, and its purpose is to determine whether the sample matrix contributes bias to the analytical results. The background concentrations of the analytes in the sample matrix must be determined in a separate aliquot and the measured values in the matrix spike corrected for background concentrations.

4.11 Matrix spike duplicate (MSD) - Two aliquots of the same sample taken in the laboratory and analyzed separately with identical procedures. Analysis of a matrix spike and matrix spike duplicate, indicates precision associated with laboratory procedures, but not with sample collection, preservation, or storage procedures.

4.12 Method blank - An aliquot of reagent water or other blank matrix that is treated exactly as a sample including exposure to all glassware, equipment, solvents, reagents, internal standards, and surrogates that are used with other samples. The method blank is used to determine if method analytes or other interferences are present in the laboratory environment, the reagents, or the apparatus.

4.13 Method detection limit (MDL) - The minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero, as determined from analysis of a sample containing the analyte in a given matrix, as described in 40 CFR Part 136, Appendix B, 1 July 1995 edition.

4.14 Practical quantitation limit (PQL) - The lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. The practical quantitation limit is generally three to ten times greater than the method detection limit.

4.15 Primary Dilution Standard - A solution of several analytes prepared in the laboratory from stock solution and diluted as needed to prepare calibrations solutions and other needed analyte solutions.

4.16 Quality Control Sample (QCS) - A solution of method analytes of known concentrations which is used to fortify an aliquot of LCS or sample matrix. The QCS is obtained from a source external to the laboratory and different from the source of calibration standards. It is used to check laboratory performance with externally prepared test materials.

4.17 Stock Standard Solution - A concentrated solution containing one or more method analytes prepared in the laboratory using assayed reference materials purchased from a reputable commercial source.

4.18 Surrogate - A pure analyte(s), which is extremely unlikely to be found in any sample, and which is added to a sample aliquot in known amount(s) before extraction or other processing and is measured with the same procedures used to measure other sample components. The purpose of the surrogate is to monitor method performance with each sample.

5.0 Interferences and Potential Problems

5.1 Solvents, reagents, glassware, and other sample processing hardware may yield discrete artifacts and/or elevated baselines, causing misinterpretation of the chromatograms. All of these materials must be demonstrated to be free from interferences, under the conditions of the analysis, by running method blanks.

5.2 Interferences co-extracted from the samples will vary considerably from source to source. Although a general cleanup technique is provided as part of this method, individual samples may require additional cleanup approaches to achieve the sensitivities stated in Table 1-2.

5.3 Tetryl decomposes rapidly in aqueous solutions, as well as, with heat. Samples, standards and extracts should not be exposed to temperatures above room temp and should not be stored in aqueous dilutions for long periods of time. Degradation products of Tetryl appear as shoulder peaks to 2,4,6-TNT for the Zorbax Extend -C18 column system.

5.4 Efforts should be made to completely resolve all analytes of interest on both the Acclaim E2 and the Zorbax Extend-C18 column systems. In the event that a pair of analytes coelutes on one system, then the pair must be resolved on the other system in order to confirm the presence of hits in the samples and to confirm the recovery of analytes in the LCS and MS/MSD. If resolution on these two columns is not achieved a Halo PhenylHexyl or similar column may be used to achieve separation and confirmation. Use of the ZORBAX Extend-C18 column should give resolution for all 18 8330B analytes and surrogate. If a large concentration of either 2,4-dinitrotoluene or 2,6-dinitrotoluene is present it may mask the response of the other isomer. If it is not apparent that both isomers are present (or are not detected), an isomeric mixture will be reported.

5.5 For analytes that co-elute on one or more analytical columns, the analyst should be aware that quantitation is affected by the way concentrations are listed on “page 3” of the EnviroQuant software. If the concentrations of co-eluting analytes are not added together on “page 3” and one of the coeluting analytes is present in the sample, then the quantitation will not be accurate and %RPD between columns may be greater than 40%D, resulting in a false assumption that the analyte is not present. If co-eluting analyte concentrations are added together in the software, and one of the analytes is present, then a more accurate quantitation is achieved. Conversely, if BOTH co-eluting analytes are present in a sample or spike, then the most accurate quantitation is achieved by NOT adding the concentrations together on “page 3”. When co-eluting analytes are prepared at different concentrations, the analyst should be aware that adding concentrations on “page 3” will not be directly proportional, and high %RPD between columns MAY occur. Consult the technical director or lab director for guidance. This is something the analyst should be aware of when interpreting data.

5.6 Whenever an analytical column is replaced, the analyst is required to verify the elution order of all the analytes. If co-elution occurs with the new column that did not occur with the previous column, then the instrument parameters need to be optimized to achieve chromatographic separation.

6.0 Health and Safety

Lab coats and gloves are used at all times. All personnel handling raw samples must have been vaccinated or titered for infectious disease. Follow all safety procedures as describes in the SOP for samples suspected of containing biological hazards.

7.0 Sample Preservation, Containers, Handling and Storage

7.1 All Samples will be held at a temperature of ≤ 6°C until extraction.

7.2 Samples should be extracted within 7 days for waters and 14 days for soils from time of sampling.

7.3 Extracts must be stored under refrigeration and must be analyzed within 40 days of extraction.

8.0 Quality Control

8.1 Initial Demonstration of Capability (DOC):
A DOC is completed according to SOP # QC006 when a new employee starts work and annually thereafter. For South Carolina projects the acceptance criteria for all analytes is 70-130%.

8.2 An MDL study and LOD determination/verification is performed according to SOP # QC018. The laboratory maintains documentation for all detection limit determinations and LOD verifications.

8.3 A retention time window study is performed at method set up and after every major instrument change such as a new column. Three injections of the standard or standards containing all analytes of interest including surrogates are made over the course of a 72-hour period. The retention time for each compound is recorded to three decimal places (e.g., 0.007). The width of the retention time window is defined as ± 3 times the standard deviation of the mean absolute retention time established during the 72-hour period. The retention time window position is set using the mid point of the ICAL standard by updating the analysis method in EnviroQuant software. On days when an ICAL is not performed, the initial CCV is used to set the window position. The center of the retention time window is the actual retention time of the analyte in the ICAL midpoint or CCV. Capillary columns with autoinjectors are very reproducible. It is acceptable to set the retention time window wider than the study indicates to ensure positive identification of all compounds. It is not permissible to set the window width less than the retention time window study.

8.4 A method blank is extracted and analyzed with each batch of 20 environmental samples or less. All target analytes in the method blank must be < RL. Acceptance criteria for DoD clients: No analytes detected at ≥ ½ LOQ. If there is a detection above the quantitation limit (or > ½ LOQ for DoD) in the method blank the entire batch associated with the blank will be re-extracted and reanalyzed except when the sample analysis resulted in a non-detect. If not enough sample volume exists for a re-extraction the sample will be qualified with a 'B' with the flag 'compound found in the associated blank. For South Carolina projects the results are flagged only if there are analytes detected above the reporting limit in the method blank.

8.5 A laboratory control sample (LCS) containing all analytes to be reported, including surrogates is extracted once per batch. Experimentally derived in-house control limits are used. The LCS results are uploaded to the control chart program automatically through Labworks. See SOP# QC016 for control chart generation. The control limits are reset annually. Control limits used may be defined by a client's project QAPP. The client's limits override the in-house limits. For South Carolina projects the control limits for the recovery of each analyte in the LCS must be 70% - 130%. Each LCS is evaluated against the appropriate control limits and ME limits before being accepted. The laboratory uses project-specific control limits, if available. Otherwise, the laboratory's own in-house control limits shall be used. The analyst can find the control limits for a particular project by looking at the Labworks code. The control limits are listed there.

8.51 For DoD projects, the recoveries for the analytes spiked in the LCS are compared with the LCS control limits. If a recovery is less than the lower control limit or greater than the upper control limit, that is an exceedence. Note which analytes exceeded the control limits and make a comparison to the list of project-specific analytes of concern. If a project-specific analyte of concern exceeds its LCS-CLs, the LCS has failed. If the LCS recovery is

outside the control limits, correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample is available. If reanalysis cannot be performed, data is qualified and explained in the case narrative. Apply appropriate flags to specific analyte(s) in all samples in the associated preparatory batch and complete an NWR form according to SOP QC033.

8.52 Corrective Action for non DoD projects: If the % recovery of a specific compound in the laboratory control spike is greater than the upper control limit and there are no positive findings for that compound, no further action is taken. If there are positive findings for that compound reanalyze the spike and all affected samples. If the % recovery of any compound fall below the lower control limit, reanalyze the spike and all effected samples. Client specific requirements for the exceptions are listed on the APPL Analysis Request Form (ARF).

8.6 A matrix spike and matrix spike duplicate are extracted with each batch provided enough volume of sample is received. The control limits used for the MS/MSD are the same as the control limits for the LCS. RPD is ≤ 30% (between MS and MSD). If an individual project has its own QAPP with client specific requirements different than 30% RSD, the client QAPP limits are used. If the any criteria are exceeded, contact the project manager who will contact the client as to additional measures to be taken. For the specific analyte(s) in the parent sample, apply appropriate flags if acceptance criteria are not met in the MS/MSD.

8.7 A surrogate compound is added to each sample and all QC samples prior to extraction. Experimentally derived in-house control limits are used. The surrogate results are uploaded to the control chart program automatically through Labworks. See SOP# QC016 for control chart generation. The control limits are reset annually. Control limits used may be defined by a client's individual project QAPP with client specific control limits that are different than the in-house limits. The control limits for the surrogates for a particular project are in the client's Labworks code. The client's limits override the in house limits. If the surrogate recovers outside the control limits, correct problem, then reprep and reanalyze all samples in the associated preparatory batch for failed surrogates if sufficient sample material is available. If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply appropriate flags to specific analyte(s) in all samples in the associated preparatory batch and complete an NWR according to QC033.

8.8 The upper and lower control limits are established on 30 data points using control charts and are established on ± 3 standard deviations from the mean.

8.9 Corrective Action for non DoD samples: If the % recovery for the surrogates falls outside of the control limits the project manager will contact the client to determine the course of action. Appropriate flags will be applied to the samples if acceptance criteria are not met.

8.10 Apply J flags to all results reported between the DL and the LOQ.

9.0 Equipment/Apparatus

9.1 HPLC columns. Columns: Statler: Acclaim E2 column, 150 x 3 mm, Waldorf: ZORBAX Extend-C18 100 x 3.0 mm 1.8-micron with KrudKatcher Ultra HPLC In-line filter 0.5µ depth filter x 0.004 in ID guard column. For South Carolina projects the column ZORBAX Extend-C18 will be used for the primary analysis and the Acclaim E2 for confirmation.

9.2 Detectors: DAD detectors, Ultra Violet Detector (Agilent VWD): 254nm and 214nm, Diode Array Detector (Agilent DAD or Agilent Infinity DAD): 190-960nm capabilities (optimized for explosives at 254nm and 214nm.)

9.3 Data system: A computer system that allows continuous acquisition and storage on machine-readable media of all signals obtained throughout the duration of the chromatographic program

9.4 HPLC: Agilent 1290 or 1200 Series HPLC (or equivalent) with dual channel pumps capable of delivering solvent at a constant flow. A column heater is preferable for keeping retention times consistent.

10.0 Reagents and Standards

10.1 Reagent grade chemicals shall be used in all tests. Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination. All reagents used will be traceable at all steps of the procedure. Reference standards must be calibrated by a body that can provide ILAC-signatory (MRA) traceability. Reagent water is defined as water in which an interferant is not observed at the method detection limit of the compounds of interest.

10.2 The expiration date for analytical standards may be extended by following re-certification procedures below:

10.2.1 Contact the standard supplier and request an expiration date extension. If the supplier is not able to extend the date, then in-house re-certification may be performed as follows:

10.2.1.1 Analyze the expired standard and quantitate it against an unexpired standard from a different supplier or different lot # from same supplier.

10.2.1.2 For organic standards, the acceptance criteria is 20%D.

10.2.1.3 If the expired standard meets the above acceptance criteria, then extend the date by 3 months for organics.

10.2.1.4 The re-certification with extended expiration date is documented in the standard prep log book, along with the analysis date, instrument name, data file ID, and name of standard supplier with current unexpired lot number that was used to re-certify the expired standard.

10.2.2 Email this information to QAU.

10.2.3 To use the standard for samples from South Carolina, a new certificate must be issued by the vendor.

10.3 Solvents: HPLC grade Acetonitrile and HPLC grade Methanol

10.4 Standards: The certified solutions must be accompanied by a certificate of analysis that states balances used in the manufacture of this standard are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z-540-1 and ISO 9001. Standards formulated in house are prepared with balances that are calibrated with weights traceable to NIST. (See SOP HPL002).

10.5 One of the concentrations will be at the quantitation limit. Refer to Table 1-2 for list of quantitation limits. This list may be superseded by client specific requirements. The analyst must refer to the analysis request form for the lab works code and look at the detection limits listed on the appropriate form 1 to determine the quantitation limit standard.

10.6 Second Source: The working calibration is verified once by the injection of a second source standard. This standard must be obtained from a vendor different from that of

the initial calibration standard. If the second source calibration response varies from the predicted response by more than ±30%D (20% for DoD/8330B and 15% for DoD/8330A), inspect the LC system to determine the cause and perform the necessary maintenance before injecting a new calibration curve. If the laboratory control spike is obtained from a different vendor and is less than ±20%D from the initial calibration (15%D for 8330A), it may be used to satisfy this requirement.

11.0 Calibration and Standardization

11.1 Calibration Stock Standards: Commercially prepared stock standards can be used at any concentration if they are certified by the manufacturer or by an independent source. Purchased stock standards can be acquired as individual standards or as prepared mixes, depending on the analyte list requested by the client and the separation characteristics of each analytical column. A prepared mix and four individual standards at 1000ug/mL are purchased from AccuStandard and O2SI to make up the analytes of interest. The Quality Assurance Manager maintains copies of the Certificates of Analysis, which are available for review.

11.2 The Calibration Stock Standard solutions are transferred into Teflon-sealed screw capped bottles. Store at <-10°C and protect from light. Stock standards should be checked frequently for signs of degradation or evaporation, especially just prior to preparing calibration standards from them. Stock standard solutions must be replaced after one year, or sooner if comparison with check standards indicates a problem.

11.3 Prepare a primary dilution standard at 10µg/mL. 8330-Mix A at 10ug/mL is prepared by taking 100uL each of M-8330-R (1000ug/mL) and 1,2-Dinitrobenzene (1000ug/mL) and diluting to 10mL final volume with 1:1 Acetonitrile/Methanol. 8330-Mix B at 10 ug/mL is prepared by taking 100uL each of 3,5-Dinitroaniline (1000ug/mL), PETN (1000ug/mL) and Nitroglycerin (1000ug/mL) and diluting to 10mL final volume with 1:1 Acetonitrile/Methanol. Primary dilution standards must be replaced after 6 months, or sooner if comparison with check standards indicates a problem.

11.4 On the day of initial calibration, freshly prepare calibration standards at a minimum of five increasing concentration levels for each analyte by diluting the primary dilution standard in a 1:1:6 ratio (v/v) Acetonitrile:Methanol:Millipore DI water. For Waldorf, prepare a working calibration standard of 1.0ug/mL, add 100uL each of 8330 Mix A (10ug/ml) and 8330 Mix B (10ug/mL) to 750uL of Millipore water plus 50uL of 1:1 Acetonitrile/methanol for a final volume of 1 mL For Statler, prepare two separate working calibration standards at 1.0ug/mL each by adding 100uL of 8330 Mix A (10ug/ml) or 8330 Mix B (10ug/mL) to 750uL of Millipore water plus 150uL of 1:1 Acetonitrile/methanol for a final volume of 1 mL. Statler requires two separate mixes for retention time separation on the E2 column. Waldorf requires one mix only, due to complete separation of all analytes on the C18 column. The low point in the curve should be at or below the reporting limit, and the calibration points should define the working range of the detector.

11.5 If using the ZORBAX Extend C18 column or the ACCLAIM E2, prepare standards and samples in a 6:1:1 v/v ratio of water:methanol:acetonitrile (3 parts Millipore water, 1 part 1:1 Methanol:Acetonitrile mix).

11.6 The second source is prepared fresh on the day of injection, at a concentration of 1ug/mL and analyzed immediately following the ICAL.

11.7 Continuing calibration verifications (CCV) are prepared from the Calibration Stock at a mid-level concentration in the calibration curve and analyzed according to EPA Method 8330 or the client-specific intervals. CCVs should be prepared as needed

and replaced when comparison with the ICAL indicates a problem (ie: %D > 20% or >15% for DoD/8330A projects). Analyze each calibration standard according to section 7.0.

11.8 Surrogate standards: The analyst should monitor the performance of the extraction, cleanup (if necessary), and analytical system and the effectiveness of the method in dealing with each sample matrix by spiking each sample, standard, and reagent water blank with 1,2-Dinitrobenzene.

11.9 HPLC MOBILE PHASE: Waldorf: Prepare a 27:73 mixture of methanol / DI water for the mobile phase, or if binary pumps are used the mixture can be mixed mechanically within the HPLC. Statler: Prepare a 48:52 mixture of methanol / DI water. The ratio of Methanol / DI water can be adjusted in order to create greater separation between analytes of interest. However, the ratio of Methanol/DI water may not be changed after the initial calibration has been generated without requiring recalibration of the instrument. For PGDN, the mobile phase ratio is 55% water : 45% Acetonitrile.

12.0 Procedure

12.1 Sample preparation – See the following APPL SOPs for the extraction procedures:

Water: MWE3535 Solid Phase extraction of waters (Method 3535)

Soil: MSE018MIS – Mechanical grinding and orbital shaker extraction of soils with Incremental Sampling (IS).
MSE018 – extraction of soils

12.2 Columns and Flow Rates:

For the instrument Waldorf: Use the ZORBAX Extend C18 with the following parameters: gradient elution using methanol/water (27:73)(v/v) at approximately 1.0 mL/min flow rate and 41℃.

For the instrument Statler: Use the Acclaim E2 column with the following parameters: gradient elution using methanol/water (48:52)(v/v) at approximately 0.5 mL/min flow rate and 30℃.

12.3 HPLC conditions:

Injection volume = 40µL (volume must be held consistent for calibration and sample runs).
Flow = approximately 0.2 – 1.0 mL/minute (depending on the column system in use)
Run time = approximately 25 - 90 minutes (depending on the analyte list and the column being used)
Column temperature = 30-50℃ (temperature must be held consistent for calibration and sample runs).

<u>For PGDN analysis, use the following parameters:</u>
Injection volume = 40-100µL
Flow = 0.73 mL/minute
Run time = 9 minutes
Column temperature = 30℃

12.4 Calibration and sample analysis:

12.3.1 Establish operating parameters by injecting calibration standards and establishing the sensitivity limit of the detectors and the linear range of the analytical system for each compound. The analysis scheme utilized consists of a calibration curve of a minimum of five data points, a system blank, and then a series of QA/QC, blanks, and sample injections. The injection sequence must allow for an end bracket calibration consisting of standard injections at the mid concentration level of the initial data sequence injections.

12.3.2 The linearity of the curve may be determined by using either Average Calibration Factors technique or Linear Regression. If Average Calibration Factors are used, the average %RSD for all the target analytes must be ≤20% RSD. If Linear Regression is used, the correlation coefficient must be greater than 0.99 (0.95 for DoD/8330A).

12.3.3 A variety of potential factors may be in play that effects the overall calibration. Minimums of five points are to be used for quantitative analysis. It may be necessary to eliminate higher or lower data points, or a point off each end. No mid level points may be eliminated from the calibration curve, unless the entire injection for a particular calibration point is eliminated due to obvious instrument injection errors.

12.3.4 Before using any cleanup procedure, the analyst should process a series of calibration standards through the procedure to confirm elution patterns and the absence of interferences from the reagents.

12.3.5 Using the external calibration procedure, determine the identity and quantity of each component peak in the sample chromatogram, which corresponds to the compounds used for calibration purposes.

12.3.6 The second source must meet ≤30%D (<20%D for DoD/8330B or <15% for DoD/8330A projects) for the RF compared to the average RF from the ICAL for all analytes. If second source does not meet acceptance criteria, the curve and/or second source should be re-prepared and re-analyzed before sample analysis may proceed.

12.3.7 The continuing calibrations must meet ≤20%D (<15% for DoD/8330A projects) for the RF compared to the average calibration factor from the ICAL for all analytes. If a CCV does not meet acceptance criteria, then samples before and after the failing CCV will be re-analyzed, unless client QAPP indicates an alternate corrective action.

12.3.8 For DoD 5.0 projects, if a CCV fails, the laboratory can immediately analyze two additional consecutive CCVs (immediately is defined as starting a consecutive pair within one hour; no samples can be run between the failed CCV and the two additional CCVs). This approach allows for spurious failures of analytes to be reported without reanalysis of samples. Any corrective actions that change the dynamics of the system (e.g., clip column, clean injection port, run blanks) requires that all samples since the last acceptable CCV be reanalyzed. Both of these CCVs must meet acceptance criteria in order for the samples to be reported without reanalysis. If either of these two CCVs fail or if the laboratory cannot immediately analyze two CCVs, the associated samples cannot be reported and must be reanalyzed. Flagging of data for a failed CCV is only appropriate when the affected samples cannot be reanalyzed. The lab must notify the client prior to reporting data associated with a failed CCV.

12.3.9 If the peak area or height (depending on calibration method employed) exceeds the linear range of the system, dilute the extract and reanalyze.

12.3.10 Samples may be screened for J-values between the MDL and the PQL, if requested by the client. J-values are estimated values, since they are below the lowest point in the calibration curve.

12.3.11 Tentative identification of an analyte occurs when a sample peak falls within the daily retention time window on the primary column. A dissimilar secondary column will be used to confirm all positive measurements observed on the primary column, in which the concentrations are greater than the established DL (or MDL). Chromatographic separation of all analytes of interest on each column is desired. In the event that separation is not possible, then separation of coeluting target analytes is necessary on the confirmation column. If samples indicate a peak within the RT window of co-eluting target analyte peaks, then the samples will be run on the confirmation column with the analytes resolved.

12.3.12 The second column will meet all the calibration and second source requirements for analytes of interest as outlined in the calibration section of this SOP. For compounds positively identified and confirmed by a second column, determine the %RPD of the concentrations between the two columns.

$$RPD = (|R_1 - R_2|) \ / \ [(R_1 + R_2)/2] \times 100$$

Where:
R_1 = result on the primary column
R_2 = result on the secondary column

12.3.13 If the %RPD is greater than 40%, then report the analyte with a Y-flag. (For specific DoD projects, a J-flag may be required rather than a Y-flag.) Check with the project manager for the flagging conventions required by a particular project. Co-eluting sample matrix peaks or co-eluting non-target analytes may interfere with confirmation of a positive finding. If one result is significantly higher (e.g., >40%), check the chromatograms to see if an obviously overlapping peak is causing an erroneously high result. If no overlapping peaks are noted, examine the baseline parameters established by the instrument data system during peak integration. Typically the higher of the two values should be reported. For cases in which the higher value may be attributed to co-eluting interferences (such as a "shoulder" on another sample peak or co-elution with a known target analyte or its breakdown product), then the lower of the Y-values may be reported, as determined by the analyst's professional judgement. If the calculated RPD is <40% and all the QC requirements are met for that analyte on both columns, the result reported is left to the analysts professional judgement. For DoD projects the results from primary analysis is reported. Check with the project manager to verify this project requirement with the client.

12.3.14 If the client requires confirmation by LC/MS, then refer to SOP HPL8321A.Refer to EPA method 8000B for establishing daily retention time windows and identification criteria. For Arizona projects refer to EPA method 8000C[4] for establishing daily retention time windows and identification criteria.

13.0 Data Analysis and Calculations

13.1 Practical Quantitation Limits are calculated as follows:

PQL = (C)(E) x DF4

Where: C = Low Calib Point (µg/mL)
E = extraction ratio (5mL/0.5L water) or (20mL/10.00g Soil)
DF4 = the dilution into water required before LC injection

13.2 To manually check the data system, calculate calibration factors and percent RSD for each analyte of interest as follows:

$$\text{Calibration Factor} = \frac{\text{Peak Height}}{\text{Mass injected (in nanograms)}}$$

The percent RSD is calculated as follows:

$$\%RSD = (SD)(100\%)/(RF_{X1}))$$

Where:
SD = Standard deviation of analyte
RF_{x1} = Mean of the initial RF for an analyte.

13.3 To manually check the sample results calculate as follows:

$$\text{Sample result (ug/L for water or ug/Kg for soil)} = \frac{(\text{peak height})(E)(DF4)}{(R_1)(\text{Injection volume})}$$

E = extraction ratio (2mL/0.5L water) or (20mL/10.00g soil)
R_1 = average calibration factor

13.4 The acceptance criteria for the ICAL %RSD is 15% (20% for DoD/8330A) if average calibration factors are used or 0.99 linear coefficient (0.995 for DoD projects) if linear regression is used to quantitate the curve.

13.5 The working calibration factor must be verified on each working day by the injection of the 8330 standard analytes at the midpoint concentration. The frequency of verification is every 10 field sample injections. If the response for any analyte varies from the predicted response by more than ±20%, a new calibration curve must be prepared for that analyte.

$$\text{Percent Difference} = \frac{|R_1 - R_2|}{R_1} \times 100$$

Where:

R_1 = Average calibration factor from first analysis
R_2 = Calibration factor from continuing analysis
SD = Standard deviation of the average RRF for a compound

13.6 For second column confirmation verification determine the relative percent difference between the calculated concentrations of each analyte reported on the column.

$$\%RPD = \frac{[A - B]}{(A + B) / 2} * 100$$

Where:
A = Concentration observed in original sample (primary column)
B = Concentration observed in duplicate sample (secondary column)

Check to be sure there are no errors in calculations, spike solutions and surrogate solutions. Also, check instrument performance.
Recalculate the data and/or reanalyze the samples since the last successful CCV, if any of the above check reveal a problem.

13.7 See SOP# DOC014 for formulas and calculations used to obtain and utilize the calibration curves.

13.8 Manual Integrations:
A copy of the chromatogram before manual integration and after manual integration of the peak is printed and placed behind the quant report. The pictures clearly indicate the beginning and ending of the peak integration. These two pictures will have the initials and date of the analyst performing the integrations. The chromatogram will be flagged with a colored tab indicating to the reviewer that a manual integration has been performed. The manual integration is reviewed by a Section Supervisor, the Technical Director, the Laboratory Director or the President (the reviewer). If the manual integration is acceptable the reviewer will initial both the before and after chromatogram.

13.9 See SOP # QC044 for further instructions.

MI1) Integration does not follow baseline

MI2) Non-target peak interference

MI3) To split a peak that was integrated as one peak by the computer.

MI4) To integrate a split peak

MI5) The whole peak or part of the peak was not integrated.

MI6) Computer integrated wrong peak

MI7) Other – (See case narrative)

14.0 Data Assessment and Acceptance Criteria for QC

14.1 The analyst completing the work first reviews data. The initial calibration curve is reviewed, the continuing calibration %D is reviewed and the spike recovery and precision is reviewed. If at any point the review shows an out of control situation, complete an NWR form. See SOP QC033. The section manager is notified verbally and the problem is investigated. The correction may be one of several points considered; standard preparation, improper injection size, extraction technique, etc. The problem is potentially solved and reanalysis or re-extraction/reanalysis is performed if possible. If reanalysis is not possible, flag the reported data accordingly.

All pertinent information on the NWR is included in the case narrative. These points are documented on the Multilevel Quality Control Sign-Off worksheet.

14.2 The second level of review is either by a peer in the same section, the section manager, or someone designated by the QAU. The Multilevel Quality Control Sign Off worksheet is signed off by the review person. The MQCS sheets are filed with the data package.

14.3 When QC parameters are exceeded, the following takes place: When the matrix spike criteria are exceeded, contact the project manager who will contact the client as to additional measures to be taken. For the specific analyte(s) in the parent sample, apply appropriate flags if acceptance criteria are not met If the MS/MSD. When the LCS is outside of limits see section 8.5 above.

15.0 Corrective Actions and Contingencies for Out of Control Data or Unacceptable Data

15.1 The quality control set consists of a method blank, laboratory control spike (LCS), and a matrix spike/matrix spike duplicate for each batch of 20 field samples or less. For USACE a LCS and LCSD must be performed. The surrogate compounds are added to all samples and QC prior to extraction.

15.2 Spike QC limits: The upper and lower control limits are established on 30 data points using control charts and are established on ± 3 standard deviations from the mean. (See SOP# QC016 for control chart generation.)

15.3 Corrective Action: If the % recovery of a specific compound in the laboratory control spike is greater than the upper control limit and there are no positive findings for that compound, no further action is taken. If there are positive findings for that compound reanalyze the spike and all effected samples or flag the results with a 'J'. If the % recovery of any compound fall below the lower control limit, reanalyze the spike and all effected samples. Client specific requirements for the exceptions are listed on the APPL Analysis Request Form (ARF).

15.4 For DoD projects, the client will decide whether or not a PE LCS is required for the project. The PE sample manufacturers control limits must be met (or in-house generated control limits using 20-30 points). If acceptance criteria are not met, then the client will decide whether or not to re-extract the batch. Samples will be J-flagged for failing analytes.

15.5 Surrogate limits: 1,2-Dinitrobenzene was chosen as the surrogate. If the surrogate recovery falls outside acceptance criteria for a sample, the sample should be re-extracted and re-analyzed, unless client QAPP indicates an alternate corrective action. The upper and lower control limits are established on 30 data points using control charts and are established on ± 3 standard deviations from the mean.

15.6 Corrective Action: If the % recovery falls outside of the control limits the project manager will contact the client to determine the course of action. If the client is unavailable, professional judgement should be used to determine if the sample would be reanalyzed or reported.

15.7 MS/MSD: The control limits established above in section 9.2 are also used for the upper and lower control limits for the MS/MSD. Acceptance limits between MS and MSD - Waters ≤ 20% RPD, Soils ≤ 30% RPD.

15.8 Corrective Action: Examine the project specific DQOs and contact the project manager who will in turn contact the client. Flag the parent sample with a "J" for failed analytes. Client specific requirements for the exceptions are listed on the APPL Analysis Request Form (ARF).

15.9 Triplicates: For DoD projects, a sample triplicate must be performed by the laboratory. The acceptance criteria for responses above the RL is 20%RPD. For triplicates that fall outside acceptance criteria with responses below the RL, the client will decide if re-extraction is necessary. For responses above the RL, re-extraction is necessary.

15.10 Blanks: Acceptance criteria: All target analytes in the method blank must be < RL. Acceptance criteria for DoD clients: No analytes detected at ≥ ½ RL.

15.11 Corrective Action: If there is a detection above the quantitation limit (or > ½ LOQ for DoD) in the method blank the entire batch associated with the blank will be re-extracted and reanalyzed except when the sample analysis resulted in a non-detect. If not enough sample volume exists for a re-extraction the sample will be qualified with a 'B' with the flag 'compound found in the associated blank.

15.12 When analyzing MIS soil samples for DoD projects requiring a grinder blank between each sample, a composite of those grinder soil blanks from each analytical batch is screened for contaminants above ½ the RL. If the composite exhibits a response above ½ the RL, then the individual grinder soil blanks from the batch must be analyzed in order to isolate the sample that caused the contamination. The sample is then reported with a B-flag for the contaminant analyte, and all individual grinder blanks should be reported.

15.13 Instrument calibration: Requirements for calibration are listed in the calibration section of this SOP.

15.14 Corrective action: If the initial calibration curve does not meet the requirements, the standards will be reformulated and reanalyzed. If the continuing calibration verification does not meet the requirements a new CCV is prepared and analyzed.

15.15 Method Detection Limits: Establish the LOD, LOQ and MDL according to SOP# QC018.

15.16 PE samples will be analyzed quarterly along with the LOD, LOQ checks, in order to meet the DoD PE-LCS requirements.

15.17 Corrective action: Errors, deficiencies, deviations, or laboratory events or data that fall outside of established acceptance criteria will be investigated. In some instances, corrective action may be needed to resolve the problem and restore proper functioning to the analytical system. The investigation of the problem and any subsequent corrective action taken is documented on a Nonconformance Work Report (NWR).

16.0 Method deviations

This SOP was compared to EPA Method 8330B and EPA Method 8330A. There are no deviations from the method.

17.0 Pollution Prevention

It is the laboratory's responsibility to comply with all federal, state, and local regulations governing waste management, particularly the hazardous waste identification rules and land disposal restrictions. The laboratory has the responsibility to protect the environment by minimizing and controlling all releases from fume hoods and bench operations.

18.0 Waste Management

It is the laboratory's responsibility to comply with all federal, state, and local regulations governing waste management, particularly the hazardous waste identification rules and land

disposal restrictions. The laboratory has the responsibility to protect the environment by minimizing and controlling all releases from fume hoods and bench operations.

19.0 Method Performance

19.1 Continuing method performance is monitored by analysis of LCS samples with each batch and control charting the results as per SOP# QC016.

19.2 Method detection limit (MDL) studies are run to ensure the performance of the instrumentation is able to satisfy data quality objectives of the client by reaching the reporting limits necessary. MDL studies are extracted with the sample volumes and final extract volumes per client project requirements. An MDL study is performed for each matrix, each initial sample volume amount and per instrument after major instrument changes take place, such as a column change and is performed in accordance with SOP# QC018.

19.3 The method is not performed by any analyst until a Demonstration of Capability (DOC) is completed. Every analyst who performs this method has demonstrated acceptable accuracy and precision by passing a Demonstration of Capability study. (See section 8.1)

20.0 Equipment/Instrument Maintenance and Troubleshooting

20.1 HPLC Maintenance

20.2 The HPLC instruments should be maintained by keeping the solvent reservoirs filled.

20.3 The solvent reservoir filter frit should be changed periodically if the chromatography indicates a significant reduction in response.

20.4 The six-port sample delivery valve seal may need to be replaced periodically if the chromatography indicates a significant shift in retention times. Leaks may be detected by physically noticing the mobile phase leaking from the valve.

20.5 Parts replacement for the HP 1090 LC may be purchased through Alpha Omega Technologies (phone # 1-800-842-5742).

20.6 Parts replacement or technical support for the Agilent 1100 LC may be obtained through Agilent Technologies (phone # 1-800-227-9770).

20.7 Because of the level of expertise of the LC-MS personnel (over 20 years experience with the instrumentation), subtle changes in chromatography and detector quality are noted on a daily basis; therefore MS maintenance and trouble-shooting may be performed as situations arise where chromatography indicates a problem. Warning flags indicating a decrease in data quality include: a decreased detector response, elevated baseline or calibration inconsistencies.

20.8 Maintenance performed on the instruments by APPL, Inc. personnel or service technicians will be documented in the instrument maintenance logbooks in accordance with SOP # DOC002.

21.0 Computer hardware and software

21.1 EnviroQuant G1701EA Rev E.02.00 Copyright © Hewlett-Packard.

22.0 References

22.1 EPA Method 8330B, Revision 1, Oct 2006 “Nitroaromatics, Nitramines and Nitrate Esters by HPLC”

22.2 DoD Quality Systems Manual for Environmental Laboratories, Version 5.0 July 2013

22.3 Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, EPA Method 8000B, Revision 2, December 1996

22.4 Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, EPA Method 8000C, Revision 3, March 2003
22.5 EPA Method 8330A, Revision 1, February 2007 “Nitroaromatics, Nitramines and Nitrate Esters by HPLC”
22.6 ISO/IEC 17025:2005(E)

23.0 Any tables, diagrams, flowcharts, validation data

Table 1: Generic PQLs for Waters and Soils
Table 2: Specific Low Level Soil and Water PQLs
Table 3: DoD QSM, version 5.0, Table 3

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Section Manager Name: Paula Young

Section Manager Signature: Paula Young Date: 06/29/16

QAU Director Name: Sharon Dehmlow

QAU Director Signature: Sharon Dehmlow Date: 06/29/16

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Table 1
Generic PQLs for Waters and Soils

	Soil mg/Kg	Water ug/L
HMX	0.5	0.5
RDX	0.5	0.5
1,3,5-Trinitrobenzene	0.5	0.5
1,3-Dinitrobenzene	0.5	0.5
Tetryl	0.5	0.5
Nitrobenzene	0.5	0.5
2,4,6-Trinitrotoluene	0.5	0.5
4-Amino-2,6-dinitrotoluene	0.5	0.5
2-Amino-4,6-dinitrotoluene	0.5	0.5
2,4-Dinitrotoluene	0.5	0.5
2,6-Dinitrotoluene	0.5	0.5
2-Nitrotoluene	0.5	0.5
3-Nitrotoluene	0.5	0.5
4-Nitrotoluene	0.5	0.5
Nitroglycerin	0.5	0.5
PETN	5.0	5.0
Nitroguanadine	0.5	0.5
MNX	0.5	0.5
3,5-DNA	0.5	0.5
PGDN	0.25	0.25

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Table 2
Specific Low Level Soil and Water PQLs

	Soil mg/Kg	Water ug/L
HMX	0.5	1.0
RDX	0.5	0.5
1,3,5-Trinitrobenzene	0.09	1.0
1,3-Dinitrobenzene	0.4	0.5
Tetryl	0.5	1.0
Nitrobenzene	0.5	1.0
2,4,6-Trinitrotoluene	0.3	0.5
4-Amino-2,6-dinitrotoluene	0.5	1.0
2-Amino-4,6-dinitrotoluene	0.5	1.0
2,4-Dinitrotoluene	0.07	0.5
2,6-Dinitrotoluene	0.04	0.5
2-Nitrotoluene	0.5	0.5
3-Nitrotoluene	0.5	1.0
4-Nitrotoluene	0.5	0.5
Nitroglycerin	0.5	1.0
PETN	2.5	6.0

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Table 3

Table – 3. Nitroaromatics, Nitramines, and Nitrate Esters Analysis by HPLC, LC/MS, or LC/MS/MS (Method 8330B)					
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**	**Flagging Criteria**	**Comments**
Soil drying procedure	Each sample, LCS, and Method Blank.	Laboratory must have a procedure to determine when the sample is dry to constant mass. Record date, time, and ambient temperature on a daily basis while drying samples.	NA.	Flagging is not appropriate.	Commercial PT samples must reflect the grinding, extraction, and analysis steps as a minimum.
Soil sieving procedure	Each sample, LCS, and Method Blank.	Weigh entire sample. Sieve entire sample with a 10 mesh sieve. Breakup pieces of soil (especially clay) with gloved hands. Do not intentionally include vegetation in the portion of the sample that passes through the sieve unless this is a project specific requirement. Collect and weigh any portion unable to pass through the sieve.	NA.	Flagging is not appropriate.	

Table 3, continued

Table – 3. Nitroaromatics, Nitramines, and Nitrate Esters Analysis by HPLC, LC/MS, or LC/MS/MS (Method 8330B)					
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**	**Flagging Criteria**	**Comments**
Soil grinding procedure	Initial demonstration.	The laboratory must initially demonstrate that the grinding procedure is capable of reducing the particle size to < 75 µm by passing representative portions of ground sample through a 200 mesh sieve (ASTM E11).	NA.	Flagging is not appropriate.	
Soil grinding blank	Prior to grinding samples; after every 10 samples; and at the end of the batch.	A grinding blank using clean solid matrix (such as Ottawa sand) must be prepared (e.g., ground and subsampled) and analyzed in the same manner as a field sample. No reported analytes must be detected > 1/2 LOQ.	Blank results must be reported and the affected samples must be flagged accordingly if blank criteria are not met.	If any individual grinding blank is found to exceed the acceptance criteria, apply B-flag to the samples following that blank.	Grinding blanks may be composited for analysis. At least one grinding blank per batch must be analyzed.
Soil subsampling process	Each sample, duplicate, LCS, and Method Blank.	Entire ground sample is mixed, spread out on a large flat surface (e.g., baking tray), and 30 or more randomly located increments are removed from the entire depth to sum a ~10 g subsample.	NA.	Flagging is not appropriate.	

Table 3, continued

Table – 3. Nitroaromatics, Nitramines, and Nitrate Esters Analysis by HPLC, LC/MS, or LC/MS/MS (Method 8330B)					
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**	**Flagging Criteria**	**Comments**
Soil sample triplicate	At the subsampling step, one sample per batch. Cannot be performed on any sample identified as a blank (e.g., trip blank, field blank, method blank).	Three 10 g subsamples are taken from a sample expected to contain the highest levels of explosives within the quantitation range of the method. The RSD for results above the LOQ must not exceed 20%.	Examine the project-specific requirements. Contact the client as to additional measures to be taken.	If reported per the client, apply J-flag if acceptance criteria are not met and explain in the case narrative.	
Aqueous sample preparation	Each sample and associated batch QC samples.	Solid phase extraction (SPE) using resin-based solid phase disks or cartridges is required.	NA.	Flagging is not appropriate.	The salting-out procedure is not permitted.
Initial Calibration (ICAL) for all analytes (including surrogates)	At instrument setup and after ICV or CCV failure, prior to sample analysis.	ICAL must meet one of the three options below: Option 1: RSD for each analyte ≤ 15%; Option 2: linear least squares regression for each analyte: $r^2 \geq 0.99$; Option 3: non-linear least squares regression (quadratic) for each analyte: $r^2 \geq 0.99$.	Correct problem, then repeat ICAL.	Flagging is not appropriate.	Minimum 5 levels for linear and 6 levels for quadratic. No samples shall be analyzed until ICAL has passed.
Initial Calibration Verification (ICV)	Once after each ICAL, analysis of a second source standard prior to sample analysis.	All reported analyte(s) and surrogates within ± 20% of true value.	Correct problem. Rerun ICV. If that fails, repeat ICAL.	Flagging is not appropriate.	No samples shall be analyzed until calibration has been verified with a second source.

Table 3, continued

Table – 3. Nitroaromatics, Nitramines, and Nitrate Esters Analysis by HPLC, LC/MS, or LC/MS/MS (Method 8330B)					
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**	**Flagging Criteria**	**Comments**
Continuing Calibration Verification (CCV)	Before sample analysis, after every 10 field samples, and at the end of the analysis sequence.	All reported analytes and surrogates within ± 20% of the true value.	Recalibrate, and reanalyze all affected samples since the last acceptable CCV; or Immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, take corrective action(s) and re-calibrate; then reanalyze all affected samples since the last acceptable CCV.	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply Q-flag to all results for the specific analyte(s) in all samples since the last acceptable calibration verification.	Results may not be reported without a valid CCV. Flagging is only appropriate in cases where the samples cannot be reanalyzed.
Method Blank (MB)	One per preparatory batch.	No analytes detected > 1/2 LOQ or > 1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater.	Correct problem. If required, reprep and reanalyze method blank and all samples processed with the contaminated blank.	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch.	Results may not be reported without a valid method blank. Flagging is only appropriate in cases where the samples cannot be reanalyzed.

Table 3, continued

Table – 3. Nitroaromatics, Nitramines, and Nitrate Esters Analysis by HPLC, LC/MS, or LC/MS/MS (Method 8330B)					
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**	**Flagging Criteria**	**Comments**
Laboratory Control Sample (LCS)	One per preparatory batch.	A laboratory must use the QSM Appendix C Limits for batch control if project limits are not specified. If the analyte(s) are not listed, use in-house LCS limits if project limits are not specified. Use LCS Tables 8330B for HPLC analysis. Use LCS Tables 8321 for LC/MS or LC/MS/MS analysis.	Correct problem. If required, reprep and reanalyze the LCS and all samples in the associated preparatory batch for the failed analytes, if sufficient sample material is available.	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.	A solid reference material containing all reported analytes must be prepared (e.g., ground and subsampled) and analyzed in exactly the same manner as a field sample. Results may not be reported without a valid LCS. Flagging is only appropriate in cases where the samples cannot be reanalyzed.
Matrix Spike (MS)	One per preparatory batch.	A laboratory must use the QSM Appendix C Limits for batch control if project limits are not specified. If the analyte(s) are not listed, use in-house LCS limits if project limits are not specified.	Examine the project-specific requirements. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met and explain in the case narrative.	For matrix evaluation only, therefore is taken post grinding from same ground sample as parent subsample is taken. If MS results are outside the limits, the data shall be evaluated to determine the source(s) of difference, i.e., matrix effect or analytical error.

Table 3, continued

Table – 3. Nitroaromatics, Nitramines, and Nitrate Esters Analysis by HPLC, LC/MS, or LC/MS/MS (Method 8330B)					
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**	**Flagging Criteria**	**Comments**
Matrix Spike Duplicate (MSD) or Matrix Duplicate (MD)	One per preparatory batch.	A laboratory must use the QSM Appendix C Limits for batch control if project limits are not specified. If the analyte(s) are not listed, use in-house LCS limits if project limits are not specified. MSD or MD: RPD of all analytes ≤ 20% (between MS and MSD or sample and MD).	Examine the project-specific requirements. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met and explain in the case narrative.	For matrix evaluation only, therefore is taken post grinding from same ground sample as parent subsample is taken. The data shall be evaluated to determine the source of difference.
Surrogate Spike	All field and QC samples.	QC acceptance criteria specified by the project, if available; otherwise use QSM Appendix C limits or in-house LCS limits if analyte(s) are not listed.	Correct problem, then reprep and reanalyze all failed samples for all surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	Apply Q-flag to all associated analytes if acceptance criteria are not met and explain in the case narrative.	Alternative surrogates are recommended when there is obvious chromatographic interference.

Table 3, continued

Table – 3. Nitroaromatics, Nitramines, and Nitrate Esters Analysis by HPLC, LC/MS, or LC/MS/MS (Method 8330B)					
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**	**Flagging Criteria**	**Comments**
Confirmation of positive results (second column)	All positive results must be confirmed.	Calibration and QC criteria are the same for the confirmation analysis as for initial or primary column analysis. Results between primary and second column RPD ≤ 40%.	Report from both columns.	Apply J-flag if RPD > 40%. Discuss in the case narrative.	Use of a UV detector with a UV diode array detector or vice versa is not considered a valid confirmation technique. Confirmation analysis is not needed if LC/MS or LC/MS/MS was used for the primary analysis. Secondary column – Must be capable of resolving (separating) all of the analytes of interest and must have a different retention time order relative to the primary column. Use project specific reporting requirements if available; otherwise, report from the primary column.

Standard Operating Procedure

Method 8321 LC-Mass Spectrometer Analysis of Carbamate / Urea and Nitroaromatic / Nitrosamine Compounds

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STATEMENT OF PURPOSE

This procedure covers the use of High Performance Liquid Chromatography (HPLC), coupled with either the ESI (Electrospray) or APCI (atmospheric pressure chemical ionization) LC/MS interfaces in the detection and quantitation of Carbamate and Urea compounds and Nitroaromatics and Nitrosamines in soil or water matrices for methods 8321A and 8321B. The method is not limited to but includes the analytes listed in Table 1.

INSTRUCTIONS

1.0 Scope and Application

1.1 This method is applicable to the determination of the target compounds and Practical Quantitation Limits (PQL's) listed in Table 1.

1.2 This method is restricted to use by or under the supervision or trained analysts. Each analyst must demonstrate the ability to generate acceptable results with this method.

1.3 If an individual project has its own QAPP with client specific requirements that are different that the SOP, the QAPP overrides the SOP. This information will be specified in the comment section of the ARF.

2.0 Method Summary

2.1 This method provides reverse phase high performance liquid chromatographic and LC/MS interface conditions for the detection of the target analytes listed.

2.2 For Carbamates, the soil samples are extracted by Method 3550B, and the water samples are extracted by Method 3510C.

2.3 For Methamidophos, the water samples are extracted by SOP LIQ009 using Method 3520C.

2.4 For Picric Acid, the soil samples are extracted by Method 8330 and the water samples are extracted by Method 3535A.

2.5 The Nitroaromatics/Nitrosamines extracts are analyzed by HPLC-UV/VIS. Confirmations are done by LC/MS, using APCI Negative ion SIM mode. The three nitrotoluene isomers and the nitrobenzene do not ionize well on the LC/MS. They are calibrated and run on the UV/VIS. Any detection of these compounds in any extract is confirmed on the HRGC/HRMS. The rest of the Nitroaromatics/Nitrosamines compounds are calibrated on both the UV/VIS and LC/MS.

2.6 The Picric Acid extracts are analyzed by HPLC-MS, using an ESI source run in full scan mode.

3.0 Detection Limits

See table 1 for Detection Limits

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4.0 Definitions

Calibration standard - A solution prepared from the primary dilution standard solution or stock standard solution and the internal standards and surrogate analytes. The calibration solutions are used to calibrate the instrument response with respect to analyte concentration.

Extracted Ion Current Profile (EICP)— The computer where quantitation is done must have software that allows searching any GC/MS data file for ions of a specified mass and plotting such ion abundance versus time or scan number. The chromatographic plot for an ion abundance of a specified mass over the chromatographic run is known and the EICP.

Field Reagent Blank - An aliquot if reagent water or other blank matrix that is placed in a sample container in the laboratory and treated as a sample in all respects, including shipment to the sampling site, exposure to sampling site conditions, storage, preservation, and all analytical procedures. The purpose of the FRB is to determine if method analytes or other interferences are present in the field environment.

Instrument blank (Blk) - An aliquot of reagent water or other blank matrix to demonstrate that the instrument is not contributing contaminants to the samples.

Internal Standard (IS) - A pure analyte(s) added to a sample, extract, or standard solution in known amount(s) and used to measure the relative responses of other method analytes and surrogates that are components of the same sample or solution. The internal standard must be an analyte that is not a sample component.

Instrument Performance Check (IPC) - A solution of one or more compounds (analytes, surrogate, internal standard, or other test compounds) used to evaluate the performance of the instrument system with respect to a defined set of method criteria.

Laboratory control spike (LCS) - An aliquot of reagent water or other matrix to which known quantities of the method analytes are added in the laboratory. The LCS is analyzed exactly like a sample, and its purpose is to determine whether the methodology is in control, and whether the laboratory is capable of making accurate and precise measurements.

Laboratory Reagent Blank - An aliquot of reagent water or other blank matrix that is treated exactly as a sample including exposure to all glassware, equipment, solvents, reagents, internal standards, and surrogates that are used with other samples. The LRB is used to determine if method analytes or other interferences are present in the laboratory environment, the reagents, or the apparatus.

Limit of Detection - An estimate of the minimum amount of a substance that an analytical process can reliably detect. An LOD is analyte- and matrix-specific and may be laboratory-dependent. The smallest amount or concentration of a substance that must be present in a sample in order to be detected at a high level of confidence (99%)

Limit of Quantitation - The minimum levels, concentrations, or quantities of a target analyte that can be reported with a specified degree of confidence. The lowest concentration that produces a

quantitative result within specified limits of precision and bias. For DoD projects, the LOQ shall be set at or above the concentration of the lowest initial calibration standard. This also equates with the term Practical Quantitation Limit (PQL).

Matrix - A surrounding substance within which something originates, develops, or is contained, such as: drinking water, saline/estuarine water, aqueous substance other than drinking water or saline/estuarine water, non-aqueous liquid, biological tissue, solids, soils, chemical waste, and air.

Matrix duplicate (MD) - Two aliquots of the same sample taken in the laboratory and analyzed separately with identical procedures. Analysis of a matrix sample and matrix sample duplicate, indicates precision associated with laboratory procedures, but not with sample collection, preservation, or storage procedures.

Matrix spike (MS) - An aliquot of an environmental sample to which known quantities of the method analytes are added in the laboratory. The matrix spike is analyzed exactly like a sample, and its purpose is to determine whether the sample matrix contributes bias to the analytical results. The background concentrations of the analytes in the sample matrix must be determined in a separate aliquot and the measured values in the matrix spike corrected for background concentrations.

Matrix spike duplicate (MSD) - Two aliquots of the same sample taken in the laboratory and analyzed separately with identical procedures. Analysis of a matrix spike and matrix spike duplicate, indicates precision associated with laboratory procedures, but not with sample collection, preservation, or storage procedures.

Method blank - An aliquot of reagent water or other blank matrix that is treated exactly as a sample including exposure to all glassware, equipment, solvents, reagents, internal standards, and surrogates that are used with other samples. The method blank is used to determine if method analytes or other interferences are present in the laboratory environment, the reagents, or the apparatus.

Method detection limit - The minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero, as determined from analysis of a sample containing the analyte in a given matrix, as described in 40 CFR Part 136, Appendix B, 1 July 1995 edition.

Practical quantitation limit - The lowest concentration that can be reliably quantitated within specified limits of precision and accuracy during routine laboratory operating conditions. The practical quantitation limit is generally three to ten times greater than the method detection limit.
Primary Dilution Standard - A solution of several analytes prepared in the laboratory from stock solution and diluted as needed to prepare calibrations solutions and other needed analyte solutions.

Quality Control Sample (QCS) - A solution of method analytes of known concentrations which is used to fortify an aliquot of LCS or sample matrix. The QCS is obtained from a source external to the laboratory and different from the source of calibration standards. It is used to check laboratory performance with externally prepared test materials.

Sample Duplicate (DUP1/DUP2) - Two aliquots of the same sample taken in the laboratory and analyzed separately with identical procedures. Analytes of DUP1/DUP2 indicates precision associated with laboratory procedures, but not with sample collection, preservation, or storage procedures.

Stock Standard Solution - A concentrated solution containing one or more method analytes prepared in the laboratory using assayed reference materials purchased from a reputable commercial source or purchased as a mixture from a commercial source.

Surrogate - A pure analyte(s), which is extremely unlikely to be found in any sample, and which is added to a sample aliquot in known amount(s) before extraction or other processing and is measured with the same procedures used to measure other sample components. The purpose of the surrogate is to monitor method performance with each sample.

5.0 Interferences and Potential Problems

5.1 Refer to methods 3500, 3600, 8000, 8330, 8321A, and 8321B.

5.2 Solvents, reagents, and glassware and other sample processing hardware may yield discrete artifacts or elevated baselines, or both, causing misinterpretation of chromatograms or spectra. All of these materials must be demonstrated to be free of interferences under the conditions of the analysis by running reagent blanks. Specific selection of reagents and purification of solvents by distillation in all-glass systems may be required.

6.0 Health and Safety

Lab coats and gloves are used at all times. All personnel handling raw samples must have been vaccinated or titered for infectious disease. Follow all safety procedures as describes in the SOP for samples suspected of containing biological hazards.

7.0 Sample Preservation, Containers, Handling and Storage

7.1 Refer to introductory material to Chapter 4 (SW-846), Organic Analytes, section 4.1 Sampling Considerations. The analytes listed in this method do not require any special pH adjustments or preservation considerations.

7.2 All samples will be taken and held at a temperature of ≤ 6°C until delivery to the laboratory. When the samples are delivered to the laboratory they are placed into a refrigerator that is kept at ≤ 6°C until extraction. Soil samples must be extracted within 14 days. Water samples must be extracted within 7 days. Extracts must be stored under refrigeration at ≤ 6°C and analyzed within 40 days from extraction.

8.0 Quality Control

8.1 Initial Demonstration of Capability (DOC):
A DOC is completed according to SOP # QC006 when a new employee starts work and annually thereafter.

8.2 An MDL study and LOD determination/verification is performed according to SOP # QC018. The laboratory maintains documentation for all detection limit determinations and LOD verifications.

8.3 The retention time of the chromatographic peak is an important parameter for the identity of the analyte. However, because matrix interferences can change chromatographic column conditions, the retention times are not as significant, and the mass spectra confirmations are important criteria for analyte identification.

8.4 A method blank is extracted and analyzed with each batch of 20 environmental samples or less. All target analytes in the method blank must be < RL. Acceptance criteria for DoD clients: No analytes detected at ≥ ½ LOQ. For common laboratory contaminants, no analytes detected ≥ RL. Corrective Action: If there is a detection above the quantitation limit (or > ½ LOQ for DoD) in the method blank the entire batch associated with the blank will be re-extracted and reanalyzed except when the sample analysis resulted in a non-detect. If not enough sample volume exists for a re-extraction the sample will be qualified with a 'B' with the flag 'compound found in the associated blank.

8.5 A laboratory control sample (LCS) containing all analytes to be reported, including surrogates is extracted once per batch. Statistically derived in-house control limits are used. The LCS results are uploaded to the control chart program automatically through Labworks. See SOP# QC016 for control chart generation. The control limits are reset annually. Control limits used may be defined by a client's project QAPP. The client's limits override the in-house limits. Each LCS is evaluated against the appropriate control limits before being reported. The laboratory uses project-specific control limits, if available. Otherwise, the laboratories own in-house control limits shall be used. The analyst can find the control limits for a particular project by looking at the Labworks code (ex.$L1_8321). The control limits are listed there.

8.5.1 For DoD projects, the recoveries for the analytes spiked in the LCS are compared with the LCS control limits. In-house control limits are set at + or – 3 times the standard deviation of the mean LCS recovery. If a recovery is less than the lower control limit or greater than the upper control limit, that is an exceedence. If the LCS recovery is outside the control limits, correct problem, then re-extract and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample is available. If reanalysis cannot be performed, data is qualified and explained in the case narrative. Apply appropriate flags to specific analyte(s) in all samples in the associated preparatory batch and complete an NWR form according to SOP QC033.

8.5.2 Corrective Action for non DoD projects: If the % recovery of a specific compound in the laboratory control spike is greater than the upper control limit and there are no positive findings for that compound, no further action is taken. If there are positive findings for that compound reanalyze the spike and all affected samples. If the % recovery of any compound fall below the lower control limit, reanalyze the spike and all affected samples. Client specific requirements for the exceptions are listed on the APPL Analysis Request Form (ARF).

8.6 A matrix spike and matrix spike duplicate are extracted with each batch provided enough volume of sample is received. The control limits used for the MS/MSD are the same as the control limits for the LCS. RPD is ≤ 30% (between MS and MSD). If an individual project has its own QAPP with client specific requirements different than 30% RSD, the client QAPP limits are used. If the any criteria are exceeded, contact the project manager who will contact the client as to additional measures to be taken. For the specific analyte(s) in the parent sample, apply appropriate flags if acceptance criteria are not met If the MS/MSD.

8.7 A surrogate compound is added to each sample and all QC samples prior to extraction. Experimentally derived in-house control limits are used. The surrogate results are uploaded to the control chart program automatically through Labworks.

See SOP# QC016 for control chart generation. The control limits are reset annually. Control limits used may be defined by a client's individual project QAPP with client specific control limits that are different than the in-house limits. The control limits for the surrogates for a particular project are in the client's Labworks code. The client's limits override the in house limits. If the surrogate recovers outside the control limits, correct problem, then reprep and reanalyze all samples in the associated preparatory batch for failed surrogates if sufficient sample material is available. If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply appropriate flags to specific analyte(s) in all samples in the associated preparatory batch and complete an NWR according to QC033.

8.7.1 The upper and lower control limits are established on 30 data points using control charts and are established on ± 3 standard deviations from the mean.

8.7.2 Corrective Action for non DoD samples: If the % recovery falls outside of the control limits the project manager will contact the client to determine the course of action.

8.7.3 Apply J flags to all results reported between the DL and the LOQ.

9.0 Equipment/Apparatus

9.1 HPLC/MS – UV/VIS

9.1.1 High performance Liquid Chromatograph (HPLC) – An analytical system with programmable solvent delivery system and all required accessories including injection loop, analytical columns, purging gases, etc. (HP 1090L or Agilent 1100 and 1200 LC's). A C18 Column 25cm x 4.6mm is used for Carbamate analysis and KP-RPPx250 250mmx4mm is used for Picric analysis.

9.1.2 APPL Inc. maintains a Finnigan LCQ ion trap Mass Spectrometer and an Agilent Technologies 1100 G1946D SL Mass Spectrometer. The Finnigan system has ms/ms collision-associated dissociation (CAD) capabilities; the Agilent system is a single quad instrument. Both LC/MS systems may be configured with either the APCI or ESI interfaces for either positive or negative ion modes of analysis. Certain carbamate compounds perform better in one or the other of these analysis modes. To help determine which mode is optimum, look at the molecular structure of the particular analyte of interest. ESI is a more affective ionization technique for molecules that form ions in solution. The mass Spectrometer may be set for negative ion polarity (for analytes with a high affinity for electrons after ionization has taken place) or positive ion (for analytes with an affinity for protonation after ionization).

9.1.3 Data System

The data acquisition software from each instrument supplier (Agilent, Finnigan and Waters), allows the continuous acquisition and storage of all masses within a designated range to be obtained throughout the duration of the chromatographs program. The software allows any MS data file to be searched for ions of a specified mass, and such ion abundances to be plotted versus time or scan number. This type of plot is defined as an Extracted ion Current Profile (EICP). The software also allows integration of the abundances in any EICP between specified time or scan number limits.

APPL Inc. proprietary software uses the raw data (generated from the instrument supplier's acquisition software) to quantitate the data for the

Finnigan LC/MS. See SOPs HPLFIN for the procedures on using the proprietary software. EnviroQuant software is used to quantitate the data for the Agilent 1100 LC-MS.

9.1.3.1 Balance - Analytical, capable of accurately weighing to the nearest 0.0001g.
9.1.3.2 Centrifuge
9.1.3.3 Syringes
9.1.3.4 Volumetric flasks and pipettes, all Class A1. 2, 5, 10, 25, and 50, 100, and 200 ml.
9.1.3.5 Separatory funnel - 2 Liter, PTFE.
9.1.3.6 Rotary evaporator – equipped with 1000mL receiving flask.
9.1.3.7 Evaporation flasks: 500 ml (Kintes K-570050-1025 or equivalent).
9.1.3.8 Boiling chips
9.1.3.9 Concentrator adapter.
9.1.3.10 Water bath: Heated, capable of temperature control ± 5 C)
9.1.3.11 Vials: 10-20mL scintillation vials.

10.0 Reagents and Standards

10.1 Reagent grade chemicals are used in all tests. Unless otherwise indicated, it is intended that all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available. Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the analysis. All reagents used are traceable at all steps of the procedure. Reference standards must be calibrated by a body that can provide ILAC-signatory (MRA) traceability.

10.2 The expiration date for analytical standards may be extended by following re-certification procedures below:

10.2.1 Contact the standard supplier and request an expiration date extension. If the supplier is not able to extend the date, then in-house re-certification may be performed as follows:

10.2.1.1 Analyze the expired standard and quantitate it against an unexpired standard from a different supplier or different lot # from same supplier.

10.2.1.2 For organic standards, the acceptance criteria is 20%D.

10.2.1.3 If the expired standard meets the above acceptance criteria, then extend the date by 3 months for organics.

10.2.1.4 The re-certification with extended expiration date is documented in the standard prep log book, along with the analysis date, instrument name, data file ID, and name of standard supplier with current unexpired lot number that was used to re-certify the expired standard.

10.2.2 Email this information to QAU.

10.3 Organic free reagent water.
10.4 Sodium sulfate (granular, anhydrous)
10.5 Ammonium acetate or ammonium formate.
10.6 Acetic acid, for Formic acid.
10.7 Solvents.

10.7.1 Methylene Chloride, pesticide quality or equivalent.

10.7.2 Methanol, HPLC quality or equivalent.
10.7.3 Acetonitrile, HPLC quality or equivalent.

10.8 Standard solutions: Refer to SOP HPL002 for calibration mix, spike and surrogate mix concentrations.

10.9 Stock Standard solutions may be prepared from pure standard materials or can be purchased as certified solutions The Quality Assurance Manager maintains copies of the Certificates of Analysis, which are available for review.

10.9.1 Prepare stock standard solutions by accurately weighing approximately 0.0100g from pure material and record the weight in the LC-STANDARD PREPARATION BOOK (current documentation book). Dissolve the material in methanol or acetonitrile and dilute to a known final volume in a volumetric flask. Alternatively, stock standards may be purchased in solution or as custom mixes from various chemical suppliers. The stock solutions should be kept under refrigeration (4 C) with a one-year expiration date from the date of preparation.

10.9.2 Prepare one or two second-source standards at the mid-level of the calibration curve from a purchased mixture of approximately 100ug/mL. The expiration date for the second source stock is one year from the date the ampule was opened. The second source should be purchased from a separate vendor form the primary calibration source. The working second source mid-point solution must be kept under refrigeration (4 C) with a two-month expiration date from the date of preparation.

10.9.3 Prepare a spike mix using the individual stock solutions or a custom mix in solution. The spike mix should be stored under refrigeration (4°C) with a four-month expiration date.

10.10 Calibration standards – A minimum of five different concentrations for each parameter of interest should be prepared through a series of dilutions of the stock standards with methanol or acetonitrile. Routine carbamate calibration curves consist of seven levels: 0.1ppm, 0.2ppm, 0.4ppm, 0.8ppm, 1.6ppm, 3.2ppm, and 6.4ppm. Picric Acid calibration curves consist of seven levels: 0.005ppm, 0.01ppm. 0.025ppm, 0.050ppm, 0.10ppm, 0.25ppm, and 0.50ppm. Working calibration standards should be kept under refrigeration (4°C) with a two-month expiration date from the date of preparation.

10.11 Surrogate standards – The analyst should monitor the performance of the extraction, analytical system, and the performance of the method in dealing with each sample matrix by spiking each sample, blank, and QA/QC sample with at least one surrogate. The surrogates currently employed are Tributyl-phosphate and Isoxaben for carbamates. Purchased surrogate mixtures of 1000ug/mL and/or stock standards prepared from neat material are used to prepare the working surrogate mixture at 2.0ug/mL for carbamates and 5.0ug/mL for Nitroaromatics/Nitrosamines. The working surrogate mix should be kept under refrigeration (4°C) with a four-month expiration date from the date the standard was prepared.

10.12 Internal standards. The internal standards used for carbamate analysis in the positive ion mode are Azodrin (Monocrotophos), Ridomil (Metalaxyl), and Thiobencarb. Dioxacarb is the I.S. used for negative ion mode. The concentration of the four internal standards in solution is 1.0ppm, and is prepared from individual stock solutions or a custom mixture at 1000ppm.

11.0 Calibration and Standardization

11.1 Calibration standards – A minimum of five different concentrations for each parameter of interest should be prepared through a series of dilutions of the stock standards with methanol or acetonitrile. Routine carbamate calibration curves consist of seven levels: 0.1ppm, 0.2ppm, 0.4ppm, 0.8ppm, 1.6ppm, 3.2ppm, and 6.4ppm. Picric Acid calibration curves consist of seven levels: 0.005ppm, 0.01ppm. 0.025ppm, 0.050ppm, 0.10ppm, 0.25ppm, and 0.50ppm. Working calibration standards should be kept under refrigeration (4°C) with a two-month expiration date from the date of preparation.

11.2 Initial Calibration Verification – Prepare one or two second source standards at the mid-level of the calibration curve from a purchased mixture of approximately 100ug/mL. The expiration date for the second source stock is one year from the date the ampule was opened. The second source should be purchased from a separate vendor form the primary calibration source.

12.0 Procedure

12.1 Preparation of water samples:

12.1.1 For Carbamates, one liter quantities of sample for routine analysis, and 1.5 L quantities of sample for low-level analysis are extracted by Method 3510C (SOP# SEP009C). If Aldicarb Sulfoxide is requested the samples are then acidified and 300g of sodium chloride is added to the samples and extracted again. Method standards are required for Aldicarb Sulfoxide analysis. The extracts are concentrated down to dryness and brought up to volume with 1mL of LC/MS Internal standard @ 1ppm in methanol.

12.1.2 For Nitroaromatics and Nitrosamines (including Picric Acid), Method 3535A extracts the water samples. 500mL of water sample is extracted by solid-phase chromatography for a final volume of 2mL (SOP# MWE3535).

12.2 Preparation of soil samples:

12.2.1 For Carbamates, thirty-gram quantities of soil are Methylene chloride / acetone extracted by method 3550B. (SOP# SON002).

12.2.1.1 Concentration steps are achieved using a rotary evaporator.

12.2.1.2 The 5-10mL extracts are transferred to a 20mL scintillation vial. The extracts are then taken to dryness using an adapter on the rotary evaporator. One mL of LC/MS INTERNAL STANDARDS @ 1ppm is then added to the scintillation vial.

12.2.1.3 Samples are prepared for injection by transferring approximately; 280µL of the final solution into a 300µL-injection vial and capped. The vial is spun in a centrifuge for approximately two minutes. The solution is then carefully transferred into another vial capped and is ready for injection.

12.2.1.4 For soils that are dark colored, a “water solubility test” must be performed prior to instrument analysis. Place one drop of sample extract into 0.5mL DI water in a 1.8mL-injection vial. Shake the solution, and if it is cloudy, then a 1:5 dilution should be performed on the original sample extract prior to being centrifuged. If the solution is clear, then no dilution is required. The solubility test is necessary for LC systems using methanol / water mobile phases. Extracts that are not soluble in water will cause the instrument to shut down upon sample introduction onto the guard column.

12.2.2 For Nitroaromatics and Nitrosamines (including Picric Acid), the soil samples are extracted by Method 8330. Ten gram quantities are extracted on the shaker with 20mL Acetonitrile. (SOP# MSE018).

13.0 Data Analysis and Calculations

13.0 HPLC and MS CONDITIONS;

13.1.1 For Carbamate analysis the mobile phase is Water / Methanol gradient

13.1.1.1 A minimum of two injections or analytical sequences (a positive and negative ion sequence) in order to be able to pick up all the compounds listed. Both the positive and negative ion sequences require water and methanol mobile phase. Acetic acid (1%) may be added to the mobile phase in order to achieve better chromatography for certain analytes.

13.1.1.2 Flow rate is 0.6mL/minute. Initial conditions are 5% methanol / 95% water. The ramp is to 100% methanol over 10 minutes. The 100% methanol is held for 5 minutes and then ramped back to 10% over 0.2 minutes. The 10% is held for 4.8 minutes before the next injection. The total run time is 20 minutes. Note that these are base parameters and are subject to change and/or analyst preference.

13.1.1.3 Total run time 20min

13.1.1.4 Injection volume 50uL

13.1.1.5 Ionization Source = APCI in positive and negative ion Full Scan modes.

13.1.1.6 The Finnigan LCQ-MS instrument's ms/ms CAD mode may also be employed to help eliminate chromatographic background noise from samples exhibiting matrix effects or to help confirm the presence of potential hits from the full scan mode

13.1.2 For Nitroaromatics/Nitrosamines LC-UV/MS analysis, the mobile phase is approximately 50:50 Water/Methanol isocratic (flow rate 0.5mL/min).

13.1.2.1 Total run time 25-90 minutes depending upon the analyte list.

13.1.2.2 Injection Volume 100uL

13.1.2.3 UV/VIS detector at 214nm.

13.1.2.4 Ionization Source = APCI in negative-ion Full Scan mode. Note that these are base parameters and are subject to analyst change and/or preference.

13.1.3 For Nitrotoluene isomers and nitrobenzene HRGC/HRMS analysis, the carrier gas is Helium, with a 1.0mL/min flow rate in constant pressure mode.

13.1.3.1 The initial oven temperature is 75℃, with a ramp of 15℃/min, held at 150℃ for 1 min, then a ramp of 5℃/min for a final temp of 275℃.

13.1.3.2 The total run time is 26 min.

13.1.3.3 Injection volume 1µL

13.1.3.4 Ionization polarity is positive

13.1.4 For Picric Acid analysis, the mobile phase is 50:50 water/methanol, run isocratically, with a 0.6mL/min flow rate.

13.1.4.1 The total run time is 20 min.

13.1.4.2 Injection Volume 200uL

13.1.4.3 Ionization Source = ESI in full scan mode.

13.2 Agilent and Finnigan Mass Spectrometer Calibration

13.2.1 Tuning for mass axis calibration is performed annually by the instrument supplier's service engineer, as documented in the instrument maintenance

logbooks. If the analyte masses indicate that a tune is required more frequently than once per year, an auto-tune may be performed in accordance to the manufacturer's instructions. See SOP HPLMAIN for further information on instrument maintenance and troubleshooting.

13.2.2 Waters HRMS Mass Calibration

13.2.2.1 The mass axis is tuned before each calibration curve and at the beginning of each analytical sequence, using the Waters software.

13.2.3 Instruments are calibrated according to factory specifications.

13.3 Liquid chromatographic calibration and sample analysis:

13.4 Prepare calibration standards as outlined in Section 6.7 and 6.8. The analysis scheme utilized consists of an instrument blank, calibration curve of a minimum of five data points, one or two 2nd source standards, a system blank, and then a series of QA/QC, blanks, and sample injections. Once a curve is generated and verified, twelve hours of analysis is allowed until a calibration check or recalibration is performed.

13.4.1 Calibration curves are generated by integrating the extracted ion profiles for the primary (most abundant) molecular ion for each compound of interest. A minimum of five points are to be used for quantitative analysis. It may be necessary to eliminate one or two higher points, or one or two lower points, or a point off each end. No mid level points may be eliminated even if they are obvious outliers, unless the entire calibration point is eliminated due to miss-injection. Method 8000B protocols are adhered to. Response factors are used to quantitate the data, if the % RPD is < 20 %. Linear regression may also be used to quantitate the data if the correlation coefficient > 0.990. For DoD clients, the linear correlation coefficient should be > 0.995. The option of using relative response factors from internal standards is also available. Standard protocols are adhered to in relation to calibration criteria relating to the internal standard approach. If a calibration criterion is not met, then sample analysis may not proceed. Instrument maintenance or re-prep / re-analysis of the calibration curve may be required.

13.4.2 Calibration curves for the UV/VIS are generated using area response or peak heights. Minimums of five points are to be used for quantitative analysis. It may be necessary to eliminate two higher points, or two lower data points, or a point off each end. No mid level points may be eliminated even if they are obvious outliers, unless the entire calibration point is eliminated due to miss-injection. Method 8000B protocols are adhered to. Response factors are used to quantitate the data, if the % RPD is < 20 %. Linear regression may also be used to quantitate the data if the correlation coefficient > 0.990. For DoD clients, the linear correlation coefficient should be > 0.995. If a calibration criterion is not met, then sample analysis may not proceed. Instrument maintenance or re-prep / re-analysis of the calibration curve may be required.

13.4.3 Continuing calibrations and 2nd source calibration acceptance criteria is 20%D compared to the primary calibration curve. Samples following CCVs that fails to meet the 20%D criteria should be re-analyzed with acceptable CCVs. Instrument maintenance or re-prep / re-analysis of the CCV may be required.

13.4.4 For DoD 5.0 projects, if a CCV fails, the laboratory can immediately analyze two additional consecutive CCVs (immediately is defined as starting a consecutive pair within one hour; no samples can be run between the failed

CCV and the two additional CCVs). This approach allows for spurious failures of analytes to be reported without reanalysis of samples. Any corrective actions that change the dynamics of the system (e.g., clip column, clean injection port, run blanks) requires that all samples since the last acceptable CCV be reanalyzed. Both of these CCVs must meet acceptance criteria in order for the samples to be reported without reanalysis. If either of these two CCVs fail or if the laboratory cannot immediately analyze two CCVs, the associated samples cannot be reported and must be reanalyzed. Flagging of data for a failed CCV is only appropriate when the affected samples cannot be reanalyzed. The lab must notify the client prior to reporting data associated with a failed CCV.

13.4.5 LC-MS quantitation of target analytes in actual samples is performed using the appropriate calibration of the analyte response generated from the extracted ion profiles in the samples' data file. A spectrum should contain the appropriate secondary ions for firm confirmation. If possible, the attempt will also be made to confirm positive hits by MS/MS or an alternative ionization mode.

13.4.6 For Nitroaromatics/Nitrosamines analysis, the three nitrotoluene isomers and nitrobenzene do not ionize and have no response on the LC/MS. These compounds will only be quantitated and calibrated on the UV/VIS, using peak height or area response and retention times. The remaining Nitroaromatics/Nitrosamines will be quantitated using the area counts from the sample EIP data. If the nitrotoluene isomers and nitrobenzene compounds are present in the sample extracts, confirmation analysis will be performed using HRGC/HRMS, and calibration is performed using the area counts of the target ions.

13.5 Calculations

13.5.1.1 Example calculations for response (calibration) factor and linear regression calculations:

13.5.2 Response Factor Calculation:

13.5.2.1 <u>Sample response</u> X DF = concentration analyte (µg/kg)
13.5.2.2 Response factor

13.5.3 Linear Regression Calculation:

13.5.3.1 <u>Sample response – intercept</u> X DF = concentration analyte µg/kg
13.5.3.2 Slope

13.5.4 DF = Final volume (1mL)/initial volume (0.030kg) for carbamate soil analysis

13.5.4.1 Final volume (1mL)/initial volume (1.0L or 1.5L) for carbamate water and LL water analysis respectively

13.5.5 Final volume (20mL)/initial volume (0.01kg) for explosives soil analysis

.5.5.1.1 Final volume (5.0mL)/initial volume (0.5L) for explosives water analysis

13.6 See SOP# DOC014 for formulas and calculations used to obtain and utilize the calibration curves.

14.0 Data Assessment and Acceptance Criteria for QC

14.1 Data Validation

14.1.1 The analyst completing the work first reviews data. The calibration curve is reviewed, the spike recovery, and precision is reviewed. If at any point the review shows an out of control situation, the section manager is notified verbally and the problem is investigated. The correction may be one of several points considered; standard preparation, improper injection size, extraction technique, etc. The problem is potentially solved and re-analyzed or re-extraction/re-analysis is completed. These points are documented on the Multilevel Quality Control Sign-Off worksheet.

14.1.2 When QC parameters are exceeded for a sample, the sample is reanalyzed. If the sample is still outside QC parameters the following will take place: The case narrative or case letter explains the sequence of events and the data is qualified.

15.0 Corrective Actions and Contingencies for Out of Control Data or Unacceptable Data

15.1 The quality control set consists of a method blank, laboratory control spike (LCS), and a matrix spike/matrix spike duplicate for each batch of 20 samples or less. The surrogate compounds are added to all samples and QC prior to extraction.

15.2 Spike QC limits: The upper and lower control limits are established on 30 data points using control charts and are established on ± 3 standard deviations from the mean. (See SOP# QC016 for control chart generation.)

15.3 Corrective Action for Spike failure: If the % recovery of a specific compound in the laboratory control spike is greater than the upper control limit and there are no positive findings for that compound, no further action is taken. If there are positive findings for that compound reanalyze the spike and all affected samples or flag the results with a 'J'. If the % recovery of any compound fall below the lower control limit, reanalyze the spike and all affected samples. Client specific requirements for the exceptions are listed on the APPL Analysis Request Form (ARF).

15.4 Surrogate limits: Isoxaben and Tributyl_phosphate are the surrogates for 8321. If the surrogate recovery falls outside acceptance criteria for a sample, the sample should be re-analyzed. If the recovery is still out of control, the sample is re-extracted and re-analyzed, unless client QAPP indicates an alternate corrective action. The upper and lower control limits are established using 30 data points based on ± 3 standard deviations from the mean.

15.5 Corrective Action for Surrogate failure: If the % recovery falls outside of the control limits the project manager will contact the client to determine the course of action. If the client is unavailable, professional judgement should be used to determine if the sample would be reanalyzed or reported.

15.6 In the event that an out of control situation occurs, the project manager will be notified immediately. The effect of the out of control situation will be assessed according to the project DQO. If sufficient sample remains, and the situation will significantly affect the quality of the results, the sample will be re-extracted and re-analyzed. If the situation does not significantly affect the quality of the data, the project manager will notify the client and instructions from the client will be followed. In the event no sample remains, the client will be notified immediately. All situations will be documented on the multi level sheet and initialed by the project manager. All out of

control situations will be brought to the attention of the QAU in the form of an NWR. The QAU has the final authority to approve the actions taken.

16.0 Method deviations

EPA method 8321B[1] was written for the thermospray ionization technique, however APPL Inc. uses either Atmospheric Pressure Chemical Ionization or Electrospray Ionization since they are the most current technology in ionization techniques. The tuning of the mass spectrometers is performed on an as needed basis or according to the manufacturer's instructions.

17.0 Pollution Prevention

All hazardous materials that are generated during standard preparation must be properly collected and stored. Drums are available in the storage room for the following types of wastes- acidic, basic and solvents.

18.0 Waste Management

It is the laboratory's responsibility to comply with all federal, state, and local regulations governing waste management, particularly the hazardous waste identification rules and land disposal restrictions. The laboratory has the responsibility to protect the environment by minimizing and controlling all releases from fume hoods and bench operations.

19.0 Method Performance

19.1 Continuing method performance is monitored by analysis of LCS samples with each batch and control charting the results as per SOP# QC016.

19.2 A method detection Limit (MDL) study is run to ensure the performance of the instrumentation is able to satisfy data quality objectives of the client by reaching the reporting limits necessary. An MDL study is performed for each matrix per instrument after major instrument changes take place, such as a column change and is performed in accordance with SOP# QC018.

19.3 The method is not performed by any analyst until a Demonstration of Capability (DOC) is completed. Every analyst who performs this method has demonstrated acceptable accuracy and precision by passing a Demonstration of Capability study. (See section 8.1)

20.0 Equipment/Instrument Maintenance and Troubleshooting

20.1 HPLC Maintenance

20.2 The HPLC instruments should be maintained by keeping the solvent reservoirs filled and the compressed gas tanks that run the pneumatics filled at all times.

20.3 The solvent reservoir filter frit should be changed periodically if the chromatography indicates a significant reduction in response.

20.4 The six-port sample delivery valve seal may need to be replaced periodically if the chromatography indicates a significant shift in retention times. Leaks may be detected by physically noticing the mobile phase leaking from the valve.

20.5 Parts replacement for the HP 1090 LC may be purchased through Alpha Omega Technologies (phone # 1-800-842-5742).

20.6 Parts replacement or technical support for the Agilent 1100 LC may be obtained through Agilent Technologies (phone # 1-800-227-9770).

20.7 Mass Spec Maintenance

20.8 The Mass Specs should be maintained annually, as a preventative measure, by a certified service technician from the instrument manufacturer. Periodic Maintenance may be scheduled through the following contacts:

For the Agilent 1100 Mass Spec:
Agilent Technologies (Phone # 1-800-227-9770)
For the Finnigan LCQ Mass Spec:
Finnigan (Phone # 1-408-433-4800)
Technical support may also be acquired through the above listed contacts.

20.9 Because of the level of expertise of the LC-MS personnel (over 20 years experience with the instrumentation), subtle changes in chromatography and detector quality are monitored on a daily basis and MS maintenance and trouble-shooting may be performed as situations arise where chromatography or instrument response indicates a problem. Warning flags indicating a decrease in data quality include: a decreased detector response, elevated baseline or calibration inconsistencies. The first trouble shooting technique that should be performed is to tune the Mass Spec. The tuning procedure may be found in either of the following operation references located in the front office of the LC-MS Dept:

Finnigan LCQ MS Detector Hardware Manual, Rev C April 1997, or
Agilent 1100 Series LC/MSD Reference Collection CD's

20.10 If the instrument fails to tune, then a service call should be placed with the manufacturer. Procedures for cleaning the APCI and Electrospray sources, the Ion optics, the mass analyzer and the electron multiplier may be found in the manufacturer's references listed above.

20.11 Maintenance performed on the instruments by APPL, Inc. personnel or service technicians will be documented in the instrument maintenance logbooks in accordance with SOP # DOC002.

21.0 Computer hardware and software

21.1 EnviroQuant G1701AA Version A.03.00 Copyright © Hewlett-Packard 1989-1996-APPL, Inc. 2006-07-24.
21.2 Agilent 1100 Series LC/MSD Reference Collection CD's.
21.3 LCQ Detector Hardware Manual Revision C April 1997, 97000-97003
21.4 LCQ Software Manual Revision C June 1997, 97000-97002

22.0 References

22.1 Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, Update IVB
22.2 Method 8321A, USEPA SW-846, Revision 4, December 1996
22.3 Method 8321B, USEPA SW-846, Revision 2, February 2007
22.4 DoD QSM, Version 5.0 July 2013
22.5 ISO/IEC 17025:2005(E)

23.0 Tables, Diagrams, Flowcharts, Validation Data

23.1 Table 1: recommended PQL limits
23.2 Table 2: DoD QSM, version 5.0, Table 2

Section Manager Name: Paula Young

Section Manager Signature: Paula Young Date: 1/4/16

QAU Director Name: Frances Lediaev

QAU Director Signature: Frances Lediaev Date: 1/4/16

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Table 1

(Recommended Practical Quantitation Limits in Water and Soil Matrices)

	WATER PQL-µg/L	SOIL PQL-µg/Kg	Low-Level WATER PQL-µg/L
Aldicarb	1	20	0.4
Aminocarb	1	20	0.4
Barban	5	70	3.5
Benomyl/Carbendazim	1	20	0.4
Bromacil	1	20	0.4
Carbaryl	1	20	0.07
Carbofuran	1	20	0.07
Chloroxuron	1	20	0.4
Chlorpropham	5	70	3.5
Diuron	1	20	0.4
Fenuron	1	20	0.4
Fluometuron	1	20	0.4
Linuron	1	20	0.4
Methiocarb	1	20	0.4
Methomyl	1	20	0.07
Mexacarbate	5	70	0.8
Monuron	1	20	0.4
Neburon	1	20	0.4
Oryzalin	1	20	0.4
Oxamyl	1	20	0.4
Propachlor	1	70	0.4
Propham	5	70	3.5
Propoxur	1	20	0.4
Siduron	1	20	0.4
Tebuthiuron	1	20	0.4

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Table 1 (Cont.)

(Recommended Practical Quantitation Limits in Water and Soil Matrices)

	WATER PQL-µg/L	SOIL PQL-µg/Kg
2-Am-4,6-DNT	0.25	250
4-Am-2,6-DNT	0.25	250
1,3-DNB	0.25	250
2,4-DNT	0.25	250
2,6-DNT	0.25	250
HMX	0.25	250
Nitrobenzene	0.25	250
Nitroglycerine	1.25	1250
4-NT	0.25	250
3-NT	0.25	250
2-NT	0.25	250
PETN	1.25	1250
RDX	0.25	250
Tetryl	0.25	250
1,3,5-TNB	0.25	250
2,4,6-TNT	0.25	250
Picric Acid	0.12	240

APPL Inc Confidential

Table 2

Table – 2. Organic Analysis by High-Performance Liquid Chromatography (HPLC)					
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**	**Flagging Criteria**	**Comments**
Initial Calibration (ICAL) for all analytes (including surrogates)	At instrument set-up and after ICV or CCV failure, prior to sample analysis.	ICAL must meet one of the three options below: Option 1: RSD for each analyte ≤ 20%; Option 2: linear least squares regression for each analyte: $r^2 \geq 0.99$; Option 3: non-linear least squares regression (quadratic) for each analyte: $r^2 \geq 0.99$.	Correct problem then repeat ICAL.	Flagging is not appropriate.	Minimum 5 levels for linear and 6 levels for quadratic. No samples shall be analyzed until ICAL has passed.
Retention Time window position establishment	Once per ICAL and at the beginning of the analytical sequence.	Position shall be set using the midpoint standard of the ICAL curve when ICAL is performed. On days when ICAL is not performed, the initial CCV is used.	NA.	NA.	Calculated for each analyte and surrogate.
Retention Time (RT) window width	At method set-up and after major maintenance (e.g., column change).	RT width is ± 3 times standard deviation for each analyte RT from the 72-hour study.	NA.	NA.	Calculated for each analyte and surrogate.
Initial Calibration Verification (ICV)	Once after each ICAL, analysis of a second source standard prior to sample analysis.	All reported analytes within established RT windows. All reported analytes within ± 15% of true value.	Correct problem, rerun ICV. If that fails, repeat ICAL.	Flagging is not appropriate.	No samples shall be analyzed until calibration has been verified with a second source.

Table 2, continued

Table – 2. Organic Analysis by High-Performance Liquid Chromatography (HPLC)					
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**	**Flagging Criteria**	**Comments**
Continuing Calibration Verification (CCV)	Before sample analysis, after every 10 field samples, and at the end of the analysis sequence.	All reported analytes and surrogates within established RT windows. All reported analytes and surrogates within ± 15% true value.	Recalibrate, and reanalyze all affected samples since the last acceptable CCV; or Immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, take corrective action(s) and re-calibrate; then reanalyze all affected samples since the last acceptable CCV.	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply Q-flag to all results for the specific analyte(s) in all samples since the last acceptable calibration verification.	Results may not be reported without a valid CCV. Flagging is only appropriate in cases where the samples cannot be reanalyzed. Retention time windows are updated per the method.
Method Blank (MB)	One per preparatory batch.	No analytes detected > 1/2 LOQ or > 1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater.	Correct problem. If required, reprep and reanalyze MB and all samples processed with the contaminated blank.	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch.	Results may not be reported without a valid method blank. Flagging is only appropriate in cases where the samples cannot be reanalyzed.
Laboratory Control Sample (LCS)	One per preparatory batch.	A laboratory must use the QSM Appendix C Limits for batch control if project limits are not specified. If the analyte(s) are not listed, use in-house LCS limits if project limits are not specified.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for the failed reported analytes, if sufficient sample material is available.	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.	Results may not be reported without a valid LCS. Flagging is only appropriate in cases where the samples cannot be reanalyzed.

Table 2, continued

Table – 2. Organic Analysis by High-Performance Liquid Chromatography (HPLC)					
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**	**Flagging Criteria**	**Comments**
Matrix Spike (MS)	One per preparatory batch.	A laboratory must use the QSM Appendix C Limits for batch control if project limits are not specified. If the analyte(s) are not listed, use in-house LCS limits if project limits are not specified.	Examine the project-specific requirements. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met and explain in the case narrative.	If MS results are outside the limits, the data shall be evaluated to determine the source(s) of difference, i.e., matrix effect or analytical error.
Matrix Spike Duplicate (MSD) or Matrix Duplicate (MD)	One per preparatory batch.	A laboratory must use the QSM Appendix C Limits for batch control if project limits are not specified. If the analyte(s) are not listed, use in-house LCS limits if project limits are not specified. RPD ≤ 30% (between MS and MSD or sample and MD).	Examine the project-specific requirements. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met and explain in the case narrative.	The data shall be evaluated to determine the source of difference.
Surrogate Spike	All field and QC samples.	QC acceptance criteria specified by the project, if available; otherwise use QSM Appendix C limits or in-house LCS limits if analyte(s) are not listed.	Correct problem, then reprep and reanalyze all failed samples for all surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	Apply Q-flag to all associated analytes if acceptance criteria are not met and explain in the case narrative.	Alternative surrogates are recommended when there is obvious chromatographic interference.

Table 2, continued

Table – 2. Organic Analysis by High-Performance Liquid Chromatography (HPLC)					
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**	**Flagging Criteria**	**Comments**
Confirmation of positive results (second column)	All positive results must be confirmed.	Calibration and QC criteria for second column are the same as for initial or primary column analysis. Results between primary and secondary column/detector RPD ≤ 40%.	NA.	Apply J-flag if RPD > 40%. Discuss in the case narrative.	Spectral match confirmation of a UV detector with a UV diode array detector (or vice versa) is not considered an acceptable confirmation technique. A second column confirmation is required. Use project-specific reporting requirements if available; otherwise, use method requirements, if available; otherwise, report the result from the primary column.

APPENDIX I. LICENSES AND PERMITS

This appendix contains:

- BATFE license
- Persons Authorized to Accept Delivery of Explosives form.

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U.S. Department of Justice
Bureau of Alcohol, Tobacco, Firearms and Explosives

Federal Explosives License/Permit
(18 U.S.C. Chapter 40)

In accordance with the provisions of Title XI, Organized Crime Control Act of 1970, and the regulations issued thereunder (27 CFR Part 555), you may engage in the activity specified in this license or permit within the limitations of Chapter 40, Title 18, United States Code and the regulations issued thereunder, until the expiration date shown. **THIS LICENSE IS NOT TRANSFERABLE UNDER 27 CFR 555.53.** See "WARNINGS" and "NOTICES" on reverse.

Direct ATF Correspondence To	ATF - Chief, FELC 244 Needy Road Martinsburg, WV 25405-9431	License/Permit Number	**1-FL-103-20-7J-00784**
Chief, Federal Explosives Licensing Center (FELC)	Christopher R. Reeves	Expiration Date	**September 1, 2017**

Name
USA ENVIRONMENTAL INC

Premises Address (Changes? Notify the FELC at least 10 days before the move.)
720 BROOKER CREEK BOULEVARD SUITE 204
OLDSMAR, FL 34677-

Type of License or Permit
20-MANUFACTURER OF EXPLOSIVES

Purchasing Certification Statement

The licensee or permittee named above shall use a copy of this license or permit to assist a transferor of explosives to verify the identity and the licensed status of the licensee or permittee as provided by 27 CFR Part 555. The signature on each copy must be an original signature. A faxed, scanned or e-mailed copy of the license or permit with a signature intended to be an original signature is acceptable. The signature must be that of the Federal Explosives Licensee (FEL) or a responsible person of the FEL. I certify that this is a true copy of a license or permit issued to the licensee or permittee named above to engage in the business or operations specified above under "Type of License or Permit."

Mailing Address (Changes? Notify the FELC of any changes.)
USA ENVIRONMENTAL INC
720 BROOKER CREEK BOULEVARD SUITE 204
OLDSMAR, FL 34677-

Jonathan Chionchio
Licensee/Permittee Responsible Person Signature

President
Position/Title

Jonathan Chionchio
Printed Name

August 29, 2014
Date

Previous Edition is Obsolete USA ENVIRONMENTAL INC:720 BROOKER CREEK BOULEVARD SUITE 204:34677:1-FL-103-20-7J-00784:September 1, 2017:20-MANUFACTURER OF EXPLOSIVES

ATF Form 5400.14/5400.15 Part I
Revised October 2011

Federal Explosives License (FEL) Customer Service Information

Federal Explosives Licensing Center (FELC)
244 Needy Road
Martinsburg, WV 25405-9431

Toll-free Telephone Number: (877) 283-3352
Fax Number: (304) 616-4401
E-mail: FELC@atf.gov

ATF Homepage: www.atf.gov

Change of Address *(27 CFR 555.54(a)(1))*. Licensees or permittees may during the term of their current license or permit remove their business or operations to a new location at which they intend regularly to carry on such business or operations. The licensee or permittee is required to give notification of the new location of the business or operations not less than 10 days prior to such removal with the Chief, Federal Explosives Licensing Center. The license or permit will be valid for the remainder of the term of the original license or permit. **(The Chief, FELC, shall, if the licensee or permittee is not qualified, refer the request for amended license or permit to the Director of Industry Operations for denial in accordance with § 555.54.)**

Right of Succession *(27 CFR 555.59)*. (a) Certain persons other than the licensee or permittee may secure the right to carry on the same explosive materials business or operations at the same address shown on, and for the remainder of the term of, a current license or permit. Such persons are: (1) The surviving spouse or child, or executor, administrator, or other legal representative of a deceased licensee or permittee; and (2) A receiver or trustee in bankruptcy, or an assignee for benefit of creditors. (b) In order to secure the right provided by this section, the person or persons continuing the business or operations shall furnish the license or permit for for that business or operations for endorsement of such succession to the Chief, FELC, within 30 days from the date on which the successor begins to carry on the business or operations.

(Continued on reverse side)

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Federal Explosives License/Permit (FEL) Information Card

License/Permit Name: **USA ENVIRONMENTAL INC**

Business Name:

License/Permit Number: **1-FL-103-20-7J-00784**

License/Permit Type: **20-MANUFACTURER OF EXPLOSIVES**

Expiration: **September 1, 2017**

Please Note: Not Valid for the Sale or Other Disposition of Explosives.

WARNINGS

1. As provided in Title XI of the Organized Crime Control Act of 1970 (U.S.C. § 842(i)), it is unlawful for any person who (1) is under indictment for, or has been convicted in any court of, a crime punishable by imprisonment for a term exceeding 1 year, (2) is a fugitive from justice, (3) is an unlawful user of, or addicted to any controlled substance *(as defined in section 102 of the Controlled Substances Act (21 U.S.C. 802))*, (4) has been adjudicated as a mental defective or has been committed to a mental institution, to ship, transport, or receive any explosive materials in interstate or foreign commerce, (5) is an alien, other than an alien who is lawfully admitted for permanent residence *(as that term is defined in section 101(a)(20) of the Immigration and Naturalization Act)*, or meets any other exception under section 842(i)(5), (6) has been discharged from the armed forces under dishonorable conditions, or (7) having been a citizen of the United States, has renounced the citizenship of that person.
2. **Federal Regulation 27 CFR 555.53 - Licensees and permits issued under this part are not transferable to another person. In the event of the lease, sale, or other transfer of the business or operations covered by the license or permit, the successor must obtain the license or permit required by this part before commencing business or operations.**
3. **Alteration or Changes to the License or Permit. Alterations or changes in the original license or permit or in duplications thereof violates 18 U.S.C. 1001, an offense punishable by imprisonment for not more than 5 years and/or a fine of not more than $250,000.**

NOTICES

1. Any change in trade name or control of this business or operations MUST be reported within 30 days of the change to the Chief, Federal Explosives Licensing Center (FELC), 244 Needy Road, Martinsburg, WV 25405-9431. (27 CFR 555.56-555.57). A licensee or permittee who reports a Change of Control must, upon expiration of the license or permit, file an ATF Form 5400.13/5400.16.
2. Under § 555.46, Renewal of License/Permit, if a licensee or permittee intends to continue the business or operations described on a license or permit issued under this part during any portion of the ensuing year, the licensee or permittee shall, unless otherwise notified in writing by the Chief, FELC, execute and file with ATF prior to the expiration of the license or permit an application for a license or permit renewal, ATF Form 5400.14/5400.15 Part III, in accordance with the instructions on the form, and the required fee. In the event the licensee or permittee does not timely file an ATF Form 5400.14/5400.15 Part III, the licensee or permittee must file an ATF Form 5400.13/5400.16 as required by § 555.45, and obtain the required license or permit before continuing business or operations. A renewal application will automatically be mailed by ATF to the "mailing address" on the license or permit approximately 60 days prior to the expiration date of the license or permit. If the application is not received 30 days prior to the expiration date, the licensee or permittee should contact the FELC. **Note:** The user-limited permits are not renewable.
3. This license or permit is conditional upon compliance by you with the Clean Water Act (33 U.S.C. § 1341(a)).
4. THIS LICENSE OR PERMIT MUST BE POSTED AND KEPT AVAILABLE FOR INSPECTION (27 CFR 555.101).

ATF Form 5400.14/5400.15 Part I
Revised October 2011

Federal Explosives License (FEL) Customer Service Information

(Continued from front)

Discontinuance of Business *(27 CFR 555.61)(27 CFR 555.128)*. Where an explosives materials business or operations is succeeded by a new licensee or permittee, the records prescribed by this subpart shall appropriately reflect such facts and shall be delivered to the successor, or may be, within 30 days following business discontinuance, delivered to the ATF Out-of-Business Records Center, 244 Needy Road, Martinsburg, WV 25405, or to any ATF office in the division in which the business was located. Where discontinuance of the business is absolute, the records shall be delivered within 30 days following the business discontinuance to the ATF Out-of-Business Records Center, 244 Needy Road, Martinsburg, WV 25405, or to any ATF office in the division in which the business was located.

Explosive materials must be stored in conformance with requirements set forth in 27 CFR, Part 55. It is unlawful for any person to store any explosive materials in a manner not in conformity with these regulations.

TO REPORT LOST OR STOLEN EXPLOSIVES, YOU MUST IMMEDIATELY NOTIFY ATF:
CALL TOLL FREE - (888) ATF-BOMB

✂ **Cut Here**

Federal Explosives Licensing Center (FELC)
244 Needy Road
Martinsburg, WV 25405-9431

Toll-free number: (877) 283-3352
Fax number: (304) 616-4401
E-mail: FELC@atf.gov

ATF Hotline Numbers

Arson Hotline: 1-888-ATF-FIRE (1-888-283-3473)
Bomb Hotline: 1-888-ATF-BOMB (1-888-283-2662)
Report Illegal Firearms Activity: 1-800-ATF-GUNS (1-800-283-4867)
Firearms Theft Hotline: 1-888-930-9275
Report Stolen, Hijacked or Seized Cigarettes: 1-800-659-6242
Other Criminal Activity: 1-888-ATF-TIPS (1-888-283-8477)

List of Persons Authorized to Request and Accept Delivery of Explosives

Name: USA Environmental, Inc.
License No: 1-FL-103-20-7J-00784
Expires: 9/1/2017

Address: 720 Brooker Creek Blvd, Ste# 204
Oldsmar, FL 34677

By my signature below, I certify that the persons listed below are authorized by me to accept delivery of, possess and use explosives on behalf of USA Environmental, Inc.:

Robert Crownover — Director of Safety and Quality, Responsible Person
Print Name — Job Title

Signature — Date Signed

Intended Use Statement: Unexploded ordnance detonation.

List of names (Last Name, First Name, MI:

(To be determined at time of fieldwork)

EXAMPLE

APPENDIX J. CHEMICAL COMPOSITION OF MUNITIONS KNOWN OR SUSPECTED

This appendix contains the table of Chemical Composition of munitions known or suspected to have been used on Cayo Botella and Cayo del Agua.

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Chemical Composition of Munitions Known or Suspected - Cayo Botella and Cayo del Agua

Cayo	General Munition Type	Type Model	Case Composition	Filler	Potential Constituent
Cayo Botella	Projectile 6-inch	47 Cal HC Mk 34	Steel	Explosive D	Magnesium, ammonium picrate, potassium
Cayo Botella	Projectile, high-explosive incendiary 20mm	MK 1	Steel	IMR powder incendiary mixture	Ammonium, aluminum, magnesium, tetryl
		Fuze – MK.III		Tetryl,	
		Primer- M36A1		Composition A – ammonium nitrate	
		Cartridge M21A11		Tetryl	
Cayo del Agua	Projectile, 76mm, unspecified	UNK	Steel	TNT, Lead Azide, black powder, tetryl booster, FNH propellant	RDX, TNT
Cayo Botella (MK 82) Cayo del Agua (all MK 80 series) Both cays 2000 pound inert bombs	Bomb, Mk 80 series	Mk 81	Steel	Tritonal, H6, TNT, Comp B or Amatol Spotting charge: black powder, smokeless powder, zinc oxide, titanium tetrachloride	TNT, aluminum
		Mk 82			
		Mk 83			
		Mk 84			
Cayo Botella and Cayo del Agua	Bomb, practice	Mk 76	Steel	Spotting charge: black powder, smokeless powder, zinc oxide, titanium tetrachloride	Iron, potassium, zinc, titanium
Cayo del Agua	Rocket, 2.75-inch	M 151, M 229 HE	Steel	Comp B4	RDX, TNT, Calcium, White phosphorus, magnesium, sodium nitrate, RDX, TNT, nitroglycerin, lead
		M 247 HEDP		White phosphorus	
		M 156 WP		Illumination composition	
		M 257 Illumination		Comp B	
		M 261 Multi-purpose, sub-munition (M73)		N-5 propellant	
		Mk40 Rocket Motor	Aluminum	TNT	

Cayo	General Munition Type	Type Model	Case Composition	Filler	Potential Constituent
Cayo Botella	Rocket, 5-inch	Zuni	Steel, copper	HBX (Torpex)	RDX, TNT, nitroglycerin, copper, iron
Cayo Botella and Cayo del Agua	MK 44 and MK 45 Aircraft Flares				

APPENDIX K. TIME CRITICAL REMOVAL ACTION CAYO DEL AGUA, EXPLOSIVES SAFETY SUBMISSION

This appendix contains the Explosives Safety Submission for Cayo del Agua.

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Explosives Safety Submission

TIME CRITICAL REMOVAL ACTION

CAYO DEL AGUA, CULEBRA ISLAND, PUERTO RICO

GEOGRAPHICAL LOCATION: JACKSONVILLE
PROJECT NUMBER: I02PR006802

SEPTEMBER 2016

USA ARMY CORPS OF ENGINEERS

Engineering and Support Center, Huntsville

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1.0 SITE

1.1 NAME:

Time Critical Removal Action (TCRA), Cayo del Agua

1.2 ADDRESS:

Culebra Island, Puerto Rico

2.0 ANTICIPATED DATES

2.1 START:

November 23, 2016

2.2 COMPLETE:

February 15, 2017

3.0 PURPOSE

The objective of this TCRA is to remove Munitions and Explosives of Concern (MEC), Material Potentially Presenting an Explosive Hazard (MPPEH) and Explosive Hazards from the land portions of Cayo del Agua, Culebra, Puerto Rico, per the TCRA Action Memorandum dated 07 June 2016. Tasks assigned under this Task Order (TO) fall within the Defense Environmental Restoration Programs-Formerly Used Defense Site (DERP-FUDS) Military Munitions Response Program for Culebra, a FUDS. Project tasks will be performed in compliance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), and the National Contingency Plan (NCP), 40 Code of Federal Regulations (CFR) Part 300.

4.0 SITE BACKGROUND AND CURRENT CONDITIONS

The former usage for Cayo del Agua was for artillery, aerial bombing and rocket firing. The U.S. Navy and U.S. Marines conducted fleet maneuvers and Fleet Landing Exercises (FLEX) between 1923 and 1975. MK80s series general purpose High Explosive (HE) and practice bombs, 2.75-inch rockets, MK 76 practice bombs, a 76mm projectile, and evidence of aircraft flares have been located on Cayo del Agua. Other suspected munitions used in Cayo del Agua include MK 25 and MK 45 flares and 20mm projectiles. In November 2015, U.S. Army Corps of Engineers (USACE) contractors identified more than 60 intact MK 76 practice bombs (most of them with cartridges) on the cayo. Parts of 2.75-inch rocket motors were observed on the cayo, and since no practice warheads were observed the rocket motor parts were assumed to be from HE rockets.

The cayo is part of the Culebra National Wildlife Refuge (NWR), which protects important habitats for migratory shorebirds and nesting seabirds. U.S. Fish and Wildlife Service (FWS) personnel and volunteers access the cayo on a recurring basis in order to conduct wildlife censuses. Recreational users and boaters may also conduct activities at the cayo that could trigger an unintentional detonation of a munition item. Additionally, local shellfish harvesters park their boats at Cayo del Agua and typically walk through the shallow water to gather conch and other shellfish.

The potential presence of large, HE, ordnance items at Cayo del Agua present a significant imminent risk to public health and safety because local shellfish harvesters access and walk through the cay and same shallow waters that contain munitions items.

5.0 EXECUTING AGENCIES

U.S. Army Corps of Engineers, Jacksonville District, Wilberto Cubero-Deltoro, Project Manager, (904) 232-1426

U.S. Army Engineering & Support Center, Huntsville, Teresa Carpenter, Contracting Officer's Representative, (256) 895-1659

USA Environmental, Inc., Thomas Bourque, Project Manager, (941) 746-5375

6.0 SCOPE OF REMOVAL ACTION

The selected response actions to be performed under this TCRA include surface and subsurface removal of unexploded ordnance (UXO) on the land portion of Cayo del Agua. The TCRA will include the following manual operations: (1) Conducting identification (visual and geophysics), (2) Confirmation, (3) Surface and subsurface removal, and (4) Disposal of recovered MEC on the cay discovered. The TCRA will be performed on 5.34 acres of the land portion of the MRS. Anomalies shall be resolved regardless if water is encountered. Subsurface MEC or MPPEH removal will be conducted to the depth of detection or until bedrock is encountered.

7.0 SAFETY CRITERIA

The minimum separation distances (MSD) listed below will be applied during the TCRA. Preliminary site work such as surveying, laying grid lanes and anomaly detection do not require the establishment of a MSD for Quantity-Distance (Q-D) purposes. Essential personnel are defined as those on-site contractor and DoD personnel required to participate in the MEC removal, along with those approved and authorized visitors. All other personnel are non-essential personnel. The outer boundaries of the MSD arcs are depicted on the Q-D maps in Appendix A: Site Maps.

Any occupied buildings or waterways in the MSD areas during MEC operations will be evacuated. Chase or security boats will be employed to escort non-essential personnel out of the MSD area. MEC operations will cease until MSD areas are void of non-essential personnel.

Material Potentially Presenting an Explosive Hazard (MPPEH) procedures will be in accordance with DoD 4140.62 and EM 385-1-97. All MPPEH will be assessed and its explosives safety status determined and documented prior to transfer within the DoD or release from DoD control. Prior to release to the public, MPPEH will be documented by authorized and technically qualified personnel as Material Documented as Safe (MDAS) after a 100 percent inspection and an independent 100 percent re-inspection to determine that it is safe from an explosives safety perspective.

7.1 MGFD

Based upon historical usage sited in paragraph 4.0 above, the munition with the greatest fragmentation distance is the 2000 pound, Mk 84, HE general purpose bomb. Table 7-1 lists the munition with the greatest fragmentation distance (MGFD) for the MRS-Munitions Response Area (MRA). The team separation distance (TSD); the MSD for unintentional detonations for nonessential personnel; and the MSD for intentional single on site detonations for all personnel. If MEC with greater fragmentation distance is encountered, the MSD will be adjusted in accordance with DDESB Technical Paper (TP) 16, operations will continue, and an amendment to this ESS submitted for approval (a copy of this document will be available on site). Q-D arcs will be adjusted accordingly.

Table 7-1: MGFD Table

MRA	MGFD[1]	TSD[2] (ft)	MSD[3] (ft) unintentional detonation	MSD[4] (ft) intentional detonation
MRS 02				
Cayo del Agua	Mk 84 2000-lb Bomb (H-6 Fill)	437	963	4021
	Mk 84 2000 lb Bomb (Tritonal Fill)	401	935	4078

Notes:

1. *Combined MGFD for the Mk 84 2000-lb bomb is provided as historical documents do not specify the explosive payload.*
2. *For essential personnel for manual operations based on K40 of MGFD.*
3. *For nonessential personnel for manual operations based on the HFD of the MGFD*
4. *For all personnel for intentional single in-grid detonations based on the MFD of the MGFD.*

7.2 QUANTITY-DISTANCE MEC AREA UNINTENTIONAL DETONATION

The Team separation Distance (K40) is 437 feet and the Hazardous Fragmentation Distance (HFD) is 963 feet.

7.3 QUANTITY-DISTANCE INTENTIONAL DETONATION

The Maximum Fragmentation Distance, Horizontal (MFD-H) 4078 feet and the Maximum Fragmentation Distance-Vertical (MFD-V) is 3230 feet.

7.4 QUANTITY-DISTANCE DEMOLITION EXPLOSIVES STORAGE MAGAZINES

The contractor will not site a magazine for the storage of explosives. On-call explosives delivery will be used for the detonation of any MEC items recovered during operations. Explosives will be provided by a local vendor (Alba Explosives) on an “as-needed” basis. Should it be necessary to store explosives due to adverse weather conditions or other factors one magazine with attached cap box will be located at the designated explosives storage facility location (Figure 3). A Standard Operating Procedure is in place for accountability and security. The magazine is an un-barricaded Bureau of Alcohol, Tobacco, Firearms and Explosives (BATFE) Type II magazine. The total maximum net explosive weight (NEW) stored in the magazine will not exceed a total of 31 pounds.

7.5 ENGINEERING CONTROLS

If disposal activities are required, they will be performed by UXO personnel in accordance with TP 18 and within the MRS using the appropriate engineering control described below. If a MEC item is encountered, the Senior UXO Supervisor and UXO Safety Officer will determine if the item is acceptable or unacceptable to move within the sited MRS.

The use of sandbags [HNC-ED-CS-S-98-7, Amendments 1 and 2; HNC-ED-CS-S-00-3, HNC safety advisory dated 07 November 2011; and the Department of Defense Explosive Safety Board (DDESB) Memo dated May 22, 2014 (Revision of DDESB Approval for Use of Sandbags for Mitigation of Fragmentation and Blast Effects Resulting from the Intentional Detonation of Munitions)] or water mitigation (HNC-ED-CS-S-00-3) may be used to reduce the intentional detonation Minimum Safe Distance when permitted by the DDESB Fragmentation Data Review Form (Appendix B). Tamping (single or multiple items) may be used in accordance with DDESB TP-16 and the current version of the Buried Explosion Module (BEM) version 6.3.3 or later. These references will be available on site for all mitigation methods used. The use of sandbags for mitigation of fragmentation and blast effects is not approved for the MGFD

identified in Table 7-1. In addition, double sandbag mitigation may be used for Non-robust and Robust items up to and including 81mm in diameter which have a net explosive weight not exceeding 1.39 pounds TNT equivalent. For these items using double sandbag mitigation, the minimum separation distance is 12.5 feet.

8.0 MAPS

Maps for this TCRA are located in Appendix A. Figure A-1 is a map of the site in relation to the surrounding area. Figure A-2 is a map showing Cayo del Agua with the Q-D arcs that will be used during the MEC removal action on Cayo del Agua. Figure A-3 is a map showing the BATFE magazine location with Q-D arcs. A specifically set aside demolition area will not be established, MEC will be detonated within the removal grids with the associated Q-D arcs.

APPENDIX A. SITE MAPS

This appendix contains the following site maps:

- Figure A-1: Regional Location Map
- Figure A-2: Cayo del Agua QD Map
- Figure A-3: Magazine QD Map.

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N

0 800 1,600 3,200 m

0 2,600 5,200 10,400 ft

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

Culebra Cayo TCRA

Figure A-1

Regional Location Map

Island of Culebra, Puerto Rico

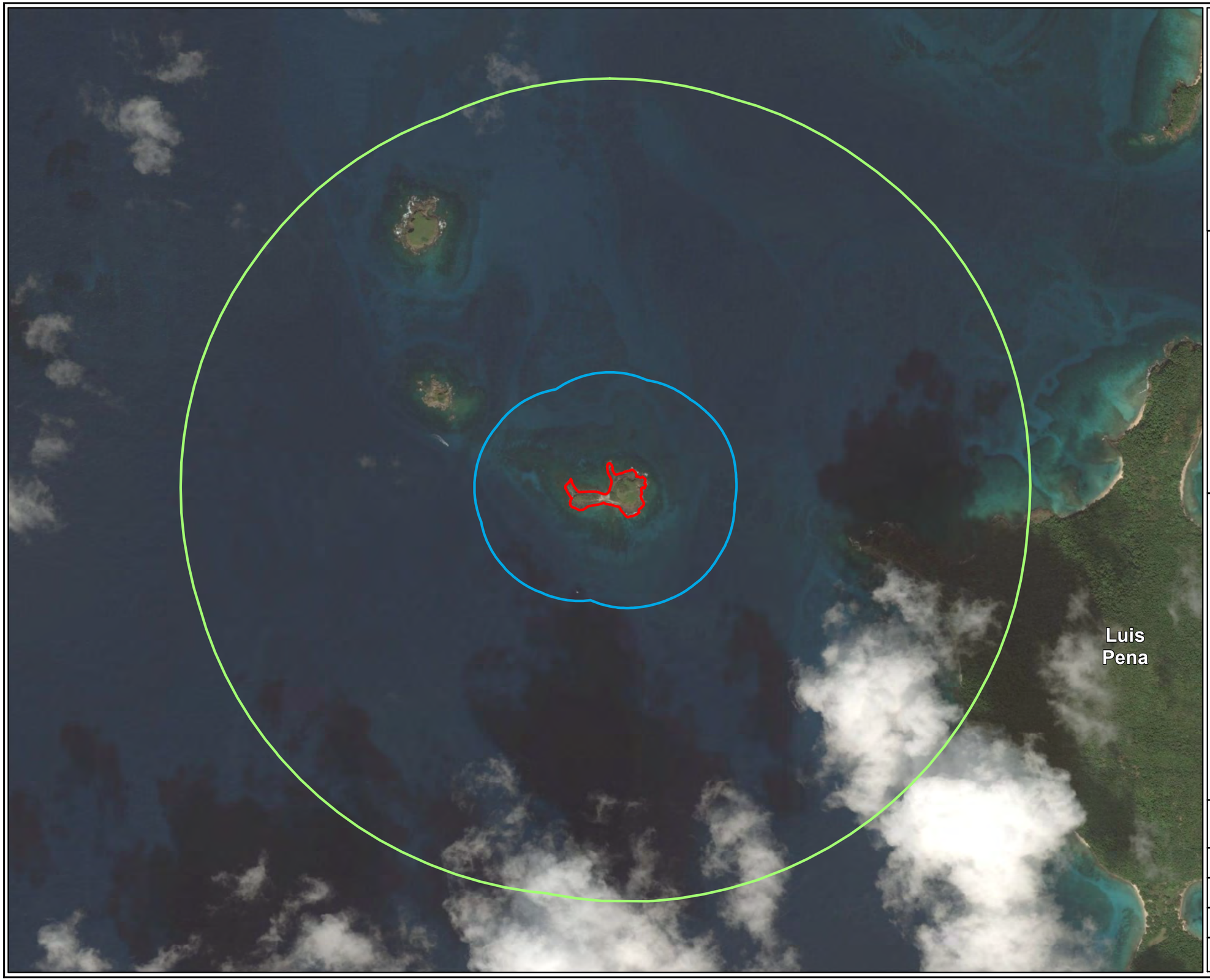
Legend

Cayo del Agua

US Army Engineering And Support Center - Huntsville, Alabama

Drawn By: JAL	Scale: 1 inch = 1,588 meters		
Checked By:	Date Drawn: 7/26/2016		
Submitted By:	Revision Date:	Rev No.	

Path: S:\Culebra1\Cayo TCRA\Maps\MXDs\ESS\Regional Location map_Agua.mxd



N

0 150 300 600 m

0 487.5 975 1,950 ft

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

Culebra Cayo TCRA

Figure A-2

Cayo del Agua ESQD Map

Island of Culebra, Puerto Rico

Legend

Cayo del Agua Boundary

2000-lb Mk 84 Bomb (H-6 Fill)

963 ft HFD

2000-lb Mk 84 Bomb (Tritonal Fill)

4,078 ft MFD

NOTE: The Maximum Fragmentation Distance (MFD) of the 2000-lb Mk 84 Bomb (Tritonal Fill) and the Hazardous Fragmentation Distance (HFD) 2000-lb Mk 84 Bomb (H-6 Fill) have been selected to be represented on the ESQD map.

US Army Engineering And Support Center - Huntsville, Alabama

Drawn By: JAL	Scale: 1 inch = 300 meters		
Checked By:	Date Drawn: 8/16/2016		
Submitted By:	Revision Date:	Rev No.	

Path: S:\Culebra1\Cayo TCRA\Maps\MXDs\ESS\Cayo del Agua MSD Map.mxd

N

0 20 40 80 m

0 65 130 260 ft

Data is projected to the UTM Coordinate System: NAD 1927 Albers

Culebra Cayo TCRA

Figure A-3

Magazine QD Map

Island of Culebra, Puerto Rico

Legend

Magazine Location

Magazine MSD

36.5m (120') PTR MSD

60.9m (200') IBD MSD

US Army Engineering And Support Center - Huntsville, Alabama

Drawn By: JAL	Scale: 1 inch = 40 meters		
Checked By:	Date Drawn: 7/28/2016		
Submitted By:	Revision Date:	Rev No.	

Path: S:\Culebra1\Cayo TCRA\Maps\MXDs\ESS\Culebra Mag QD Map.mxd

APPENDIX B: FRAGMENTATION DATA REVIEW FORM

This appendix contains copies of the Fragmentation Data Review Form of:

- 2000 pound Mk 84 Bomb (H-6 Fill)
- 2000 pound Mk 84 Bomb (Tritonal Fill)

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Fragmentation Data Review Form

Database Revision Date 3/7/2016

Category:	Air-Launched HE Rounds
Munition:	2000 lb Mk 84 Bomb (H-6 filled)
Case Material:	Steel, Mild
Fragmentation Method:	Naturally Fragmenting
Secondary Database Category:	Bomb
Munition Case Classification:	Robust

DODIC:	F126
Date Record Created:	10/5/2009
Record Created By:	SDH
Last Date Record Updated:	9/14/2011
Individual Last Updated Record:	SDH
Date Record Retired:	

Munition Information and Fragmentation Characteristics

Explosive Type:	H-6
Explosive Weight (lb):	945
Diameter (in):	17.9600
Cylindrical Case Weight (lb):	762.08101
Maximum Fragment Weight (Intentional) (lb):	1.4509
Design Fragment Weight (95%) (Unintentional) (lb):	0.1940
Critical Fragment Velocity (fps):	8250

Theoretical Calculated Fragment Distances

HFD [Hazardous Fragment Distance: distance to no more than 1 hazardous fragment per 600 square feet] (ft):	963
MFD-H [Maximum Fragment Distance, Horizontal] (ft):	4021
MFD-V [Maximum Fragment Distance, Vertical] (ft):	3175

Overpressure Distances

TNT Equivalent (Pressure):	1.38
TNT Equivalent Weight - Pressure (lbs):	######
Unbarricaded Intraline Distance (3.5 psi), K18 Distance:	197
Public Traffic Route Distance (2.3 psi); K24 Distance:	262
Inhabited Building Distance (1.2 psi), K40 Distance:	437
Intentional MSD (0.0655 psi), K328 Distance:	3584

Note: Per V5.E3.2.2.1 of DoD 6055.09-M the minimum sited K328 distance may be no smaller than 200 ft.

Sandbag and Water Mitigation Options

TNT Equivalent (Impulse):	1.15
TNT Equivalent Weight - Impulse (lbs):	1086.750
Kinetic Energy 10^6 (lb-ft²/s²):	47.9799

Single Sandbag Mitigation

Required Wall & Roof Thickness (in)	Not Permitted
Expected Max. Throw Distance (ft):	Not Permitted
Minimum Separation Distance (ft):	Not Permitted

Double Sandbag Mitigation

Required Wall & Roof Thickness (in)	Not Permitted
Expected Max. Throw Distance (ft):	Not Permitted
Minimum Separation Distance (ft):	Not Permitted

Water Mitigation

Minimum Separation Distance (ft):	Not Permitted
Water Containment System:	Not Permitted

Note: Use Sandbag and Water Mitigation in accordance with all applicable documents and guidance. If a donor charge larger than 32 grams is utilized, the above mitigation options are no longer applicable. Subject matter experts may be contacted to develop site specific mitigation options.

Minimum Thickness to Prevent Perforation

	Intentional	Unintentional
4000 psi Concrete (Prevent Spall):	50.59	18.35
Mild Steel:	7.70	2.97
Hard Steel:	6.32	2.44
Aluminum:	14.54	5.94
LEXAN:	18.80	10.46
Plexi-glass:	19.88	9.12
Bullet Resist Glass:	19.15	8.06

Item Notes

Distribution authorized to the Department of Defense and U.S. DoD contractors only for Administrative-Operational Use (17 October 2002). Other requests shall be referred to the Chairman, Department of Defense Explosives Safety Board, Room 856C, Hoffman Building I, 2461 Eisenhower Avenue, Alexandria, VA 22331-0600.

Fragmentation Data Review Form

Database Revision Date 3/7/2016

Category:	Air-Launched HE Rounds
Munition:	2000 lb Mk 84 Bomb (Tritonal filled)
Case Material:	Steel, Mild
Fragmentation Method:	Naturally Fragmenting
Secondary Database Category:	Bomb
Munition Case Classification:	Robust

DODIC:	F126
Date Record Created:	10/5/2009
Record Created By:	SDH
Last Date Record Updated:	9/14/2011
Individual Last Updated Record:	SDH
Date Record Retired:	

Munition Information and Fragmentation Characteristics

Explosive Type:	Tritonal (TNT/Al=80/20)
Explosive Weight (lb):	945
Diameter (in):	17.9600
Cylindrical Case Weight (lb):	787.31348
Maximum Fragment Weight (Intentional) (lb):	1.7507
Design Fragment Weight (95%) (Unintentional) (lb):	0.2409
Critical Fragment Velocity (fps):	7243

Theoretical Calculated Fragment Distances

HFD [Hazardous Fragment Distance: distance to no more than 1 hazardous fragment per 600 square feet] (ft):	935
MFD-H [Maximum Fragment Distance, Horizontal] (ft):	4078
MFD-V [Maximum Fragment Distance, Vertical] (ft):	3230

Overpressure Distances

TNT Equivalent (Pressure):	1.07
TNT Equivalent Weight - Pressure (lbs):	######
Unbarricaded Intraline Distance (3.5 psi), K18 Distance:	181
Public Traffic Route Distance (2.3 psi); K24 Distance:	241
Inhabited Building Distance (1.2 psi), K40 Distance:	401
Intentional MSD (0.0655 psi), K328 Distance:	3292

Note: Per V5.E3.2.2.1 of DoD 6055.09-M the minimum sited K328 distance may be no smaller than 200 ft.

Sandbag and Water Mitigation Options

TNT Equivalent (Impulse):	0.96
TNT Equivalent Weight - Impulse (lbs):	907.200
Kinetic Energy 10^6 (lb-ft²/s²):	44.0830

Single Sandbag Mitigation

Required Wall & Roof Thickness (in)	Not Permitted
Expected Max. Throw Distance (ft):	Not Permitted
Minimum Separation Distance (ft):	Not Permitted

Double Sandbag Mitigation

Required Wall & Roof Thickness (in)	Not Permitted
Expected Max. Throw Distance (ft):	Not Permitted
Minimum Separation Distance (ft):	Not Permitted

Water Mitigation

Minimum Separation Distance (ft):	Not Permitted
Water Containment System:	Not Permitted

Note: Use Sandbag and Water Mitigation in accordance with all applicable documents and guidance. If a donor charge larger than 32 grams is utilized, the above mitigation options are no longer applicable. Subject matter experts may be contacted to develop site specific mitigation options.

Minimum Thickness to Prevent Perforation

	Intentional	Unintentional
4000 psi Concrete (Prevent Spall):	44.42	16.48
Mild Steel:	7.15	2.80
Hard Steel:	5.86	2.30
Aluminum:	13.44	5.58
LEXAN:	18.27	10.26
Plexi-glass:	19.14	8.90
Bullet Resist Glass:	18.48	7.89

Item Notes

Distribution authorized to the Department of Defense and U.S. DoD contractors only for Administrative-Operational Use (17 October 2002). Other requests shall be referred to the Chairman, Department of Defense Explosives Safety Board, Room 856C, Hoffman Building I, 2461 Eisenhower Avenue, Alexandria, VA 22331-0600.

DEPARTMENT OF DEFENSE EXPLOSIVES SAFETY BOARD
4800 MARK CENTER DRIVE, SUITE 16E12
ALEXANDRIA VIRGINIA, 22350

SEP 19 2016

DDESB-PE

MEMORANDUM FOR DIRECTOR, U.S. ARMY DEFENSE AMMUNITION CENTER
ATTENTION: ATCL-AC

SUBJECT: DDESB Approval of Time Critical Removal Action Explosives Safety Submission, Cayo del Agua, Culebra Island, Puerto Rico [USATCES MEC File Number 1532]

References: (a) DAC ATCL-AC Memorandum of 6 September 2016, Subject: Request for Approval of Time Critical Removal Action (TCRA) Explosives Safety Submission (ESS) Cayo Del Auga, Culebra Island, Puerto Rico (PR), Formerly Used Defense Site (FUDS), September 2016, [USATCES MEC File Number 1532].

(b) DoD 6055.09-M, DoD Ammunition and Explosives Safety Standards, date varies by volume

(c) DDESB TP-15, Approved Protective Construction, Revision 3, May 2010

(d) DDESB-PD Memorandum of 22 May 2014, Subject: Revision of DDESB Approval for Use of Sandbags for Mitigation of Fragmentation and Blast Effects Resulting from the Intentional Detonation of Munitions

The Department of Defense Explosives Safety Board (DDESB) Staff has reviewed the subject time critical removal action explosives safety submission (TCRA-ESS) forwarded by reference (a) against the requirements of reference (b). Based on the information provided, approval is granted for removal and treatment of material potentially presenting an explosive hazard (MPPEH) and munitions and explosives of concern (MEC) at Culebra Island, Puerto Rico. This approval is based on the following:

a. The efforts addressed in this TCRA-ESS involve manual unintentional detonation operations and intentional detonations supporting munitions response actions within Munitions Response Area (MRA) Cayo del Agua.

b. The property is part of the Culebra National Wildlife Refuge.

c. The munition with the greatest fragmentation distance (MGFD) for the MRA Cayo del Agua is the 2000-pound Mk 84 (Tritonal filled) Bomb; the minimum separation distance (MSD) for teams for manual unintentional detonation operations is 437 feet (ft) based on K40 of the 2000-pound Mk 84 (H-6 filled) Bomb; the MSD for nonessential personnel from manual unintentional detonation operations is 963 ft based on the hazardous fragment distance of

the 2000-pound Mk 84 (H-6 filled) Bomb; and the MSD for all personnel from intentional detonations is 4,078 ft based on the maximum fragment distance of the MGFD.

d. The use of sandbags, water mitigation systems and earth tamping is authorized as an engineering control for intentional detonations involving the MEC identified in reference (a) provided the Army ensures usage per reference (c), paragraph C6.2.7.5.

e. The use of double sandbags is authorized as an engineering control for intentional detonations involving the MEC identified in reference (a) provided the Army ensures usage per reference (d).

f. One ATF Type II aboveground magazine is approved to store non-fragmenting demolition materials up to 31 pounds net explosive weight of hazard division (HD) 1.1 and mission essential quantities of HD 1.4. The applicable inhabited building distance is 200 ft and the public traffic route distance is 120 ft.

g. Demolition materials, per reference (a), may be delivered as needed.

h. Prior to initiation and through completion of on-site explosives operations, all nonessential personnel will be evacuated and prevented from entering any area/facility encumbered by the MSD required for the operation being conducted, or explosives operations will be suspended if nonessential personnel enter the MSD.

i. MPPEH will be inspected and classified as material documented as safe prior to release to the public.

If changes occur during or after completion of this effort that could increase explosive hazards to site workers or the public due to the presence of military munitions at the site, an amendment to this TCRA-ESS must be submitted to DDESB for review and approval.

The point of contact for this action is Ms. Kristene Bigej, (571) 372-6705, DSN 372-6705, E-mail address: kristene.a.bigej.civ@mail.mil.

THIERRY L. CHIAPELLO
Executive Director

DEPARTMENT OF THE ARMY
US ARMY DEFENSE
AMMUNITION CENTER 1 C
TREE ROAD
MCALESTER OK 74501-9053

ATCL-AC 27 September 2016

MEMORANDUM FOR MEMORANDUM FOR US Army Corps of Engineers, Environmental and Munitions Center of Expertise, CEHNC-CX-MM, P.O. Box 1600, Huntsville, AL 35807-4301

SUBJECT: Army and DDESB Approval of Time Critical Removal Action Explosives Safety Submission (ESS), Cayo del Agua, Culebra Island, Puerto Rico [USATCES MEC File Number 1532].

1. References:

(a) Memorandum DDESB-PE, dated 19 September 2016, subject: Approval of Time Critical Removal Action Explosives Safety Submission (ESS), Cayo del Agua, Culebra Island, Puerto Rico [USATCES MEC File Number 1532].

2. The Department of Defense Explosives Safety Board (DDESB) and the U.S. Army Technical Center for Explosive Safety has reviewed the subject ESS and based on the information provided, approval is granted.

3. The conditions of reference 1.a must be met for this ESS to be valid. Any changes to this ESS must be submitted to the USATCES for review and approval.

4. The POC is Dr. Jim Langley, ATCL-ACE, DSN 956-8767, or COMM (918) 420-8767, email jimmy.l.langley.civ@mail.mil, Alternate POC Mr. Landon Johnson, (918) 420-8807, DSN 956-8807, email landon.k.johnson5.civ@mail.mil.

TIRONE.JOSEPH.ANDREW.1026683749 Digitally signed by TIRONE.JOSEPH.ANDREW.1026683749 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=TIRONE.JOSEPH.ANDREW.1026683749 Date: 2016.09.27 10:25:29 -05'00'

Joseph A. Tirone
Director
US Army Technical Center for Explosives Safety

CF (w/Encl):

Office of the Director of Army Safety, (DACS-SF/Mr. Patton), Bldg. 1456, 9351 Hall Rd, Ft. Belvoir, VA 22060-5527

Office of the Deputy Assistant Secretary of the Army for Environment, Safety, and Occupational Health, Special Assistant for Munitions, DASA-DESOH/Mr. King, 110 Army Pentagon, Washington, DC 20310-0110